**ACOEM Evidence Table: Problem of Obesity in the Workplace**

| Author/Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Bi et al. 2015 | Problem of Obesity in the Workplace | Large, population-based study | No declared COI. | 48,704 Chinese migrant workers from a 2012 national survey done by the Chinese Center for Disease Control and Prevention.<br><br>4.7% of the cohort were obese. | Mean age was 33.2 years.<br><br>Majority of the cohort was male (57.3%). | The primary outcome of interest was cardiometabolic risk profile in Chinese migrant workers relative to the overall Chinese population. | No follow up. | Most metabolic risk factors were significantly less prevalent in migrant workers than in the general population in China (all p<0·001).<br><br>Obesity and central obesity were more prevalent in male migrant workers (p<0·0001). | "Compared with the general population in China, most cardiometabolic risk factors were less prevalent in migrant workers. However, overweight, obesity and central obesity were more prevalent in male migrant workers than among men in the general population. Cardiometabolic risk profiles for migrant workers are not optimal and effective national interventions that can reach this special population are needed." | |

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| Munir et al. 2012 | Problem of Obesity in the Workplace | Prospective cohort study | Funding for this work was supported by a county fire and rescue service. | The BMI and body composition of 735 male firefighters from a UK county fire and rescue service was assessed. | The sample was entirely male (100%). Within each study group, the average age was 37.6 (8.5) years. | The aim of the study was to establish the prevalence of obesity among a large sample of firefighters in the UK and to explore changes in body mass index (BMI) over a 3-year period.<br><br>BMI data were used as a continuous variable and recoded into categories: normal weight (18.5–24.9 kg/ m2), overweight (25.0–29.9 kg/m2) and obese (≥30.0 kg/ m2) [9]. We dichotomized BMI using a cut-off of ≥27 kg/m2 defined by the guidelines [1] as the threshold for intervention. | Changes in body mass index (BMI) were assessed in 2008 and 2011 over a 3-year period. | In 2008, 65% of the firefighters were either overweight (54%) or obese (11%). In 2011, slightly fewer firefighters were overweight (53%), but the proportion classified as obese increased significantly to 13%.<br><br>Those classified as normal weight in 2008 were more likely to have gained weight by 2011 in comparison with those categorized as obese at baseline.<br><br>A lower proportion of firefighters were classified as high risk for obesity based on their waist circumference in 2008.<br><br>There were no significant overall changes in BF% and WC for the whole sample between 2008 and 2011. Significant between-participant effects for the BMI group for BF% [$F(2, 730) = 360$, $P < 0.001$] and WC [$F(2, 730) = 349$, $P < 0.001$] were found. There were significant interaction effects between time and BMI (2008) for BF% [$F(2, 730) = 9.5$, $P < 0.001$] and between time and BMI (2008) for WC [$F(2, 730) = 7.4$, $P < 0.01$]. Therefore, while overall averages for BF% and WC remained stable, 2008 BMI category predicted the amount of change over time. | "The proportion of firefighters who are either overweight or obese is lower in this UK sample than that found in US studies. Nevertheless, the proportion of UK firefighters classed as overweight was higher than that found in the general population samples from England. Given the negative implications of obesity for performance, there is a need for further investment in theory-based, sector specific health promotion research and practice." | |

**ACOEM Evidence Table: Impact of Workplace on Obesity**

*Occurred in laboratory rather than real workplace setting

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Au et al. 2013 | Impact of Workplace on Obesity | Prospective Cohort Study | No COI declared | 9276 women aged 45-50 years were identified from the Australian Longitudinal Study of Women's Health | Mean age not listed. Subjects were all women aged 45-50 years at baseline visit in 1996. | The primary outcome of interest was weight change relative to employment status and work hours in middle-aged women. | 2 years after first survey in 1996 | Physical activity levels did not differ by employment status. Employed women who worked very long hours had a higher proportion engaged in no physical activity (35.9%) than women who worked fewer hours (P<0.01).<br><br>Employed women were more likely to drink alcohol (P<0.01). Those working very long or long hours were more likely to drink at high-risk levels (≥3 drinks per day) (P=0.01).<br><br>There was no association between unemployment and weight change when health status was controlled for.<br><br>Among the employed, those who worked longer hours (≥35) tended to gain more weight (P<0.05). | "Employment was associated with more weight gain and less weight loss. Among the employed, working longer hours was associated with more weight gain, especially at the higher levels of weight gain where the health consequences are more serious."<br><br>"As women work longer hours, they are more likely to make lifestyle choices that are associated with weight gain." | |

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| Brondel et al. 2010 | Impact of Workplace on Obesity | Randomized Controlled Trial* | No COI declared | 12 normal weight male students.<br><br>Mean BMI of participants was 22.3 $kg/m^2$ (SD: 1.83 $kg/m^2$). | Mean age of participants was 22 years (SD 3 years). All subjects were male. | The primary outcome of interest was changes in energy intake and physical activity relative to sleep duration (8h vs 4h). | Two 48h study visits occurred at least 5 days apart from one another. | Relative to the 8h sleep session, subjects consumed 22% more calories after sleep restriction ($P<0.01$), and preprandial hunger was higher before breakfast ($P<0.001$) and dinner ($P<0.05$).<br><br>There was no change in the perceived pleasantness of the foods or in the desire to eat the foods.<br><br>Relative to the 8h sleep session, afternoon physical activity was higher ($P<0.01$) while physical activity during the night was lower ($P<0.05$) after sleep restriction. | "One night of reduced sleep subsequently increased food intake and, to a lesser extent, estimated physical activity–related energy expenditure in healthy men. These experimental results, if confirmed by long-term energy balance measurements, suggest that sleep restriction could be a factor that promotes obesity." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Cain et al. 2015 | Impact of Workplace Obesity | Randomized Controlled Trial* | No COI declared | 16 participants free from psychiatric or major medical problems, medications affecting the central nervous system and had normal body mass indices (BMI 20-25). | 50% women, 50% men. Mean age: 20.1 years | "Participants underwent a simulated night shift and control condition a counterbalanced order. On the following morning, participants were provided an opportunity for breakfast that included high- and low-fat food options."<br><br>"Total amount of food consumed (g) was calculated for each participant, per condition, and compared using paired sample t-test. The total amount of food consumed was calculated for high- and low-fat foods for each condition. These were compared using a two- way repeated measure analysis of variance for control versus simulated shift and high fat versus low fat. | Participants attended the laboratory on two occasions (control and simulated night shift) after weeklong screening to ensure consistent sleep/wake schedules. The two occasions were approximately a week apart. | "Participants ate significantly more high-fat breakfast times after the simulated night shift than after the control condition (p=0.012). The preference for high-fat food was apparent among the majority of individuals following the simulated night shift (81%), but not for the control condition (43%). Shift work and control conditions did not differ, however, in the total amount of food or calories consumed"<br><br>"Following the simulated night shift, the total food consumption increased for 31.25% of participants and 81.25% of individuals ate more of the high-fat food options | "A simulated night shift leads to preference for high-fat food during a subsequent breakfast opportunity.<br>These results suggest that food choice may contribute to weight-related chronic health problems commonly seen among night shift workers." | |

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| Fried et al. 2013 | Impact of Workplace on Obesity | Prospective cohort study | No mention of COI | 1,949 working adults were identified from the Tel Aviv Medical Center Inflammation Survey cohort and returned for a follow up visit. | Mean age of participants was 44.8 years (SD 9.3 years). The majority of the cohort are male (67%). | The primary outcome of interest was changes in waist circumference and waist-hip ratio over time compared to job enrichment. | Second visit took place about 3.5 years (SD= 40 months) after first visit. | Job enrichment has a curvilinear effect on changes in waist circumference (β=0.11, *p*=0.00) and waist-hip ratio (β=0.13, *p*=0.00).<br><br>Job enrichment was not a significant predictor of changes in time in BMI (β=-0.01, *p*=0.45).<br><br>Dieting, smoking, alcohol consumption, sport intensity, and job category were not significant predictors of waist circumference, waist to hip ratio, or BMI changes over time. | "The results supported the U-shaped relationship between job enrichment and changes in both indicators of abdominal obesity over time, such that the level of abdominal obesity was reduced when job enrichment was moderate and was increased when job enrichment was either high or low. As expected, no such association was observed for the general obesity measure of body mass index (BMI)."<br><br>"The curvilinear relationship of job enrichment with changes in waist circumference and waist-hip ratio helps illuminate the pattern in which job design contributes to abdominal obesity over time" | |

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| Godard et. al. 2015 | Impact of Workplace on Obesity | Prospective Cohort Study | No COI declared | The sample is made up of 7218 individuals interviewed in 2004, 2006, and 2010 waves of the Survey of Health, Ageing and Retirement in Europe (SHARE), who declared in each wave that they were either employed or retired. Excluded transitions from employment to unemployment, disability or inactivity and transitions from retirement to employment, unemployment, disability or inactivity. Sample number finalized after conditioning on having no missing value on weight, height and any covariate included in the model. | Whole sample average age was 59.68 years Women: 45.3% Men: 54.7% | Clinical weight categories were derived from the BMI: underweight (BMI<18.5 kg/m2), normal (BMI from 18.5 to 24.9 kg/m2), overweight (BMI from 25 to 29.9 kg/m2) and obese (BMI 30 kg/m2 and above). An individual weight change was computed as well as a dummy variable indicating whether the individual experience a weight change of at least 10% between two subsequent waves of the survey. BMI is shown to be highly correlated with more precise measures of adiposity. | Biennial basis (every two years) | "There is suggestion of a non-linear impact of retirement on men's BMI. Retirement would mostly affect the right- hand side of the male BMI distribution thus increasing the risk of obesity"<br><br>"Retirement, however, causes a 12% point increase in the probability of being obese (at the 5% significance level) within a two- to four-year period among men. It corresponds to a 60% increase in the probability of being obese within a two- to four-year period." | Retirement induced by discontinuous incentives in early retirement schemes causes an increase in the probability of being obese among men.<br><br>This pattern is driven by men retiring from strenuous jobs and by those who were already at risk of obesity. | No significant results are found among women |

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| Gordon et al. 2012 | Impact of Workplace on Obesity | Prospective Cohort Study | No mention of COI. | Data from 1962-2006 was obtained from the National Health Examination Survey (NHANES).<br><br>Height and weight was analyzed using both civilian and military data in NHANES but sample size was not mentioned for civilians.<br><br>Detailed anthropometric data from 6682 male US Army soldiers was obtained from the 1962-1966 NHANES. Data from 1774 male and 651 female US Army soldiers was obtained from the 2003-2006 NHANES. | Mean age of participants was not reported.<br><br>Sample included both males and females except for some of the analyzed military data was all male. | The primary outcome of interest was anthropometric changes over the last 50 years. | No follow up, but NHANES is conducted in four year cycles. | The civilian mean stature increased between 1962-2006 for both males and females, but the rate of increase in mean weight was considerably faster.<br><br>The male obesity rate changed from 10.7% in 1962 to 31.3% in 2006. The female change for the same period was 15.8% to 33.2%.<br><br>In the Army, the proportion of obesity increased from 3.6% to 20.9%, in males.<br><br>Biacromial and hip breadths and chest, waist, and buttock circumferences increased significantly in US Army Active Duty males from 1987-1988 to 2006-2007 (all $P<0.001$). | "US national probability samples have shown little recent increase in stature, while showing substantial increase in weight, and the trend is apparent in US Army data as well."<br><br>"Ergonomic dimensions related to body weight have likely increased substantially in recent years." | |

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| Greer et al. 2013 | Impact of Workplace on Obesity | Prospective Cohort Study* | No COI declared | 23 healthy participants with a mean BMI of 23.0 $kg/m^2$ (SD: 1.8 $kg/m^2$) | Mean age of participants was 20.5 years (SD 1.8 years). The majority of the cohort was female (57%). | The primary outcome of interest was neurological mechanisms controlling appetite and food desire relative to sleep duration (normal 8h sleep vs total sleep deprivation). | Second study visit occurred 7 days after first. | Sleep deprivation diminished activity in the anterior cingulate cortex ($P<0.001$), lateral orbital frontal cortex ($P<0.05$) and anterior insular cortex ($P=0.02$)—as food desire progressively increased.<br><br>Sleep deprivation resulted in a significant increase in the proportion of 'wanted' food items of high-caloric content ($P=0.04$). | "Insufficient sleep may lead to the development/maintenance of obesity through diminished activity in higher-order cortical evaluation regions, combined with excess subcortical limbic responsivity, resulting in the selection of foods most capable of triggering weight-gain." | |

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| Gu et al. 2014 | Impact of Workplace on Obesity | Prospective Cohort Study | No COI declared | 125,992 working adults were identified from the 2004-2011 National Health Interview Survey.<br><br>26.2% met criteria for Obesity (BMI ≥30). | Mean age of participants was 41.3 years (SE 13.5 years). The majority of the cohort are male (54.9%). | The primary outcome of interest was obesity prevalence by occupation, race/ethnicity, and gender at the time of survey. | No follow up, but NHIS conducted annually | The fastest growing prevalence of obesity was amongst Hispanic male workers (slope: 1.087; P=0.001)<br><br>Overall prevalence of obesity was highest among non-Hispanic black women (40%) and lowest among non-Hispanic white women (23.1%).<br><br>Overall prevalence of obesity increased 4.1% (0.51% annually) between 2004-2011.<br><br>The highest prevalences of obesity were in workers of transportation and material moving and protective service, regardless of gender and race/ethnicity.<br><br>Prevalence of obesity steadily increased from 2004 through 2008 across gender and race/ethnicity but leveled off from 2008 through 2011. | "The prevalence of obesity in relatively low-obesity occupations (eg, white-collar jobs) significantly increased between 2004–2007 and 2008–2011, whereas the prevalence in high-obesity occupations (eg, blue-collar jobs) did not change significantly."<br><br>"Workers in all occupational categories are appropriate targets for health promotion and intervention programs to reduce obesity" | |

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| Hogenkamp et al. 2013 | Impact of Workplace on Obesity | Randomized Controlled Trial* | No COI declared | 16 healthy normal-weight men<br><br>Mean BMI of participants was 23.6 $kg/m^2$ (SD: 0.6 $kg/m^2$). | Mean age of participants was 23 years (SD 0.9 years). All participants were male. | The primary outcome of interest was changes in food portion size choice, self-reported hunger, and ghrelin levels relative to sleep duration (8h, total sleep deprivation). | Two study visits occurred at least 28 days apart from one another. | After total sleep deprivation, subjects had 13% higher plasma ghrelin levels (P=0.04), and chose 14% larger portions (P=0.02) relative to the 8h sleep condition.<br><br>Self-reported hunger was greater after sleep deprivation (P<0.01).<br><br>Following breakfast, sleep-deprived subjects chose 16% larger snack portions (P=0.02), but selection of food items was not significant (P=0.13). | "The over-eating associated with sleep loss may be the result of two independent mechanisms: a homeostatic drive to compensate for nocturnal energy deficits, and an increase in reward system susceptibility to calorically dense foods."<br><br>"Whereas the homeostatic drive thus can be reset by a caloric load, e.g. a breakfast, this does not appear to be the case for the portion size choices driven by the reward system." | |

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| Itani et al. 2013 | Impact of Workplace on Obesity | Prospective Comparative Study | No mention of COI | 30,194 men employed by the same Japanese public institution who got checkups in 1999 and 2006. | Mean age of participants was 39 years (SD 9.1 years). All subjects were male. | The primary outcome of interest was the onset of lifestyle related diseases (obesity, hypertension, hyperlipidemia, low HDL, hyperglycemia) relative to work hours and availability of weekly rest days. | Follow up occurred 7 years after baseline survey. | Those who worked ≥9 hours had higher incidence rates of obesity, hypertriglyceridemia, and dyslipidemia (all P≤0.01).<br><br>Those who did not use most of the weekly rest days had higher incidence rates of hypertension, hypertriglyceridemia, dyslipidemia, and metabolic syndrome (all P≤0.01).<br><br>There was no association between those who worked ≥9 hours and/or did not use most of the weekly rest days and incidence rates of hyperglycemia and low HDL.<br><br>Subjects who worked ≥9 hours (OR: 1.13 (95% CI: 1.04-1.23) and/or did not use most of their weekly rest days (OR: 1.19 (95% CI: 1.07-1.33) were more likely to have hypertriglyceridemia (both P<0.01) | "The results revealed that hours worked and actual availability of weekly rest days independently increased the risk of onset of hypertriglyceridemia."<br><br>"Working only regular hours and taking advantage of weekly rest days can contribute to the prevention of hypertriglyceridemia." | |

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| Kottwitz et al. 2014 | Impact of Workplace on Obesity | Prospective Cohort Study | No COI indicated | 57 women in their first year of occupational life participated at baseline and 38 at follow-up. | Average age: 22.47 years<br><br>Female: 100%<br><br>Male: 0% | Working conditions were assessed by self-reports and observer-ratings.<br>BMI at baseline and change in BMI one year later were regressed on self- reported social stressors as well as observed work stressors, observed job control, and their interaction.<br><br>The impact of changing work conditions were investigated, specifically social stressors, demands, and control at work, on BMI. | There was a follow-up survey one year later. | "BMI at baseline is highly correlated with BMI at follow-up ($p<0.01$), indicating considerable stability of inter-individual differences in body weight."<br><br>"Longitudinally, an increase in social stressors is associated with an increase in BMI too."<br><br>"Job control, while not correlated with baseline and follow-up BMI, did predict change in BMI, however, no significant interaction emerged." | "Seen individually, social stressors at work predicted BMI, Moreover, increase in social stressors and decrease of job control during the first year of occupational life predicted increase in BMI. Work redesign that reduces social stressors at work and increases job control could help to prevent obesity epidemic." | |

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| Kullgren et al. 2016 | Impact of the workplace on obesity | Randomized Controlled Trial | No COI declared | 132 obese employees participated in this study | Average age: 43.9 years<br><br>Female: 87.1%<br><br>Male: 12.9% | Testing whether employer matching of employees' monetary contributions increases employees' participation in deposit contracts to promote weight loss and weight loss.<br><br>Rates of making 1 or more deposits, weight loss at 24 weeks (primary outcome), and 36 weeks, were measured.<br><br>Deposit rates were compared using chi-square tests. Weight loss was compared using t-tests. | 12 weeks of follow-up was used for online questionnaires and weight monitoring. | "Among participants eligible to make deposits, 29% made one or more deposits and matching did not increase participation. At 24 weeks, control participants gained an average of 1.0 pound, whereas 1:1 matched deposits participants lost an average of 5.3 pounds (p=0.005). After 36 weeks, control participants gained an average of 2.1 pounds, whereas no match participants lost an average of 5.1 pounds (p=0.008)." | "Participation in deposit contracts to promote weight loss was low, and matching deposits did not increase participation. For deposit contracts to impact population health, ongoing participation will need to be higher." | |

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| Marchand et al. 2014 | Impact of Workplace on Obesity | Prospective Cohort Study | No COI declared | 5925 non-obese working adults were identified from the first cycle of the Canadian National Population Health Survey from 1994-2008. | Mean age of participants was 36.9 years (SD 12.0 years). About half of the cohort was male (51%). | The primary outcomes of interest were the contribution of mental health, job stress, and family and social factors on obesity by gender. | Canadian National Population Health Survey conducted every two years. | Obesity in men increased from 5.6% in 1996 to 14.9% in 2008, and among women from 4% in 1996 to 11.1% in 2008.<br><br>Female gender and physical activity are significantly associated with a reduced obesity risk (both P<0.01), while hypertension is associated with an increased obesity risk (P<0.05).<br><br>Low decisional authority at work was associated with increased obesity risk in women (P<0.05)<br><br>Living together as a couple were associated with an increased obesity risk (P<0.01).<br><br>Psychological distress tended to decrease obesity risk (P<0.05). | "Good mental health (ie, low psychological distress), non-work factors (ie, living in couple, child-related strains) and individual characteristics (ie, physical inactivity, hypertension and psychotropic medication) are predictive factors of obesity for both men and women, while work factors (ie, low decision authority) only contribute to predict women's obesity risk."<br><br>"Psychological distress did not mediate the relationship between work factors and obesity risk." | |

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| Markwald et al. 2012 | Impact of Workplace Obesity | Prospective Cohort Study* | No COI declared | Sixteen healthy participants | 50% female; 50% male Average age: 22.4 years | Subjects were studied in an inpatient study and quantified effects of 5 days of insufficient sleep, equivalent to a workweek, on energy expenditure and energy intake compared with adequate sleep. | Subjects were studied for 14-15 days. | "Insufficient sleep increased total daily energy expenditure by approximately 5%; however, energy intake (especially at night after dinner) was in excess of energy needed to maintain energy balance. Insufficient sleep led to 0.82 kg weight gain despite changes in hunger and satiety hormones ghrelin and leptin, and peptide YY, which signaled excess stores."<br><br>"Transitioning from an insufficient to adequate/recovery sleep schedule decreased energy intake, especially of fats and carbohydrates, and led to -0.03kg weight loss." | "Sleep plays a key role in energy metabolism. Importantly, findings demonstrate physiological and behavioral mechanisms by which insufficient sleep may contribute to overweight and obesity"<br><br>"Increased food intake during insufficient sleep is a physiological adaptation to provide energy needed to sustain additional wakefulness; yet when food is easily accessible, intake surpasses that needed." | |

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| McHill et al. 2014 | Impact of Workplace Obesity | Prospective Cohort Study* | No COI declared | 14 healthy subjects who were deemed so based on clinical history, physical examination, psychological tests, etc. | Average age: 26.4 years<br>Female: 57.1%<br>Male: 42.9% | Changes in energy expenditure, macronutrient utilization, appetitive hormones, sleep, and circadian phase during day versus nightshift work were quantified. | Subjects lived at the research center for approximately 6 days to simulate a daytime work followed by a 3-day night shift schedule. | "Total daily energy expenditure increased by approximately 4% on the transition day to the first night shift, which consisted of an afternoon nap and extended wakefulness, whereas total daily energy expenditure decreased by approximately 3% on each of the second and third nightshift days, which consisted of daytime sleep followed by afternoon and nighttime wakefulness.<br>Energy expenditure decreased by approximately 12-16% during scheduled daytime sleep opportunities despite disturbed sleep."<br><br>"Ratings of hunger were decreased during nightshift days despite decreases in 24 hour levels of the satiety hormones leptin and peptide YY." | "Reduced total daily energy expenditure during nightshift schedules and reduced energy expenditure in response to dinner represent contributing mechanisms by which humans working and eating during biological night, when the circadian clock is promoting sleep, may increase the risk of weight gain and obesity." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Mercan et al. 2014 | Impact of Workplace on Obesity | Large, population-based study | No COI declared. | 46,930 subjects from the Health and Retirement Study.<br><br>Mean BMI of cohort was 27.9 kg/$m^2$ (SD: 5.2 kg/$m^2$). | Mean age was 60.4 years (SD: 6.3 years).<br><br>Majority of the cohort was male (53%). | The primary outcome of interest was obesity relative to working duration. | No follow up. HRS conducted biannually. | Older workers who work >59 hr/week are more likely to gain weight than older workers who work <59 hr/week. | "This study's findings may support initiatives of the European Union and other governments to regulate the length of working schedules."<br><br>"Our results of this study suggest that old workers' work hours are associated with high BMIs.." | |

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| Mina et al. 2012 | Impact of Workplace on Obesity | Prospective Cohort Study | No COI indicated | The files of 1094 subjects were reviewed. | Median age of drivers was 47 (2009) and 48 (2004). For recruits, median age was 32 (2009) and 31 (2004). Female drivers: 3% Male drivers: 97% Female recruits (2004): 7% Female recruits (2009): 14% Male recruits (2004): 93% Male recruits (2009): 86% | The BMI health parameter was split into three groupings: normal (<25 kg/m2), overweight (25-29.9 kg/m2) and obese (>30 kg/m2).<br><br>The prevalence of the selected health parameters was calculated in the form of raw counts and percentages for each cohort. Prevalence values were calculated for three groups (drivers, recruits and both drivers and recruits combined), two time periods (2004 and 2009) and two gender classifications (both females and males, males only).<br><br>Inferential statistical testing was done via a generalized mixed model analysis, a chi-square goodness of fit test, and an independent samples t- test. | 5 years | The proportions of drivers with systolic blood pressure greater than 140 mmHg ($p<0.001$), total cholesterol greater than 5.5 mmol/L ($p<0.001$) and who smoked ($p<0.01$) all decreased significantly. The proportions of drivers who were obese ($p<0.001$) and who had diabetes ($p<0.01$) and pre-diabetes ($p<0.001$) all increased significantly." | "The rate of increase of obesity in drivers is similar to the general population and is also observed in recruits. Increases in the prevalence of diabetes and pre- diabetes are likely to reflect the increased prevalence of obesity and the impact of regular screening. These were offset by improvements in systolic blood pressure, total cholesterol and smoking status, with a neutral overall effect on cardiac risk score." | |

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| Minkel et. al. 2014 | Impact of Workplace on Obesity | Randomized Controlled Trial* | No COI indicated | There were a total of 26 participants who completed this experiment. | Average age was 34.9 years Male: 53.8% Female: 46.2% | This experiment was designed to investigate the effects of sleep deprivation on physiological stress responses in healthy adults.<br><br>Randomization to one night of sleep-deprivation or a normal-sleep control condition. After a night of baseline sleep, 12 subjects were sleep deprived and 14 were not. Comparison was achieved through the Trier Social Stress Test after sleep manipulation, which requires delivering a speech and performing difficult arithmetic. Saliva samples were collected at different time intervals after a stressor was administered. Samples were then assayed for cortisol. | 3-night laboratory experiment | "Sleep deprivation was associated with higher cortisol levels at baselines ($p<0.0001$) and an amplified cortisol response to the stressor relative to control participants ($p=0.0039$)." | "Sleep deprivation is associated with both elevated resting cortisol release and with an exaggerated cortisol response to a stressor indicative of elevated HPA axis responses in healthy adults. Individual differences in the magnitude of this response may represent a risk factor for psychological and physical health consequences associated with heightened cortisol exposure." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Nabe-Nielsen et al. 2011 | Impact of Workplace on Obesity | Prospective Cohort Study | No COI declared | 2,062 participants were enrolled a few weeks before graduating as healthcare helpers/assistants.<br><br>Data was collected from "The Danish Healthcare Worker Cohort – Class of 2004." | Average age:<br>Female: 100%<br>Male: 0% | Analyzed whether shift work was associated with changes in smoking habits, level of physical activity, or weight.<br><br>Work schedule was categorized into "fixed day work," "fixed evening work," "fixed night work," "two shifts without night work," and "two or three shifts with night work."<br><br>BMI was also categorized into underweight (<18.5), normal weight (18.5 – 24.9), and overweight (>25). As outcome measure, it was calculated whether each participant lost weight, gained weight, or maintained weight during follow-up.<br><br>The exposure reference group consisted of fixed day-shift workers. | Follow-up occurred on a yearly basis, the first being i n 2005, and the second in 2006.<br><br>In total a 2-year follow-up | "More participants increased their level of physical activity ranging from 25% among fixed night-shift workers to 81% among two- and three-shift workers with night shifts."<br><br>"Working two or three shifts including night work was associated with lower odds of gaining weight among participants categorized as "normal weight" at baseline (OR=0.38; 95% CI: 0.19 to 0.74)."<br><br>"Among those who were sedentary at baseline, fixed night-shift workers had lower odds of increasing their level of physical activity than fixed day-shift workers (OR=0.08)." | "Changes in health behaviors may mediate some of the association between fixed night work and health outcomes"<br><br>"Fixed night-shift workers had lower odds of becoming physically active, lower odds of smoking cessation, and higher odds of taking up smoking again, whereas night work as part of a rotating schedule was associated with lower odds of weight gain." | Length of the follow- up might be too short to draw any firm conclusions about exposure to shift work and its effect on the risk of obesity |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Oksanen et al. 2013 | Impact of Workplace on Obesity | Large, population-based study | No COI declared. | 39,873 subjects from the Finnish Public Sector Survey in 2000-2002.<br><br>11% of the cohort was obese. | Mean age was 44.3 years.<br><br>Majority of the cohort was female (81%). | The primary outcomes of interest were obesity and sleep problems in the working population. | No follow up. | High job strain was associated with a lower risk of obesity but higher risk of sleep problems.<br><br>There was a positive correlation between obesity and sleep problems at both the individual and workplace level.<br><br>The relationship between obesity and sleep problems on the individual level was mediated by age, sex, SES, alcohol consumption, and job strain. | "Obese employees and those with sleep problems tend to cluster in the same workplaces, suggesting that, in addition to targeting individuals at risk, interventions to reduce obesity and sleep problems might benefit from identifying "risky" workplaces." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Pan et al. 2011 | Impact of Workplace o n Obesity | Large, Population - Based Study | No COI declared | 69,269 women in Nurses' Health Study I (1988-2008) and 107,915 women in Nurses' Health Study II (1989-2007) were included in analyses.<br><br>Subjects were without diabetes and c ardiovascular disease at baseline. | Average age at baseline (NHS I): 53.9 years<br><br>Average age at baseline (NHS II): 34.3 years<br><br>Female: 100%<br>Male: 0% | Examined the relationship between duration of rotating night shift work and risk of incident type 2 diabetes in two groups of women. In a secondary analysis, it was examined whether duration of shift work was associated with greater weight gain.<br><br>Questionnaires asking about night shift work, symptoms, diagnostic tests, and hypoglycemic therapy were sent to participants. Additional questionnaires inquired about risk factors for chronic diseases, such as body weight, menopausal status, and hormone use. Fixed- effect models were done for analysis. | n/a | "In the age- and questionnaire-cycle- adjusted models, duration of rotating night shift work was monotonically associated with an increased risk of type 2 diabetes in both cohorts ($p<0.001$)."<br><br>"In the model with BMI, every 5-year increase of rotating night shift work was associated with 5% elevated risk of type 2 diabetes in NHS I and II."<br><br>"In multivariate analysis, each 5-year increase in rotating night shift work was associated with an increase of 0.17 units in BMI and an increase of<br>0.45 kg in weight gain." | "An extended period of rotating night shift work is associated with a modestly increased risk of type 2 diabetes in women, which appears to be partly mediated through body weight."<br><br>"Long duration of shift work was also associated with greater weight gain." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Quist et al. 2013 | Impact of Workplace on Obesity | Prospective cohort study | No COI declared | The study was made up of 4,134 Danish healthcare workers. | Average age: 45 years<br>Female: 96.3%<br>Male: 3.7% | "Investigate psychosocial factors outside the classical work stress models as potential predictors of change in BMI."<br><br>Weight change acts as an indicator of lifestyle and health behavior.<br><br>Change in BMI was examined bi-directionally, both as an increase and decrease.<br><br>Baseline questionnaire data was collected, followed by two follow-up interviews. | 3 years of follow-up | "In women, high role conflicts increased the odds of weight gain (OR=1.13). High role clarity increased the odds for both weight gain (OR=1.09) and weight loss (OR=1.14) among women." | "There are a few new risk factors for weight change outside the traditional work stress models."<br><br>"The hypothesis that psychosocial work factors would be associated with change in BMI when these represented an unfavorable work environment received only limited support." | |

ACOEM Evidence Table: Rodriguez-Fernandez et al. (2015)

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Rodriguez-Fernandez et al. 2015 | Impact of Workplace o n Obesity | Prospective Cohort Study | No COI declared | Comprised of both surface and underground workers with originally 15,580 study participants at baseline.<br><br>The total number of participants retained through all four waves of data collection and thus included in the longitudinal analyses was 6,496 | Average age of employees: 36.3%<br>Female: 3.6%<br>Male: 96.4% | Measuring the prevalence and prospective trends in major metabolic risk factors (cholesterol level, blood glucose level, systolic blood pressure level, diastolic blood pressure level, raised blood pressure, and BMI range) for NCDs and their association with duration of employment." | There were 3-year, 4-year and 5-year follow-up surveillance points | "Metabolic risk indicator rates were markedly high and increased significantly from baseline through 5- year follow-up ($p<0.001$). Adjusting for gender and age, longer duration of employment (10 years or more) predicted raised cholesterol ($p=0.003$), raised blood pressure ($p=0.009$) and overweight/obesity ($p-0.001$) at baseline; and persistent raised cholesterol ($p=0.003$), and both incident ($p=0.014$) and persistent raised blood glucose ($p=0.044$) at 3-year follow-up." | "Individuals employed for longer periods in a mining operations setting in Papua, Indonesia, may face elevated NCD risk through various routes. Workplace health promotion interventions and policies targeting modifiable lifestyle patterns and environmental exposures present an important opportunity to reduce such susceptibilities and mitigate associated health risks." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Roos et al. 2013 | Impact of Workplace on Obesity | Prospective cohort study | No mention of COI | 7332 working adults completed both the 2000-2002 and 2007 Helsinki Health Study surveys. | Mean age of participants not reported. Subjects were sent baseline surveys if they reached the age of 40, 45, 50, 55, or 60 years old during 2000-2002. The majority of the cohort was female (79%). | The primary outcome of interest was weight gain relative to working conditions. | Follow up survey was sent out in 2007 to all participants who responded to first survey in 2000-2002. | During follow-up, 26% of women and 24% of men gained ≥5 kg.<br><br>In women, reporting violence or threat of violence OR=1.37, 95% CI=1.08–1.74) and working at night (OR = 1.43, 95% CI=1.13–1.82) were both associated with increased risk of weight gain.<br><br>In men, hazardous exposures (OR= 1.64, 95% CI =1.11–2.41) were associated with weight gain. | "Working conditions were mostly unassociated with weight gain. However, nighttime shift work, physical threat at work, and hazardous exposures at work were moderately associated with weight gain. More attention should be devoted to the prevention of weight gain in general and among risk groups in particular." | |

| Author/Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Schmid et al. 2008 | Impact of Workplace on Obesity | Randomized Controlled Trial* | No COI declared | 9 healthy normal-weight men<br><br>Mean BMI of participants was 23.8 $kg/m^2$ (SD: 0.6 $kg/m^2$). | Mean age of participants was 24.2 years (SD 1.0 years). All participants were male. | The primary outcome of interest was changes in feelings of hunger and plasma ghrelin and leptin relative to level of sleep duration (7h, 4.5h, total sleep deprivation). | Three overnight study visits occurred at least 2 weeks apart from one another. | Plasma ghrelin levels were 22% higher after total sleep deprivation than after 7h sleep (0.85 ± 0.06 vs 0.72 ± 0.04 ng/mL); P = 0.048) with intermediate levels of the hormone after 4.5h sleep (0.77 ± 0.04 ng/mL).<br><br>Subjects felt hungrier after total sleep deprivation than after 7h sleep (3.9±0.7 vs 1.7 ± 0.3; P<0.05) or 4.5 h sleep (2.2±0.5; P<0.05).<br><br>Serum leptin levels did not differ between conditions. | "A single night of total sleep deprivation acutely increases feelings of hunger and plasma levels of the hunger-promoting hormone ghrelin in normal-weight healthy men."<br><br>"Our results provide further evidence for a disturbing influence of sleep loss on endocrine regulation of energy homeostasis, which on the long run may result in weight gain and obesity" | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Schmid et al. 2009 | Impact of Workplace on Obesity | Randomized Controlled Trial* | No COI indicated | 15 healthy normal weight participants | Average age: 27.1 years Men: 100% Female: 0% | Spontaneous physical activity was registered by accelerometry during the entire experiment, and food intakes as well as relevant hormones were assessed during a 15-hour daytime period after 2 nights of regular sleep and after 2 nights of restricted sleep. | Participants were tested less than or about 6 weeks apart on 2 conditions. | "Sleep restriction significantly decreased physical activity during the daytime spent under free-living conditions after the first night of sleep manipulation (p-0.008).<br>Also, intensities of physical activity were shifted toward lower levels, with less time spent with intense activities (p=0.046). Total energy intake, feelings of hunger, and appetite as well as ghrelin and leptin concentrations during day 2 remained unaffected by acute sleep restriction." | Observed decrease in daytime physical activity may point to another potentially important behavioral mechanism for the health- impairing influence of sleep loss. | Total energy intake during the entire experimental day 2 did not differ between the 4-hour sleep and the 8- hour sleep condition. |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Schmid et al. 2011 | Impact of Workplace on Obesity | Prospective Comparative study* | Schultes has given a talk to Johnson & Johnson, Novo Nordisk, and Abbott.<br><br>All other authors have no declared COI. | 15 healthy, unmedicated, normal-weight males.<br><br>Mean BMI of subjects was 22.9 $kg/m^2$ (SE: 0.3 $kg/m^2$) | Mean age of participants was 27.1 years (SE 1.3 years). All subjects were male. | The primary outcome of interest was glucose tolerance, insulin sensitivity, hypothalamic-pituitary-adrenal secretory activity, and inflammatory markers relative to sleep duration (4h vs. 8h). | Follow up visit occurred at least 6 weeks after first visit. | Food intake from the breakfast buffet was identical in the respective 4h and 8h-sleep condition with regard to total energy intake and individual macronutrients.<br><br>Breakfast-induced increases in blood glucose ($P<0.05$) as well as serum insulin ($P<0.01$) and C-peptide levels ($P<0.05$) were distinctly higher in the 4h than the 8h-sleep condition.<br><br>ACTH, cortisol, and IL-6 did not differ between the sleep conditions. | "Data indicate an impairment of glucose tolerance after 2 days of sleep restriction to ~4 h that appears to be primarily caused by a reduction in insulin sensitivity."<br><br>"Unchanged HPA secretory activity and IL-6 concentrations argue against a mediation of these effects by stress-related or inflammatory mechanisms." | |

| Author/Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Simpson et al. 2010 | Impact of Workplace on Obesity | Randomized control trial* | No mention of COI | 82 healthy participants recruited from advertisements in Philadelphia. | Mean age of participants was 29.9 years. The majority of the cohort are male (57%). | The primary outcome of interest was adiponectin levels relative to sleep duration (10h vs. 4h). | Participants remained in laboratory setting for 11 days. | Sleep restriction resulted in a decrease in plasma adiponectin levels among Caucasian women ($Z=-2.19$, $p=0.028$), but an increase among African American women ($Z=-2.73$, $p=0.006$).<br><br>No significant effects of sleep restriction on adiponectin levels were found among men.<br><br>A 2×2 between-group analysis of covariance on adiponectin change scores controlling for BMI confirmed significant interactions between sleep restriction and race/ethnicity ($p<0.001$), as well as among sleep restriction, race/ethnicity and sex ( $p=0.043$). | "Inflammatory responses to sleep loss appear to be moderated by sex and race/ethnicity."<br><br>"Observed decreases in adiponectin following sleep restriction may be one avenue by which reduced sleep duration promotes cardiovascular risk in Caucasian women." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Spaeth et al. 2013 | Impact of Workplace o n Obesity | Randomized Controlled Trial* | No COI declared | 225 healthy adults were subjects in this study, 198 of whom were sleep-restricted subjects and 27 control subjects. | Average age: 31.4 years<br><br>Female: 44.9%<br><br>Male: 55.1% | Examining sleep restriction's effects on weight gain, daily caloric intake, and meal timing.<br><br>There was an 8-to-1 randomization to an experimental condition (5 consecutive nights of 4 hours in bed) or to a control condition (all nights 10 hours in bed).<br><br>Repeated-measures experiments assessed body weight at admittance and discharge in all subjects and caloric intake timing across days following 2 baseline nights, 5 sleep restriction nights, and 2 recovery nights or across days following control condition nights. | Subjects were examined for 9 consecutive days in-laboratory. | "Sleep-restricted subjects gained more weight (0.97kg) than control subjects (0.11kg) (p=0.007)."<br><br>"Sleep-restricted subjects consumed extra calories (130% of daily caloric requirement) during days with a delayed bedtime compared with control subjects who did not consume extra calories (100.6% of daily caloric requirement) (p=0.003) during corresponding days."<br><br>"In sleep-restricted subjects, increased daily caloric intake was due to more meals and the consumption of 552.9 additional calories at night." | "Sleep restriction promoted weight gain. Chronically sleep-restricted adults with late bedtimes may be more susceptible to weight gain due to greater daily caloric intake and the consumption of calories during late-night hours." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Spaeth et al. 2014 | Impact of Workplace o n Obesity | Prospective Comparative Study* | No COI declared | 44 healthy adults completed this study | Average age: 32.7 years<br>Female: 47.7%<br>Male: 52.3% | Assessing caloric intake, macronutrient intake, and meal timing during sleep restriction (SR).<br><br>Repeated- measures ANOVAs were used to compare caloric intake, macronutrient intake, and meal timing between baseline and SR in all subjects.<br><br>All food was weighed and recorded before being provided to subjects and detailed descriptions of items and amount consumed was dictated. | Subjects were studied for 14 or 18 consecutive days continuously. | "During sleep restriction, subjects increased daily caloric intake ($p<0.001$) and fat intake ($p=0.024$), including obtaining more calories from condiments, desserts, and salty snacks ($p<0.05$) and consumed 532.6 calories during late-night hours."<br><br>During SR, subjects consumed fewer calories ($p=0.008$) between 8:00am and 2:59pm, but consumed more calories from 3:00pm to 9:59pm ($p=0.001$) than during baseline. | "Men may be more susceptible to weight gain during sleep loss than women due to a larger increase in daily caloric intake, particularly during late-night hours."<br><br>"Subjects consumed a higher percentage of calories from fat and a lower percentage of calories from protein during SR than baseline." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Spaeth et al. 2015 | Impact of Workplace on Obesity | Prospective Cohort Study* | No COI declared | 25 healthy adults participated in the studies | Average age at first study: 33.3 years<br><br>Male: 48%<br><br>Female: 52% | Caloric intake, meal timing and weight were objectively measured to examine how individuals responded to two chronic sleep restriction exposures separated by a time interval.<br><br>Nurses assessed weight and participants selected their meals and snacks from menu options. | The two laboratory studies were separated by at least 60 days (mean of 621 days). | "Individuals exhibited consistent caloric intake changes during sleep restriction across exposures ($p=0.77$)."<br><br>"The change in daily caloric intake during sleep restriction showed large phenotypic individual differences across participants (ranged from -500.7 to 1178.2 kcal)."<br><br>"Late-night macronutrient composition was stabled within participants across exposures ($p>0.59$)." | "There is phenotypic differential vulnerability and trait-like stability of energy balance responses to repeated sleep restriction, underscoring the need for biomarkers and countermeasures to predict and mitigate this vulnerability." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Tasali et al. 2014 | Impact of Workplace on Obesity | Prospective Cohort Study* | No COI declared | 10 overweight young adults.<br><br>Mean BMI of subjects was 28.0 $kg/m^2$ (SE: 0.6 $kg/m^2$).<br><br>Racial breakdown of subjects was 3 Caucasians, 4 African-Americans, 1 Asian, and 2 Hispanics. | Mean age of participants was 28.6 years (SE 1.7 years). Half of the cohort was male (50%). | The primary outcome of interest was appetite and desire for high calorie foods relative to sleep duration. | 1-week baseline followed by 2 weeks of extended sleep intervention. | Additional sleep was associated with a 14% decrease in overall appetite (*P*=0.030) and a 62% decrease in desire for sweet and salty foods (*P*=0.017).<br><br>Desire for fruits, vegetables and protein-rich nutrients was not affected by added sleep.<br><br>Sleep extension was associated with a ~7% increase in average daytime activity (P=0.02). | "Obtaining adequate sleep is associated with less desire for high calorie foods in overweight young adults who habitually curtail their sleep."<br><br>"The amount of additional sleep obtained in real life settings could conceivably have important metabolic implications to reduce obesity and diabetes risk." | |

| Author/ Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Wells et al. 2006 | Impact of Workplace on Obesity | Prospective Cohort Study* | No mention of COI | 50 undergraduate students from a major, private east coast university.<br><br>Mean BMI of subjects was 22.3 $kg/m^2$ (SD: 2.6 $kg/m^2$) | Mean age of participants was 19.3 years (SD 1.1 years). The majority of the cohort was female (56%). | The primary outcome of interest was food intake and choices relative to sleep duration (7h vs ≤4h). | Three consecutive days of study follow up after baseline. | Subjects consumed fewer calories two days following sleep loss ($P<0.05$).<br><br>Following sleep loss, subjects reported choosing foods less for health and weight control ($P<0.001$). | "Sleep deprivation impacts food consumption and choice, which may have subsequent health implications." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Wong et al. 2014 | Impact of Workplace on Obesity | Prospective Comparative Study | No COI declared | 39 healthy steel construction workers in Hong Kong (6 bar benders, 33 bar fixers).<br><br>Mean BMI of subjects was 21.1 $kg/m^2$ (SD: 2.7 $kg/m^2$). | Mean age of participants was 44.2 years (SD 10.9 years).<br><br>Sex of subjects not explicitly stated (likely all male). | The primary outcome of interest was to calculate the daily energy expenditure, oxygen consumption, and heart rate changes in steel construction workers. | 2.5 hours | expenditure of overall steel work, was 2.57 Kcal/min. Mean response in heart rate to steel construction work was 110.8 beats/min (SD: 18.4 beats/min). Percentage of maximal heart rate attained was 63.4% (SD: 10.8%) in steel construction workers.<br><br>Bar fixing induced higher physiological responses such as heart rate (10.0%), % of maximal heart rate (10.5%), oxygen consumption (25.1% and 14.0%) and energy expenditure (15.4%), as compared to bar bending. | "Bar fixing induced significantly higher physiological responses in heart rate, percentage of maximal heart rate, oxygen consumption and energy expenditure."<br><br>"Energy expenditure of overall rebar work, bar bending, and bar fixing were 2.57 Kcal/min, 2.26 Kcal/min and 2.67 Kcal/min, respectively." | |

**ACOEM Evidence Table: Benefits of Addressing Obesity in the Workplace**

*Occurred in laboratory rather than real workplace setting

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Alker 2015 | Benefits of Addressing Obesity in the Workplace | Prospective Cohort Study | No mention of COI | 630 employees of secondary schools in Massachusetts | Average age: 44.5 years.<br><br>65.4% women | Teachers (n=361) vs. Other school staff (n=269)<br><br>vs.<br><br>Total Sample (n=630) | 1-year and 2- year follow up. Consisted of survey assessments of health risk factors and measurements for height, weight, and BMI | Greater BMI associated with greater productivity loss. Total Sample: β = 0.236, p = .0001;<br>Teachers: β = 0.228, p=.007;<br>Other school staff: β = 0.242, p = .003.<br><br>Greater BMI associated with absenteeism, but for other school staff not statistically significant.<br>Total Sample: β = 0.060, p=.04;<br>Teachers: β = 0.064, p = .02;<br>Other school staff: β = 0.037, p = 0.43 | "Greater BMI was associated with both on- the-job productivity loss and absenteeism" | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Alosco et al. 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study* | No COI declared | A total of 50 Heart failure (HF) patients were recruited from a National Institute of Health study examining the impact of cardiac rehabilitation (CR) on cognition in HF. | 26.0% of the sample was female and the average age was 66.72 (±7.94) years. | The predictive validity of BMI on cognitive function was assessed at baseline, 12-Weeks and 12-Months after cardiac rehabilitation. | At baseline, participants performed the 2-minute step test (2MST) to assess physical fitness levels and were administered a neuro-psychological battery. These procedures were repeated 12-weeks and 12-months later. | The sample had an average BMI of 28.49 (±6.02), placing them in the overweight classification, and repeated measures analysis of variance showed no significant BMI changes over time ($p = 0.57$).<br><br>Decreases in BMI predicted improved memory 12- weeks later ($p = 0.02$), as well as improved attention/executive function ($p = 0.052$) at the 12-month follow-up. On average, for every one unit decrease in BMI there was a 5.7% improvement in memory 12-weeks later. 12-week BMI explained an additional 7% of the variability in memory increases over this time period. Likewise, on average, for every one unit BMI decrease there was a 1.4% improvement in attention/executive function 12-months later. 12-month BMI explained an additional 1% of the variability in attention/executive function increases at 12-months.<br><br>Regression analyses controlling for baseline BMI and baseline 2MST revealed decreases in BMI predicted better 2MST performance 12-weeks later ($\Delta F(1, 46) = 14.34$, $p < 0.001$). | "CR was associated with cognitive improvements and this effect may be associated with decreases in BMI. Improved fitness may partially explain the benefits of decreased BMI on cognitive improvements in HF." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Asay et al. 2016 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | In the MarketScan Health Risk Assessment, 356,758 observations came from 229,615 individuals.<br><br>In the Medical Expenditure Panel Survey (MEPS) analysis, 24,006 individuals met inclusion criteria.<br><br>Participants were continuously enrolled in the databases and employed for at least 1 year, were not pregnant, and responded to the question on missed workdays. | In the MarketScan sample, 129,503 participants were female (36.3%). The percentage of respondents within the 18–34, 35–49, and 50–64 year categories were 26.1%, 43.4%, and 30.5%, respectively.<br><br>In the MEPS sample, 10,075 participants were female (42.0%). The percentage of respondents within the 18–34, 35–49, and 50–64 year categories were 30.6%, 39.3%, and 39.3%, respectively. | The study examined the association between employee absenteeism and 5 conditions: 3 risk factors (smoking, physical inactivity, and obesity) and 2 chronic diseases (hypertension and diabetes).<br><br>Absenteeism costs were estimated for a hypothetical small employer (100 employees) and a hypothetical large employer (1,000 employees). | The study analyzed absenteeism from 2008 through 2011 using samples of respondents who were aged 18 to 64 years, were continuously enrolled in the databases and employed for at least 1 year, were not pregnant, and responded to the question on missed workdays.<br><br>Absenteeism costs were quantified in 2011 and adjusted them to reflect growth in employment costs to 2015 dollars. | The prevalence rates for obesity in the MarketScan sample was 26.0% and was 30.0% in the MEPS sample.<br><br>Absenteeism estimates ranged from 1 to 2 days per individual per year depending on the risk factor or chronic disease.<br><br>Individuals with a condition had significantly greater absenteeism than those without one. Absenteeism increased with the number of risk factors or diseases reported.<br><br>When we used our regression results to calculate the total cost of absenteeism to employers, we found that obesity had the highest total cost at $11.2 billion per year.<br><br>Extrapolating these results to reflect employer size, we found that per-year absenteeism for a small employer ranged from 6 days for diabetes to 31 days for obesity and costs ranged from $1,621 for diabetes to $8,065 for obesity. A large employer (1,000 employees) could face absenteeism rates of 65 days for diabetes to 1,083 days for physically inactive employees. Annual costs for a large employer could range from approximately $17,000 for diabetes to more than $285,000 for physical inactivity. | “After adjusting for wage growth to 2015, our estimates of absenteeism costs were similar to previous estimates: for instance, for obesity, our estimated cost of $11.2 billion (range, $4.8–$17.9 billion) was within the range of prior estimates: $4.3 billion in 2004 ($5.5 billion in 2015 dollars) and $12.8 billion in 2008 ($14.6 billion in 2015 dollars.”<br><br>“Absenteeism costs associated with chronic diseases and health risk factors can be substantial. Employers may incur these costs through lower productivity, and employees could incur costs through lower wages.” | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Baker et al. 2008 | Benefits of Addressing Obesity in the Workplace | Prospective Cohort Study | No COI declared. | Data used for this study represent the experience of 890 employees who volunteered to participate in the program in 2006 and for whom baseline and follow-up data were collected.<br><br>Participants were employees from 119 companies of varying sizes contracting with ASH to provide the Healthyroads program. | Participants were majority female (74.3%) and the average age was 44.2 ± 10.9 years. | Healthy roads intervention provides telephone counseling to program participants and access to educational materials through a health improvement Web site.<br><br>A predictive return-on-investment (ROI) model was applied to an obesity management intervention to demonstrate the use of econometric modeling in establishing financial justification for worksite health promotion.<br><br>Projected ROI from the Healthyroads program was determined by comparing program costs to the medical and productivity savings derived from reductions in health risks as a result of participating in the program. ROI is expressed as a ratio of program savings, or benefit, to program costs. | A pre experimental pretest/posttest study design was used to assess changes in health risks among program participants over 1 year.<br><br>Self-reported risk factors were analyzed using X2 and t test methods. Changes in risk factors, demographics, and financial measures comprised the ROI model inputs that determined medical and productivity savings.). | At baseline, participants weighed an average 191.4 pounds, had an average BMI of 30.6, and 76.4% were overweight or obese.<br><br>Over 1 year, there were statistically significant reductions in 7 of 10 health risk categories (poor diet, inadequate physical activity, high total cholesterol, high blood glucose, high blood pressure, high stress, and obesity) for participants, 1 risk category (high alcohol consumption) significantly increased (from 13% prevalence to 16%), and smoking status and depression remained unchanged.<br><br>As shown, compared to the reference scenario where no changes would have been expected to occur during the study period, total employer expenses were reduced by $311,755. Of total projected expense reductions, 59% are attributed to a 4.3% reduction in health care expenditures ($184,582) and 41% are attributed to productivity enhancements ($127,173). When combined, projected medical and productivity savings in year 1 are higher than the cost of the Healthyroads program ($267,000), thus producing an net present value of $44,755 and an ROI of $1.17 to $1.00. | “Using an ROI model to project program savings is a practical way to provide financial justification for investment in worksite health promotion when risk reduction data are available.”<br><br>“Our study demonstrates ways in which an econometric ROI Model can be used by employers to estimate cost savings from risk reduction programs and provide a business justification for their health promotion programs. In this case, significant improvement in program participants’ health risk profile over 1 year produced an estimated $1.17 to $1.00 ROI.” | |

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| Baumert et al. 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared | The study population consisted of 6817 employed subjects drawn from the MONICA/KORA Augsburg, Germany. | 4269 men (62%) and 2548 women were included in the analysis.<br><br>Mean age of participants was 42.2 years (SD = 10.4) | The primary outcome of interest was risk of suicide mortality and exposure was categorized as high job strain and adverse working conditions.<br><br>Suicide risks were estimated by Cox regression adjusted for suicide-related risk factors including obesity (BMI ≥ 30) using BMI <30 as a reference group. | Baseline surveys were conducted in 1984 – 1995 and participants were followed up after an average for 12.6 years (SD 4.2). | Obesity was significantly associated with high adverse chronobiological/physical working conditions ($p<0.001$) and job strain ($p=0.029$) compared to Low or intermediate categories.<br><br>Cox regression revealed that a high adversity of chronobiological or physical working conditions significantly increased the risk for suicide mortality (HR 2.73 (95% CI 1.16-6.42, ($p=0.022$)) compared to the low or intermediate adversity group in the model adjusted for living alone, low educational level, smoking, high alcohol consumption, obesity and depressed mood. | Adjustment for obesity and confounding risk factors increased risk for suicide mortality for those with high levels of adversity in chronobiological/physical working conditions compared to low/intermediate levels. | |

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| Besen & Pranksy 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared | The study population consisted of 5583 participants with valid data from the 40 and over health module in the National Longitudinal Survey of Youth (NLSY79) | In 1979, roughly half of the sample was male, 59%. In 2010, 48% of the sample consisted of males.<br><br>Participants within the cohort were aged 14 to 22 years in 1979 and aged 45 to 53 years in 2010. | The study assessed the relationship between health conditions and the risk for membership in five distinct trajectories of health related productivity loss.<br><br>Multinomial logistic regression was used to examine the relative risk of being in the low-risk, early-onset increasing risk, late-onset increasing risk, or high-risk trajectories compared with the no-risk trajectory for having various health conditions.<br><br>In addition to the continuous BMI variable, authors created an obesity variable on the basis of BMI of 35 or higher. | Participants have been reinterviewed annually from 1980 to 1994, and then every other year from 1996 to 2010. Specifically, the productivity loss trajectories were based on 12 waves of NLSY79 data, which were collected annually from ages 25 to 29 years (waves 1 through 5) and biennially from ages 30 to 44 years (waves 6 through 12). | Across the entire sample, the most prevalent condition was obesity, experienced by 31.25% of the sample, the mean BMI of the sample was 28.3 (SD = 5.9).<br><br>The current study found a generally high incidence of obesity regardless of the trajectory group, suggesting that obesity is not highly related to being in the different productivity loss trajectories (No Risk 29.38%, Low Risk 35.93%, Late Onset 37.38%, Early Onset 36.54%, High Risk 40.48%).<br><br>Obesity was eliminated via backward elimination from the multinomial logistic regression model because of a lack of significance. | "Instead, the chronic health conditions, such as diabetes, asthma, and arthritis, that are associated with obesity may be what impacts the likelihood of having productivity loss from ages 25 to 44 years.42 Nevertheless, to the extent that obesity increases the chances of developing these other conditions, programs targeting weight loss may be effective for lowering the risk of individuals falling into one of the higher-risk trajectories by decreasing the likelihood of developing chronic health conditions." | |

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| Bilger 2013 | Benefits of Addressing Obesity in the Workplace | Prospective Cohort Study | No mention of COI | Combines data from study on 935 overweight + obese full time employees over 12 months (CDC-WAY) and new study of 933 employees over 18 months (NHLBI-WAY) | For HRQOL sample (no statistical significant difference between samples): 46.18, 45.16 (less than 5%, 5% greater weight loss), 84.8% female | Those who showed evidence of 5% or greater weight loss at 12 month assessment (17% of participants)<br><br>Vs<br><br>Those who did not show 5% or greater weight loss/gained weight at 12 month assessment (control group) | Looked at health expenditures through claims data 1 yr prior to intervention, at 12 months and at 18 months after start of intervention | Positive difference in HRQOL score of 0.026 (p-value: 0.03) for those who lost 5% or more weight compared to those who did not. Other factors examined in samples: (absenteeism, presenteeism, health expenditure) not significant at 0.05 level. | "Clinically significant weight loss among overweight employees prevents deterioration in HRQOL and provides some evidence that these improvements may lead to increases in employee productivity. However, over the period analyzed, medical expenditures did not appear to the affected." | HRQOL – Health Related Quality of Life |

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| Bridger et al. 2013 | Benefits of Addressing Obesity in the Workplace | Prospective comparative study | No COI declared | 1,069 participants from the Naval service cohort study of occupational stress were included in the final analysis. | Among Jumior rates, 60% of respondents were female and the average age was 31.9 years.<br><br>Among Senior rates, 33% of respondents were female and the average age was 40.7 years.<br><br>Among Officers, 41% of respondents were female and the average age was 39.7 years.<br><br>Among Senior officers, 4% of respondents were female and the average age was 49.6 years | Logistic regression was used to determine whether lifestyle behaviours measured in 2007 predicted the 2011 binary health risk outcome described above, while controlling for potential effect modifiers. Respondents were divided into two groups, coded '0' and '1' (health risk = 'none' vs health risk = 'increased or above' based on BMI and waist circumference data.<br><br>Binary classification of health outcomes (Obese/ overweight BMI>25 and change in BMI) was used to identify 'cases' in 2011 that were compared with 'controls' in a case–control analysis | Each respondent's health and lifestyle data from the 2007 survey was matched with his or her 2011 data, enabling change in health and lifestyle to be investigated. | The mean BMI in 2007 was 25.8 and in 2011 it was 26.3. On both occasions, the mean BMI was in the 'overweight' category. In 2011, 39% were in the 'healthy weight' category, 45% 'overweight' and 16% obese. The mean change in BMI over the period was 0.46.<br><br>These findings indicate that personnel with no risk of health complaints due to BMI and waist circumference in 2011 exercised more, drank more and had physically demanding jobs four years earlier.<br><br>Of the variables reported in 2007, BMI was the variable that differed most often between cases and controls ($p < 0.001$). Those with a high BMI in 2007 were more likely to become obese or overweight in 2011. Change in BMI (putting on weight) was associated with lower subjective health in 2011 as was lack of exercise in 2007 ($p < 0.001$). | "Evidence is presented for the benefits of exercise in sustaining employee health and for an association between a high BMI and a number of common health complaints that have traditionally been tackled through workplace ergonomics. This evidence can be used to support the development of workplace design concepts that promote physical activity." | |

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| Burt et al. 2013 | Benefits of Addressing Obesity in the Workplace | Prospective Comparative Study | No COI declared | 347 individuals were included for prospective analysis from three healthcare and manufacturing workplaces<br><br>146 (42.1%) participants met criteria for obesity (BMI ≥30). | The majority of the cohort is male (N=201, 57.9%)<br><br>Mean age of participants is 40.5 years with a range of 19–68 years (SD = 10.7) | The primary outcome of interest was incident cases of dominant hand CTS (carpal tunnel syndrome) at the time of follow up.<br><br>Adjusted HRs for dominant hand CTS for obesity (BMI ≥ 30) were calculated using (BMI <30) as a reference group. | Individual health assessment, physical examination and questionnaires were collected at baseline with annual follow-up for 2 years. | BMI was not significantly associated with incident dominant hand CTS as a continuous variable (p= 0.29), but obesity was when using the standard cutoff of 30 kg/m2 (p= 0.01).<br><br>Obesity was also a confounder of the association between the percent time in significant exertion and CTS. With obesity in the model, the estimate for forceful exertion increased by 15%. The test of interaction between obesity and forceful exertion was not statistically significant (p=0.07).<br><br>The exposure- response relationship between percent time in forceful exertion and CTS, adjusted for obesity appeared to be linear.<br><br>Proportional hazards multivariate modelling resulted in final models that included the percent of time working with forceful exertion and the ACGIH TLV for HAL as a ratio. Obesity was a significant predictor of CTS in both models (BMI≥30 vs <30 kg/m2: Model 1 (HR = 3.19, 95% CI 1.28 - 7.98); Model 2 (HR = 3.26, 95% CI 1.45-7.31. | Obesity predicted CTS in proportional hazards multivariate modelling<br><br>Time spent in forceful exertion can be a greater risk for CTS than obesity if the job exposure is high.<br><br>Obesity resulted in positive confounding of the association between physical job demands and CTS in this study - if someone is both obese and has high physical job demands, the risk is increased beyond what it would be if only one of these risk factors were present. | |

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| Carls et al. 2011 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | Ginger Smith Carls and coauthors received funding for this research from Johnson & Johnson. | There were 10,601 employees who met inclusion criteria. | Employees were on average 40.2 years of age and slightly less likely to be women (43.6% women). | The study compared changes in measures for each employee in the sample for nine health risks on the basis of a series of questions on the health risk assessment (obesity, high blood pressure, high total cholesterol, tobacco use, excessive alcohol consumption, poor nutrition, physical inactivity, high stress, and poor emotional health).<br><br>Employees were classified as having a weight risk (ie, obesity) if their body mass index (BMI) was 30 kg/m2 or greater, on the basis of their height and weight. | Employees who completed at least two health assessments in nonconsecutive years during the period of 2002 to 2008 were included in the analysis and risk and cost trends were then compared for each of the nine health risks using multivariate models. | From baseline to follow-up, 76% of the employees stayed at lower at risk (not obese) for weight (Table 2) and equal percentages added or lost weight risk during the study (4%).<br><br>Employees who added weight risk (moved from BMI < 30 kg/m2 to BMI ≥ 30 kg/m2) increased their average annual medical costs to $1267, about $982 (95%CI:$255–$1710) more than employees who remained at lower risk, whose costs increased an average of $285 each year.<br><br>Employees who added weight risk also started out with higher costs than those who remained lower risk ($3742 compared with $3154, P = 0.1330), suggesting that employees who added the risk may have had more baseline medical problems.<br><br>Employees who lost weight risk experienced annual cost growth that was $101 lower than that of employees who remained at higher risk, although this difference was not statistically significant.<br>Employees who lost weight risk also started with about<br>$100 lower costs than employees who remain at high weight risk ($4256 compared with $4358, P=0.8268). | "Preventing weight gain through effective employee health promotion programs is likely to result in cost savings for employers."<br><br>"Employees who moved into high-risk status for weight during the study period experienced significantly higher cost growth than employees who did not gain sufficient weight to be put into an obese category. Conversely, employees who lost sufficient weight so that they were no longer obese experienced lower cost growth than employees who remained at risk for weight, but this finding was not statistically significant."<br><br>"In our study, employees who gained weight and moved into the obese category experienced annual cost increases totaling $652 more than those who maintained weight over an average of 4.8 years." | |

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| Clark et al. 2016b | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | One-hundred employee wellness center members were included in the analysis. | Members had an average age of 42 years and 90% were female. | The present study aims to assess potential changes in health behaviors following wellness coaching.<br><br>Topics discussed at the session include discussion of what the participant perceived was successful during the past week as well as his or her overall experience in reaching his or her goals. | Participants completed study questionnaires when they started wellness coaching (baseline), after 12 weeks of wellness coaching, and at a 3-month follow-up.<br><br>The initial session is followed by 11 weekly in person follow-up sessions to discuss and complete self-identified wellness goals. These sessions are scheduled for 30 to 60 minutes. | The average (SD) BMI at baseline was 32.3 (7.9) kg/m2, with 55% being obese and 23% being overweight.<br><br>From baseline to week 12, these 100 wellness coaching participants improved their self-reported health behaviors (11 domains, 0- to 10-point scale) from an average of 6.4 to 7.7 ($p < .001$), eating self efficacy from an average of 112 to 142 (on a 0- to 180-point scale; $p < .001$), and goal-setting skills from an average of 49 to 55 (on a 16- to 80-point scale; $p < .001$).<br><br>On average, the Health Behaviors score increased by 13.4 points from baseline to 12-week end of treatment ($p < .0001$). In this same model, higher BMI was associated with a slightly lower health behavior score on average (1-kg/m2 increase in BMI associated with 0.39 decrease in score, $p = .03$).<br><br>In terms of weight, BMI was reduced from 32.1 (7.8) kg/m2 to 31.8 (7.8) kg/m2 ($p < .0001$) during the 12 weeks of wellness coaching and continued to decrease at the 3-month follow-up, BMI = 31.5 (8.0) kg/m2 ($p < .005$). | "The results from this single-cohort prospective study suggest that wellness coaching may improve a wide range of health behaviors, such as physical activity level, nutritional habits, support, stress management, healthy sleep, spirituality, and quality of life. Additionally, the results suggest that participants improved their self-confidence for eating, nutritional habits, and physical activity level; and given that self- efficacy is predictive of long-term success, this is an important finding. Finally, participants potentially learned goal- setting skills, which can also help them maintain these positive lifestyle changes over time"<br><br>"While the change in absolute weight was small, participants did reduce their BMI during wellness coaching and continued to reduce their BMI during the 3- month follow-up period." | |

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| Dackehag 2015 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No mention of COI | 4599 workers aged 20-64 from the Swedish Survey of Living Conditions | Age: Men (mean = 42.78, SD = 10.66); Women (mean = 43.11, SD = 10.70)<br><br>52.5% men (n=2415); 47.5% women (n=2184). | Examines the association between excess weight and income, measured as the logarithm of annual income from employment above a threshold of 100,000 SEK<br><br>Used two approaches: OLS (ordinary least squares) and FE (fixed effects). OLS approach analyses impact on current income of lagged weight. FE approach analyses the impact on current income of changes in lagged weight<br><br>Lagged weight categories: Normal weight (BMI of 18.5-25), overweight (BMI 25-30) and obese (BMI>30) | Up to a 25-year follow-up.<br>Used unbalanced panel data from four surveys during time period. | Found significant obesity penalty related to discrimination when applying individual fixed effects for men. No significant excess-weight penalty for women found.<br><br>Fixed Effects approach with minimum income of 100,000 SEK annually: Model 1 (included individuals background variables): Men who were obese had a 9.56% obesity penalty ($p<0.01$)<br><br>Model 2 (adds health variables): Men who were obese had an 9.16% obesity penalty ($p<0.01$) | "When analyzing the impact of excess weight on income from employment for Swedish men and women, we observe that men appear to experience an obesity penalty while women do not."<br><br>"The obesity penalty for men is considerable in magnitude and relates to discrimination rather than lower productivity due to bad health." | |

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| De Vroome et al. 2015 | Benefits of Addressing Obesity in the Workplace | Large, population-based study | No COI declared | 69,300 subjects were identified in the first cohort of the 2007-2011 Netherlands Working Conditions Survey. | Mean age and sex of subjects not reported. | The primary outcomes of interest were prevalence, additional days of sickness absence, and associated costs of chronic diseases. | Annual NWCS survey data analyzed from 2007-2011. | 35.2-38.7 % of the Dutch working population reported having any type of chronic physical or psychological disease.<br><br>The top 5 chronic diseases associated with the greatest financial burden in lost productivity are musculoskeletal disorders, psych disorders, other chronic disorders (including epilepsy and skin disorders), cardiovascular diseases, and life-threatening diseases (including cancer and AIDS),<br><br>The estimated national financial impact of lost productivity is between €321 million-€1.3 billion per year. | "Chronic diseases result in substantial productivity loss due to sickness absence. Given the ageing population, the proposed increase in the state pension age and an increase in sedentary lifestyle and obesity, the prevalence of chronic diseases may be expected to rise."<br><br>"Coordinated efforts to maintain and improve the health of the working population are necessary to minimize socioeconomic consequences." | |

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| DiBonaventura et al. 2015 | Benefits of Addressing Obesity in the Workplace | Large, population-based study | No COI declared | 71,530 subjects were identified from the 2013 National Health and Wellness Survey.<br><br>33.1% met criteria for Obesity (BMI ≥30). | Mean age of participants was 48.7 years (SD 16.3 years). Half of the cohort was male (49.5%). | The primary outcome of interest was health status relative to obesity. | No follow up, but NHWS conducted annually | Increasing BMI was inversely associated with mental and physical health statuses for obese subjects relative to normal weight subjects (P<0.05).<br><br>Work productivity impairment, physician visits, emergency room visits, and costs also increased significantly as BMI increased (P<0.05). | "Increasing BMI was associated with decreasing health status and increasing work-related impairment, healthcare resource utilization, and costs." | |

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| Elias 2005 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study* | No mention of COI | 1423 participants of the Framingham Heart Study who were free of dementia, stroke, and clinically diagnosed cardiovascular disease up to the time of cognitive testing | Average age = 67 years (range = 55-88).<br><br>551 men (38.7%)<br><br>872 women (61.3%) | They were determining the effect of obesity on cognitive performance.<br><br>Weight categories: Obese group (≥ 30 kg/$m^2$)<br><br>vs.<br><br>Non-obese group: normal weight (<25kg/$m^2$) + overweight (25-29.9 kg/$m^2$) | 18-year surveillance window measuring diastolic and systolic blood pressures, body mass index, casual glucose, self- reported number of cigarettes smoked per day, total serum cholesterol, and self-reported number of alcoholic beverages per week. | For men, obesity was statistically significantly associated with decrements in cognitive performance.<br><br>No significant associations observed between obesity and cognitive performance for women.<br><br>For obese versus non- obese men, there was a 0.23 S.D. lowering of the visual reproductions ($p<0.05$); 0.31 S.D. lowering of the digit span backward ($p<0.01$); and 0.25 S.D. lowering of the global composite ($p<0.01$). The model adjusted for age, obesity, hypertension, total cholesterol, alcohol consumption, cigarettes/day, education level, occupation level, and native English language. | "Obesity was related to cognitive performance in men but not women."<br><br>"The gender-specific results for obesity… suggests that the underlying mechanisms linking them to cognition may be different." | |

| Author/Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Finkelstein et al. 2010 | Benefits of Addressing Obesity in the Workplace | Large, population-based study | Funded by Allergan, Inc. | 33,015 working adults from the 2008 US National Health and Wellness Survey and 2006 Medical Expenditure Panel Survey (8,875 from MEPS and 24,140 from NHWS).<br><br>33% of the cohorts were obese. | Mean age was 42.2 years (SE 0.1 years).<br><br>Majority of the cohort was male (58.3%). | The primary outcomes of interest were medical expenditures and cost of absenteeism due to obesity. | No follow up. | Medical expenditures for grade I, II, and III obesity were all significantly higher ($P<0.05$) than the normal weight group and ranged from $475 more for grade I to $1269 more for grade III obesity..<br><br>The annual cost attributable to obese full-time employees is $73.1 billion. Individuals with a BMI>35 represent 37% of the obese population but are responsible for 61% of excess costs.<br><br>With the exception of overweight men, medical expenditures, absenteeism, and presenteeism (being unproductive on the job) increase with increasing BMI. | "Successful efforts to reduce the prevalence of obesity, especially among those with a body mass index>35, could result in significant savings to employers" | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Fitzmaurice et al. 2011 | Benefits of Addressing Obesity in the Workplace | Large, population-based study | No COI declared | 201,480 adults from the 2003 Behavioral Risk Factor Surveillance System survey. | Median age was between 40-49 years.<br><br>Half of the cohort was female (50.2%). | The primary outcomes of interest were healthy behaviors in those with and without disabilities. | No follow up but BRFSS is collected annually. | People with a disability were more likely to be overweight and to smoke than people without a disability.<br><br>The prevalence of heavy alcohol and insufficient fruit and vegetable consumption was significantly lower among those who used an assistive device irrespective of activity limitation compared to the No Disability Group.<br><br>Adults in all disability groups were more likely to report physical inactivity relative to the No Disability Group. | "There is evidence that people with a disability report poor lifestyle behaviours that increase disease risk and may need assistance with smoking cessation, weight loss and adoption of a physical activity routine. Screening for unhealthy behaviours and advice should be incorporated into routine health care visits for working age adults with disabilities." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Gazmararian 2015 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 454 physically inactive non-faculty university employees at Emory University in Atlanta Georgia | <u>Age</u><br>Nonobese: 41.3 (SE = 0.7)<br><br>Obese 43.4 (SE = 0.7)<br><br>Morbidly Obese 43.2 (SE = 1.0)<br><br><u>% Female</u><br>Nonobese: 60.8% (SE = 0.031)<br><br>Obese: 62.8% (SE = 0.034)<br><br>Morbidly Obese: 74% (SE = 0.045) | Determined pharmaceutical, inpatient, outpatient, and total health care costs for three years, and classified based on exposure (obesity).<br><br>Weight categories: Nonobese (BMI < 30) (reference group) (n=255)<br><br>vs.<br><br>Obese (BMI ≥ 30) (n=199)<br><br>vs.<br><br>Morbidly obese (BMI ≥ 35) (n=96)<br><br>*morbidly obese also in obese category | 34-month follow-up recording claims data for all medical and pharmaceutical expenses and also determined sick leave hours from Emory University human resources records. | "Monthly average for all medical expenditures is $75 more per month ($905 annually) for obese individuals than nonobese individuals and is $83 more per month ($992 annually) for morbidly obese individuals than nonobese individuals."<br><br>Monthly average costs of total medical expenses: Nonobese: 180.1 (SE = 17.8) Obese: 255.5 (SE = 28.4), p=0.020 Morbidly Obese: 262.8 (SE = 35.8); p=0.024<br><br>Monthly average costs of pharmaceutical expenses: Nonobese: 39.0 (SE = 7.24) Obese: 73.0 (SE = 12.4), p=0.013 Morbidly Obese: 82.3 (SE = 18.9); p=0.009 | "Our results in a population of university employees indicated that total medical expenditures were higher for obese individuals than nonobese individuals, which reflect the poorer health behaviors and health status of obese adults"<br><br>"Differences in total medical expenditures were primarily due to higher pharmaceutical expenses" | |

| Author/Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Gifford 2015 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | The data include information on 178,910 unique employees who were eligible for medical and disability benefits and who participated in at least 1 HRA survey over 2010– 2012—about 38% of all employees represented.<br><br>The time series sample was limited to 39,917 employees that had at least 2 integrated health risk assessment (HRA) survey responses at least 12 months apart. | For the Healthy weight cohort, 67% of participants were female and the average age was 39.3 years.<br><br>For the Overweight cohort, 47% of participants were female and the average age was 41.9 years.<br><br>For the Obese cohort, 64% of participants were female and the average age was 42.0 years. | The objective of this study was to examine how much of the relationships between unhealthy body weight, and health and productivity outcomes are attributable to health status, and how much can be ameliorated by weight loss or improvements in health. Cross-sectional and first-difference regressions were conducted of employees' body mass index (BMI) category, illness absences, presenteeism, medical spending, and disability leaves.<br><br>Standard categories were used in which a BMI of 18 to 25 indicates healthy weight, above 25 to 30 indicates overweight, and above 30 indicates obese. | The sample was limited to the first observed HRA and the subsequent HRA that occurs at least 12 months later. The average duration between HRA observations was about 15.8 months (–.04 months). | For every type of health and productivity outcome, employees in the obese BMI category have significantly worse outcomes than employees in the healthy and overweight BMI categories.<br><br>The average number of illness absences for the obese category is almost twice that for the healthy weight category, while the amount of time with work difficulties is about 54% greater. Employees in the obese category are at least twice as likely as employees in the healthy weight category to experience an STD claim. Medical payments in the obese category are about 45% greater than in the healthy weight category. Employees in the overweight category also have significantly worse outcomes than employees in the healthy weight category.<br><br>Among initially obese employees, remaining obese at the subsequent HRA was associated with a 0.825 percentage point (–0.71 percentage points) increase in presenteeism compared to employees who lost enough weight to move into a lower BMI category. However, weight loss was not associated with changes in any other health and productivity outcome. | "Employees in the obese BMI category have significantly worse outcomes than employees in the healthy and overweight BMI categories. Controlling for physical and emotional health status mediates much of the observed relationships. Improved health, stress, and psychological distress are associated with reduced illness absence and presenteeism among overweight and obese employees. Obese employees who lost weight experienced reduced presenteeism. The findings suggest that overweight and obese employees can realize improved productivity without weight loss." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Ginsberg et al. 2012 | Benefits of Addressing Obesity in the Workplace | Simulation | No COI declared. | The BMI prevalence distribution for adults aged 20 and above was multiplied by the total adult population aged 20 and above in 2010 of 4,835,024 persons [29,30] in order to estimate the number of adults within each unit BMI category. | On an assumption (based on expert opinion as to the ideal age group for intervene with weight control programs) that the average age of a participant in the program was 52 years, and that each had, on average, a residual life expectancy of 30 years [30], we estimated the additional (discounted) health-care costs due to the increased life expectancy of those persons who reduced their BMI. | This study then seeks to calculate the expected costs and cost-utility of the implementation of various clinical and community-based intervention strategies forming part of the interventional suite currently recommended by the tri-ministerial NPHPP to reduce the burden of obesity in Israel.<br><br>BMI unit values were assigned QALY weights by interpolating the values (Table 1) from a UK study [34]. This allowed for marginal QALY improvements per unit decrease in BMI and hence total lifetime QALY gains (discounted at 3% per annum) and cost per QALY per intervention to be calculated. | The efficacy data in the studies that were used in this paper were based on intervention studies of up to only one year duration, with modeling techniques in some studies extrapolating the outcomes over longer periods of time. | On average, persons who were overweight (25 ≤ BMI < 30)had health care costs that were 12.2% above the average health care costs of persons with normal or sub-normal weight to height ratios (BMI < 25). This differential in costs rose to 31.4% and 73.0% for obese and severely obese persons, respectively.<br><br>For overweight (25 ≤ BMI < 30) and obese persons (30 ≤ BMI < 40), costs per person for the interventions ranged from 35 NIS for a community intervention to 860 NIS, reflecting the intensity of the clinical setting intervention and the unit costs of the professionals carrying out the intervention [e. g., dietician].<br><br>Expected average BMI decreases ranged from 0.05 to 0.90. Higher intervention costs and larger BMI decreases characterized the two clinical lifestyle interventions for the severely obese (BMI ≥ 40).<br><br>A sensitivity analysis on recidivism rates showed the total net cost is relatively inelastic with respect to changes in the recidivism rate above the baseline 50% levels; a 60% increase in recidivism (increasing the rate from 50% to 80%) only causes a 12% increase in the net costs to society. | "A program directed at the entire Israeli population aged 20 and over, using a variety of eight different interventions would cost 2.07 billion NIS overall."<br><br>"Under baseline assumptions, implementation of the cluster of interventions would save 32,671 discounted QALYs at a cost of only 47,559 NIS per QALY, less than half of the Israeli per capita GNP (104,000 NIS). Thus implementation of these components of the NPHPP should be considered very cost-effective."<br><br>"Despite the large costs of such a large national program to control obesity, cost-utility analysis strongly supports its introduction." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Giver et al. 2011 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared | Information with regard to lifestyle (respondents 4,526) and general health (respondents 5,023) was collected from eldercare trainees from Danish colleges. | 100% of the sample was female and the average age for the cohort was 32.6 years. | The study sought to determine the predictive effect of lifestyle factors (including categorical BMI) and self-rated health on dropout from the eldercare sector two years after qualification.<br><br>Body mass index (BMI) was divided into four categories: underweight (BMI<20kg/m2), normal weight (20 ≤BMI <25kg/m2), overweight (25 ≤BMI<30kg/m2), and obesity (BMI ≥30kg/m2). Normal weight (20≤BMI<25kg/m2) was chosen as reference level. | The study examines the effects of lifestyle parameters and general health in 2004 on the risk of dropout from the eldercare sector two years later. | 37% of the sample were categorized to be either overweight or obese (BMI > 25kg/m2).<br><br>Being overweight or obese compared to normal weight decreased the odds of dropout from eldercare into education two years after qualification by 39% (95% CI 0.47–0.79, p = 0.0021) and 46% (95% CI 0.38–0.77, p=0.0012), respectively. | "We found that overweight as well as smoking decreased the likelihood of undertaking further education."<br><br>"The results of the present study show that a poorer self-rated health is a predictor for dropout, not only from the eldercare two years after qualification, but from the labor market as a whole." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Goetzel 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 2458 employees from 121 Colorado businesses | Average 43 years at baseline (SD=11.1);<br><br>34% women | Health risk profile 1 year after program implementation<br><br>vs.<br><br>Health risk profile at baseline (reference) | Recorded health risk assessment data for a year following program implementation | Statistically significant decreases in high risk prevalence for obesity (2.0% reduction)<br><br>Obesity-- At baseline: Mean=24.04, SD=0.43<br><br>At follow-up: Mean=22.05, SD=0.41<br><br>Change: -1.99%, p≤0.001. | "The person-level analysis found reductions in 10 modifiable health risks, which, in turn, were translated into health and productivity cost savings."<br><br>"The analysis projected a savings of $2.03 for every dollar invested, considering both medical and productivity impacts." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Harden et al. 2015 | Benefits of Addressing Obesity in the Workplace | Prospective Cohort Study | No COI declared | The total sample size is 1,030 participants in a large, Internet-based worksite weight loss intervention.<br><br>There were no differences in absenteeism or presenteeism variables by randomization condition or by worksite type ($p > .05$) therefore two intervention arms were pooled into one sample based on successful employee weight loss. | The participants in this study sample were on average 46.95 (±10.96) years of age and 73.45% female. | At follow up, participants were categorized as Weight gainers, Weight maintainers ($0 <$ weight loss $\geq 5\%$) and Clinically significant weight loss (weight loss $\geq 5\%$) in order to assess baseline to postprogram presenteeism, absenteeism, and weight loss and productivity indicators. | Participants completed baseline surveys, weigh- ins and completed the postprogram (12 months) assessments of weight, absenteeism, and presenteeism. | Twenty-two percent of the participants lost a clinically meaningful amount of weight (≥5% weight loss). There were no statistically significant ($p < .05$) relationships between weight change from baseline to 12 months and change scores of absolute or relative absenteeism or for absolute or relative presenteeism. Within a modestly successful Internet-based, worksite weight loss intervention, weight loss did not improve self-reported absenteeism or presenteeism. | "The results indicated that there was no significant relationship between weight loss and productivity variables from baseline to postprogram." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Harris- Adamson 2013 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 3515 participants without baseline carpal tunnel syndrome (CTS) or previous carpal tunnel surgery release or baseline polyneuropathy from workers in industries such as manufacturing, production, service and construction | <u>Age:</u><br>< 30: (n=1089, 31%);<br><br>≥30 and <40: (n=836, 24%);<br><br>≥40 and <50: (n=933, 26%);<br><br>≥50: (n=656, 19%)<br><br><u>Sex:</u><br>53% male (n=1860)<br><br>47% female (n=1654) | The primary outcome was CTS of the dominant hand.<br><br>CTS at end of follow-up (n=204, 5.8%)<br><br>vs.<br><br>No CTS at end of follow-up.<br><br>Weight categories: Obese (BMI ≥ 30 kg/m2) (n=1176, 34%); Normal or overweight (<30 kg/m2) (n=2324, 66%) (reference group) | Followed-up to 7 years assessing symptoms (tingling, numbness, burning, and/or pain in one or more of the first three digits) at regular intervals; physical examinations and electrodiagnostic study procedures conducted annually or after symptoms | Obese was statistically significantly positively associated with CTS incidence<br><br>Obese IRR = 1.89; 95% CI (1.42-2.52)<br><br>Multivariable model for CTS, adjusting for gender, age, and BMI: Obese HR = 1.67; 95% CI (1.26-2.21), p=0.00. | Obese BMI "almost doubled the risk of CTS and, when assessed as a continuous variable, the HR increased approximately linearly with increasing BMI."<br><br>"Interventions addressing obesity may also have a positive impact on incidence of CTS." | CTS – carpal tunnel syndrome |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Haukka 2012 | Benefits of Addressing Obesity in the Workplace | Prospective Cohort | None | 385 | 21-62yr (median 47yr)<br>All female | Compared workers with multisite musculoskeletal pain that was high (n=146), ascending (n=44), descending (n=66), or low (n=129) | 2 years | Not being obese predicted decreased prevalence of musculoskeletal pain (Odds Ratio 3.7, 95% CI 1.1 to 12.7) in a model adjusted for age, perceived physical workload, leisure time physical activity, smoking, and psychosocial factors at work | "Obesity is a potential modifiable risk factor for the occurrence and course of musculoskeletal pain over time." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Haukka 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 386 female workers of kitchens of schools, nurseries, nursing homes, or geriatric service centers in Finland with data on SA due to musculoskeletal pain from ≥4 of the 9 time points | Mean age = 46.0 yrs; SD = 8.7<br><br>All women | Subjects were grouped into sickness absence trajectories based on their behavior. "high" (11% of workers); "intermediate" (48%); or "none" (41%)(reference group).<br><br>Weight categories: Overweight/ obesity (≥25 $kg/m^2$ ); Normal (<25 $kg/m^2$ ) | Follow up for over two years by questionnaire evaluating pain and sickness absences due to pain in seven sites during the past three months | With "none" trajectory as reference, being overweight/ obese predicted belonging to the "intermediate" trajectory (Model 1: OR 1.59, 95% CI (1.03-2.45). Model 2: OR = 1.67, 95% CI (1.05-2.67). Model 3: OR = 1.71; 95% CI (1.08-2.72)<br><br>Model 1 adjusted separately adjusted predictors for age, study arm, and organizational reforms.<br>Model 2 adjusted for age, multisite pain, musculoskeletal diseases, other somatic diseases, depressive symptoms, body mass index, smoking, study arm, and organizational reforms.<br>Model 3 adjusted for age, multisite pain, musculoskeletal diseases, depressive symptoms, body mass index, smoking, study arm, and organizational reforms. | "Overweight or obesity have an important independent role in predicting the occurrence of SA due to musculoskeletal pain."<br><br>"Early screening and special attention to these factors seem warranted to enable prevention of their unwanted consequences on work ability" | SA – sickness absence |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Hsiao et al. 2016 | Benefits of Addressing Obesity in the Workplace | Prospective Cohort Study | No COI declared | A total of 359 participants from two independent Taiwan adult asthma cohorts (a prospective phase cohort in and a cross-sectional phase cohort) were analyzed. | In total, the average age was 55.23 (± 14.55) years.<br><br>Overall, 54.03% of the study population (N = 194) were women. | The study assessed the relationship between the predictors (including continuous BMI) and the TAQLQ (Asthma Quality of Life Questionnaire) and ACT (asthma control) scores of the total subjects with univariate and multivariate analyses | Employees were required to have 12 months of health plan enrollment after the index date from 2003 to 2011. | The average BMI within this study was 25.33 (±4.21).<br><br>The associations between the BMI and the ACT and TAQLQ scores in the total number of patients was not found to be significant (ACT p=0.371, TAQLQ p=0.798)<br><br>In the pathway analysis, we did not find that BMI was a significant factor in a prospective cohort. After combining the two cohorts, BMI had an indirect effect (b = 0.013) on the TAQLQ scores through the work symptoms, wheeze frequency, and the ACT score.<br><br>BMI had an indirect effect (b = -0.013) on the ACT scores through the work symptoms, wheeze frequency, and health care utilization. | "We found that the patients with asthma and with higher BMIs displayed more work symptoms, which indirectly resulted in lower asthma control and QoL in a cross-sectional phase cohort."<br><br>"Patients with asthma and with higher BMIs who worked in poor environments had increased work symptoms and wheeze frequencies that were associated with poor asthma control and poor QoL in the observed adult patients with asthma. Therefore, body weight and poor workplace management are required for controlling asthma symptoms and improving QoL in patients with asthma." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Janssens et al. 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared | 2983 Belgian workers were included in the final analysis. | The study population consisted of 1372 men (46%) and 1611 women (54%).<br><br>The average age of participants was 43.4 (SD 6.7). | The relation between BMI class, presenteeism, and high sickness absence was examined using logistic regression analysis. The odds ratios were calculated for overweight and obese persons in comparison with normal-weight colleagues as reference class (crude model). | Each respondent's health and lifestyle data from the 2007 survey was matched with his or her 2011 data, enabling change in health and lifestyle to be investigated. | The mean BMI for the sample was 25.3 (SD 4.0) and in the male sample, 45% and 11% of the participants were, respectively, overweight and obese. Within the female population, 25% overweight and 13% obese workers were observed.<br><br>The crude model of the logistic regression analysis demonstrated that obese men were 1.58 times ($p < 0.05$) more likely to show presenteeism. In women, however, this association was not significant (OR 1.30, 95% CI 0.94–1.78).<br><br>Obesity was a significant predictor of high sickness in women (OR 1.84, 95% CI 1.33–2.54) and men (OR 1.71, 95% CI 1.16–2.53).<br><br>Even after adjusting for several possible confounding factors (health behavior, age, profession, educational level, perceived job demands, control, support, and both WHI and HWI) the relationship remained significant. The obese women were 1.79 times more likely to be absent for at least 10 days in comparison with their normal-weight female colleagues. For men only a borderline significant relationship was reached in the obese group (P=0.051). | "Body mass index class was positively and significantly associated with presenteeism (at least two occasions of working despite illness) in the male employees and was a significant predictor of high sickness absence (at least 10 sick leave days) in the female population. A final multivariate model demonstrated that these relations were only partly mediated by self- rated health. Conclusion: The results of this study suggest a gender difference concerning absenteeism and presenteeism in overweight and obese employee." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Jensen et al. 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | 2,235 newly educated female health care workers without prior history of low back pain (LBP) were included in the analysis. | The mean age of participants was 35 years.<br><br>The sample was 100% female. | This prospective cohort study determines the risk of developing LBP from moderate or high physical work loads and from being overweight or obese among newly educated female health care workers without prior history of LBP.<br><br>Body mass index (kg/m2) was characterized (BMI = 18.5-24.9), overweight (BMI = 25.0-29.9) and obese (BMI over 30.0). Respondents with BMI<18.5 were excluded from the analyses (n = 196). | Risk factors and incidence of LBP were assessed at one and two years after graduation. | An additional analysis showed no differences in prevalence of LBP between normal weight (60%) and overweight (58%) respondents at baseline, whereas obese showed a significantly increased prevalence of LBP (65%, P <0.001).<br><br>In both the unadjusted and adjusted analyses, obese health care workers did not have a significant increased risk for developing Low back pain 1–7 days (OR 0.92, CI 95% 0.49-1.73) or Low back pain over 7 days (OR 0.79 95% CI 0.45-1.41) compared to their normal weighted colleagues. | "This study showed that overweight and obesity do not increase the risk for developing LBP among newly educated female health care workers."<br><br>"Preventive initiatives for LBP among health care workers ought to focus on reducing high physical work loads rather than lowering excessive body weight." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Kaaria 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 5277 municipal employees free of chronic NP at baseline who were aged 40, 45, 50, 55, or 60 | <u>Age:</u><br>*Women* (n=4220):<br>40 years – (n=920, 21.8%);<br>45 years – (n=933, 22.1%);<br>50 years – (n=915, 21.7%);<br>55 years – n=989, 23.4%);<br>60 years – (n=463, 11.0%)<br><br>*Men* (n=1057):<br>40 years – (n=185, 17.5%);<br>45 years – (n=207 19.6%);<br>50 years – (n=205, 19.4%);<br>55 years – (n=292, 27.6%);<br>60 years – (n=168, 15.9%)<br><br>80% women. | Chronic neck pain at follow-up<br><br>vs.<br><br>No chronic neck pain at follow-up.<br><br>Weight categories: Normal BMI (<24.9 kg/$m^2$) (reference group); Overweight (25.0-29.9 kg/$m^2$); Obesity (≥30.0 kg/$m^2$) | Varied from 5 to 7 years. Follow-up survey in 2007, baseline questionnaire completed 2000-2002 | "Overweight and obesity were predictive of chronic NP in women, but not in men."<br><br>*For women:*<br>Adjusted for age:<br>Overweight OR = 1.20; 95% CI (1.04-1.52)<br>Obese OR = 1.46; 95% CI (1.14-1.87);<br><br>Adjusted for age, physical workload, emotional exhaustion, bullying, GHQ, sleep problems, acute NP, low back pain and body mass index:<br>Overweight OR = 1.22; 95% CI (1.00-1.48)<br>Obese OR = 1.39; 95% CI (1.07-1.80);<br><br>Final model incorporated all variables associated with chronic NP in 2nd model:<br>Overweight OR = 1.22; 95% CI (1.00-1.48)<br>Obese OR = 1.39; 95% CI (1.08-1.80) | "We found some potentially modifiable risk factors of chronic NP among employees, particularly ….high BMI in women." | NP – neck pain<br><br>GHQ – General Health Questionnaire |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Kleinman et al. 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | Funding for this study was provided by Eisai Inc. Safiya Abouzaid, Zhixiao Wang, and Annette Powers are employees of Eisai Inc. Nathan Kleinman and Lenae Andersen are employed by HCMS Group, which received funding from Eisai Inc for research and manuscript development. | The total sample size is 72,778 eligible employees from the Human Capital Management Services Research Reference Database (RRDb) (39,696 (BMI < 27), 14,281 (27 ≤ BMI < 30), and 18,801 (BMI ≥ 30)). | For the BMI < 27 cohort, the average age was 38.79 years and 32.8% female.<br><br>For the 27 ≤ BMI < 30 cohort, the average age was 40.87 years and 22.9% female.<br><br>For the BMI >=30 cohort, the average age was 40.89 years and 38.9% female. | The study examines three cohorts of employees defined by BMI (kg/m2): BMI < 27, 27 ≤ BMI < 30, and BMI ≥ 30. The 27 ≤ BMI < 30 cohort is further divided into subcohorts on the basis of the presence or absence of comorbidities such as T2DM, hypertension, and dyslipidemia, as described hereafter.<br><br>The objective of this study was to evaluate the economic burden of overweight and obesity in a large population of employees. | Employees were required to have 12 months of health plan enrollment after the index date from 2003 to 2011. | Twenty-six percent of the employees in this study had BMI≥30 kg/m 2.<br><br>Total costs and total days absent in the BMI < 27, 27 ≤ BMI < 30, and BMI ≥ 30 cohorts were $4258, $4873, and $6313 and 4.46, 5.57, and 7.54 days, respectively.<br><br>Medical, pharmacy, sick leave, workers' compensation costs and days were higher for higher-BMI cohorts (P < 0.01). Employees with BMI ≥30 kg/m2 had the most short-term disability costs and days and least productivity (P < 0.001).<br><br>The HPQ productivity scores were significantly lowest in BMI≥30 cohort (8.23), but the difference in productivity score | "Employees with higher BMI levels are associated with significantly more costs and absences and lower self-reported productivity."<br><br>"In this study, obesity was associated with significant burden for employers. Nearly all adjusted cost and absence day outcomes were higher among employees with higher BMI values." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Konnopka et al. 2011 | Benefits of Addressing Obesity in the Workplace | Simulation | No COI declared. | The BMI prevalence distribution for adults aged 20 and above was multiplied by the total adult population aged 20 and above in 2010 of 4,835,024 persons [29,30] in order to estimate the number of adults within each unit BMI category. | We calculated population-attributable fractions (PAF) stratified by age groups a and gender g, indicating the portion of morbidity and mortality falling upon obesity and overweight.<br><br>The PAF was calculated by combining prevalence P of obesity and overweight with relative risks (RR) for a disease d.<br><br>Age groups were defined by 5-year age classes from age 15 to age 90 plus an additional age class older than 90. | We used the concept of attributable fractions based on German prevalence data and relative risks from US studies as well as routine statistics.<br><br>We estimated obesity- and overweight-attributable deaths, years of potential life lost (YPLL) and quality-adjusted life years lost (QALY) for various diseases associated with obesity and overweight.<br><br>Direct costs were estimated for inpatient and outpatient treatment, rehabilitation and nonmedical costs. Indirect costs were estimated for sickness absence, early retirement and mortality using the human capital approach. | The goal of this study was to estimate the health impact of obesity and overweight in Germany for the year 2002 from a societal perspective. | Obesity- and Overweight-attributable diseases led to 317,355 hospital stays, 70,707 rehabilitations, 5,875,022 days of sickness absence and 3,736 persons went into early retirement. The tendency was for females to use slightly more resources than males.<br><br>We estimated 36,653 obesity- and overweight-attributable deaths with 428,093 consecutive YPLL and 367,772 QALYs lost. Obesity caused 4,854 million EUR in direct costs corresponding to 2.1% of the overall German health expenditures in 2002 and 5,019 million EUR in indirect costs.<br><br>Forty-three percent of direct costs resulted from endocrinological diseases like diabetes and obesity itself, followed by cardiovascular diseases (38%), neoplasms (14%) and digestive diseases (6%). | "Obesity and overweight are connected to considerable morbidity and mortality as well as societal costs. Improvement and further development of effective strategies for preventing and dealing with obesity and overweight are necessary."<br><br>"To this date, this study is the most comprehensive analysis of the direct and indirect costs of obesity and overweight in Germany considering a wide group of diseases and cost categories, as well as mortality-determined lost QALYs. Here one sees that obesity and overweight resulted in a considerable loss of potential life years and QALYs, and caused high direct and indirect costs, which are comparable to other international estimates." | |

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| Kubo et al. 2013 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared | The study population consisted of 10,173 employees (9209 daytime workers, 964 three-shift workers) from a Japanese manufacturing corporation | 100% of the participants within the sample were male.<br><br>Mean age of participants was 23.6 years. | The study compared the risk of developing hypertension between rotating shift workers and daytime workers.<br><br>Hazard ratios were adjusted by the factors "baseline BMI" and "max increase in BMI." (difference between the maximum BMI during the follow-up period and the baseline BMI). | Participants were assessed after a 27.5-year follow-up period (129,194 total person-years; mean follow-up period, 12.7 years). | There were no differences in mean BMI kg/m2 at baseline between Daytime and Three-Shift Work groups (p= 0.18) but the maximum increase in shift worker BMIs was greater than that in daytime workers (shift, 3.2 kg/m2; daytime, 2.6 kg/m2; t test, $P < 0.001$).<br><br>Cox proportional hazards regression revealed that "shift work," "baseline BMI," and "maximum increase in BMI" were all independent risk factors for hypertension ($p<0.001$).<br><br>Among the original cohort, shift workers generated significantly higher hazard ratios for hypertension than daytime workers did (HR 1.88, 95% CI 1.71–2.07, $p<0.001$; IR 4.5, 95% CI 4.1–4.9).<br><br>Kaplan–Meier survival curves and results of the Cox proportional hazards model for systolic and diastolic hypertension found that "shift work," "baseline BMI," and "maximum increase in BMI" were significant independent risk factors for both systolic and diastolic hypertension ($p<0.001$). | "Shift work is a significant risk factor for hypertension that is independent of both starting weight and weight gained over years of work."<br><br>"Specifically, hypertension risk among shift workers is not solely mediated by weight gain because of shift work.<br>This is seen in the significantly elevated risk of hypertension even among shift workers who were not obese. For the viewpoint of practice, the overall incidence of hypertension was lower among all workers with limited body weight gain, suggesting that weight control remains a promising strategy for hypertension prevention in both daytime and shift workers." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lal et al. 2012 | Benefits of Addressing Obesity in the Workplace | Simulation | No COI declared. | In New Zealand (NZ) in 2007, an estimated 35% of the population aged 15 and over (1.2 million people) were overweight and 25.4% (850,000 people) were obese.<br><br>The prevalence of overweight for Māori (31.7%) and Pacific (24.5%) populations was lower, however the prevalence of obesity was much higher for the Māori (43.2%) and Pacific (65.1%) populations.<br><br>These ethnic groups comprise approximately 14.6% and 6.9% of the NZ population respectively. | Using the HCA, long-term absences were valued at the net present value of the current and future gross wages stream using age specific workforce participation rates and wage rates, until the deceased employees would have reached retirement age. All calculations employed age and sex specific data.<br><br>For each disease, NZ specific data on the proportional breakdown of males and females having the disease was obtained from the World Health Organization.<br><br>The total cost category for each disease was then proportioned between males and females. The PAFs for males and females were multiplied by the sex-specific total cost for each disease. | Population attributable fractions (PAFs) were calculated based on the relative risks obtained from large cohort studies and the prevalence of overweight and obesity.<br><br>For each disease, the PAF was multiplied by the total health care cost. The costs of lost productivity associated with premature mortality were estimated using both the Human Capital approach (HCA) and Friction Cost approach (FCA). | A prevalence-based approach to costing was used in which costs were calculated for all cases of disease in the year 2006.<br><br>All costs are expressed in NZ dollars for the 2006 reference year. Where costs were not available for the reference year (such as private hospital admissions where the most recent available data were for 2004), costs were inflated to 2006 prices based on the NZ health care price index. | Health care costs attributable to overweight and obesity in NZ in 2006 were estimated to be NZ$623.9m. The estimated health care cost for overweight and obesity equates to 4.4% of New Zealand's total health care expenditure of $15.4b in 2006.50 Costs attributable to the Pacific and Māori populations were 10.5% and 18.5% of the total costs, respectively.<br><br>The costs attributable to obesity and overweight were the largest for type 2 diabetes at $238.7m or 38%. Hypertension accounted for the second largest share of obesity and overweight related costs at $167m or 27%. Of the cancers, colorectal cancer had the highest level of expenditure for overweight and obesity at $7m or 1%.<br><br>The diseases with the highest PAFs were also the diseases with the highest costs attributable to overweight and obesity. Diabetes type 2 had the highest PAFs for all populations, the highest PAF being for the male and female Pacific population at 62.1% and 62.0% respectively. Osteoarthritis had the second-largest PAFs and the third-highest costs attributable to osteoarthritis at $143.3m or 23%. Hypertension had the third-highest PAFs and the second-largest cost of $167m or 27%. | "The costs of lost productivity using the FCA were estimated to be NZ$98m and NZ$225m using the HCA. The combined costs of health care and lost productivity using the FCA were $722m and $849m using the HCA.<br><br>The cost burden of overweight and obesity in NZ is considerable. Policies and interventions are urgently needed to reduce the prevalence of obesity thereby decreasing these substantial costs." | |

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| Lallukka et al. 2011 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | N=7332 participants completed the Helsinki Health Study questionnaire survey data at baseline in 2000-2002 and follow-up in 2007. | The sample was majority female (n=5399, 73%). | Two measures of workplace bullying asked whether the respondent had (i) reported being bullied and (ii) observed bullying.<br><br>Logistic regression models were fitted, adjusting for age, childhood bullying, education, working conditions, obesity, common mental disorders, limiting long-standing illness, and baseline sleep problems.<br><br>Obesity was measured by body mass index of at least 30 kg/m2 based on self-reported weight and height. | The cohort was followed at baseline in 2000-2002 and follow-up in 2007 (5-7-year follow-up time). | After adjustment for obesity, limiting long-standing illness, and common mental disorders, no association was found for reported baseline bullying, although a weak association between earlier bullying and sleep problems remained (model 4: OR 1.30, 95% CI 1.10-1.52).<br><br>As among women, adjustments for education, physical, and psychosocial working conditions (model 3) had only minor effects on the associations for men, whereas adjustment for obesity, limiting long-standing illness, and common mental disorders most attenuated the association of reported bullying with sleep problems (OR 2.27, 95% CI 1.30-3.97). | "Workplace bullying is associated with sleep problems, but associations attenuate after factors related to the social environment, work, and health (including obesity) are simultaneously taken into account." | |

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| Lallukka 2011 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 5986 participants of survey conducted 2000, 2001, and 2002 among employees aged 40, 45, 50, 55, and 60 in Helsinki, Finland | At baseline: 40-60 yrs, 78% women. | Disability Retirement after baseline survey through 2008 (n=457)<br><br>Vs<br><br>No disability retirement after baseline survey through 2008 (control group) (n=5529) | Recorded disability retirement events until 2008 and linked to baseline questionnaire data (n=457) | Obesity did not mediate the studied association between sleep problems and subsequent disability retirement.<br><br>Model 2 adjusted for age, gender, marital status, occupational status, etc.: HR = 2.29, 95% CI (1.57,3.34). Adding behavioral risk factors in Model 3 showed that these factors did not mediate the association.<br>Model 3 (Model 2 + smoking, heavy drinking, physical inactivity, and obesity): HR = 2.20, 95% CI (1.50, 3.21)." | "The contribution of health behaviors and obesity to the association was negligible, rending no support of their mediating effects" | |

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| Lilley et al. 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared | 2626 workforce active participants were identified from the Prospective Outcomes of Injury Study.<br><br>Among work absent (n=609) individuals, 178 met criteria for Obesity (BMI ≥30). | Mean age of participants was 41 years (SD 13 years). The majority of the cohort are male (63%). | The primary outcome of interest was 'not working' at the time of interview.<br><br>Adjusted odds ratios for Overweight (BMI 25-29) and Obesity (BMI ≥ 30) were calculated using Under/normal weight (BMI ≤24) as a reference group. | Injury and pre-existing health and lifestyle factors were assessed as predictors of work status 3 months after hospitalized and non-hospitalized injury | Dimension-level multivariable analyses for not working 3 months after injury found increased risk of 'not working' for those with BMI ≥ 30; OR 1.61 (1.26 to 2.05).<br><br>Obesity (BMI ≥ 30) was found to be a significant independent predictor of not working 3 months following injury; OR 1.48 (1.13 to 1.94).<br><br>The pre-injury lifestyle factor, (BMI included) had p values <0.20 in the dimension-specific logistic regression modelling. | "While the overall BMI term did not have a significant association with not working in the overall model, obesity was significantly associated with increased odds of not working compared to the reference of normal BMI."<br><br>"Our study found that obese workers were more likely to not be working 3 months following injury." | |

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| Matsudaira 2013 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No mention of COI | 765 workers from Japanese population who had no low back pain during the past year and no history of sciatica at baseline | less than 40 (37.6%); 40-49 (29.6%); 50 or more (32.8%).<br><br>88.5% male. | New episode of sciatica w/o low back pain during the 2-yr follow-up period (n=141; 18.4%)<br><br>vs.<br><br>No sciatica during 2-yr follow-up period (control group) | 1- and 2- year follow-up questionnaires | Obesity statistically significant in development of new-onset sciatica during 2yr follow-up period;<br><br>age and sex adjusted OR: 1.77; 95% CI: 1.17-2.68; p=0.007<br><br>Effect modification of age and sex on OR:<br>≥50 (OR: 3.18; 95% CI: 1.65-6.15; p=0.001);<br>male (OR: 1.93; 95% CI: 1.26-2.95; p=0.002) | "Significant associations between development of new-onset sciatica and age and obesity were found in both univariate and multivariate analyses."<br><br>"Our results suggest that reducing or preventing obesity may lower the risk of new- onset sciatica." | Sciatica – symptom characterized by lower back pain radiating below the knee<br><br>Obesity defined as BMI ≥25 $kg/m^2$, because Japanese population |

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| Michaud et al. 2012 | Benefits of Addressing Obesity in the Workplace | Simulation | No COI declared. | According to criteria, there are 1.26 million individuals aged 50 eligible for the surgery under the current eligibility criteria, and 2.66 million under the extended eligibility criteria. | The size and demographic composition (race and gender) of the entering 50 year-old cohort is based on Census projections. | The Future Elderly Model (FEM), We use the microsimulation model to project the experience of the 2010 cohort of age 50 individuals under the status-quo, and under each of the four scenarios (25% weight loss to those who get the surgery, 50% of the lost weight after 10 years and sensitivity analyses where the surgery reduces weight by 15% and 35%, respectively) above. We conduct 1000 simulations and compute the mean outcomes.<br><br>Individuals are classified as obese if their BMI exceeds 30. Within this group, "class 1 obesity" refers to those with a BMI between 30 and 34.9, class 2 obesity to those with a BMI between 35 and 39.9, and finally class 3 (or morbid) obesity to those who have a BMI over 40. | Estimation of the relevant transition probabilities is done using longitudinal data from the Health and Retirement Study (1992–2004).<br><br>Table reports the average of 100 simulations for population scenarios in the years 2004, 2030 and 2050 | In the current eligibility scenario, bariatric surgery achieves a permanent reduction in weight of 25% among those with a BMI over 40, or among those with a BMI between 35 and 40 with qualifying co-morbidities.<br><br>Under the baseline (no intervention) scenario, those eligible have a total life expectancy of 28.8 years at age 50, and a healthy life expectancy of 19.9 years. This implies that they may expect to live close to 8.9 years with ADL limitations. Under the bariatric surgery intervention, they live on average 1.55 years longer and spend 2.91 additional years without ADL limitations. Hence, this implies that their unhealthy life expectancy is reduced by 1.36 years. The present value of their total medical costs is reduced by $4649: $3247 of this reduction accrues to Medicare, $276 to Medicaid, and $1126 to other (private) sources. Because eligible patients live on average 1.15 years longer, the lifetime cost-savings are somewhat muted by their longer life-span. | "We find that the total social value of bariatric surgery is large for treated patients, with incremental social cost-effectiveness ratios typically under $10,000 per life year saved. On the other hand, pharmaceutical interventions against obesity yield much less social value with incremental social cost- effectiveness ratios around $50,000. Our approach accounts for: competing risks to life expectancy; health care costs; and a variety of non-medical economic consequences (pensions, disability insurance, taxes, and earnings), which account for 20% of the total social cost of these treatments.<br><br>On balance, bariatric surgery generates substantial private value for those treated, in the form of health and other economic consequences. The net public fiscal effects are modest, primarily because the size of the population eligible for treatment is small. The net social effect is large once improvements in life expectancy are taken into account." | |

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| Neovius et al. 2010 | Benefits of Addressing Obesity in the Workplace | Prospective comparative study | No COI declared | The sample consisted of nation-wide cohort of 43989 Swedish men performing mandatory military conscription.<br><br>349 (1%) participants met criteria for obesity (BMI ≥30) and 2525 (6%) of participants met criteria for overweight (BMI 25–29.9). | 100% of the participants within the sample were male.<br><br>Mean age of participants was 18.7 (±0.5) years. | Sick-leave episodes were divided into 'short-term' (1–7 days), 'intermediate-term' (8–30 days) and 'long-term' (>30 days) episodes.<br><br>The primary predictor of the analyses was body mass index (BMI) used as a proxy for adiposity (BMI categories underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9) and obesity (≥30)). | Participants performing military conscription tests in 1969–70 were followed between 1986 and 2005 regarding sick-leave (803,684 person-years follow up). | Obesity was associated with >30% risk elevation for episodes ranging from 8 to 30 days [HR 1.35; 95% CI 1.24–1.47] as well as for episodes >30 days (HR 1.34; 95% CI 1.24–1.47, respectively) compared to normal weight.<br><br>Obesity was also associated with an increased risk of sick-leave episodes <7 days (HR 1.13; 95% CI 1.09–1.16). | "Overweight and obesity are associated with increased risk for sick-leave compared to normal weight, especially for sick-leave episodes of longer duration."<br><br>"Risk of sick-leave showed a J-shaped relation with body mass index, with increased risk for overweight, obesity and underweight compared to normal weight." | |

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| Neovius 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 45920 Swedish men performing military conscription between 1969 and 1970 | Age at baseline: Underweight: 18.7 SD 0.5 Normal weight<br><br>All men. | Aim to estimate lifetime productivity losses to society associated with obesity status, and its components: sick leave, disability pension, and premature death.<br><br>Weight classifications: Underweight (BMI <18.5) (n=6325, 14% of total); Normal Weight (BMI 18.5-24.9) (n=36605, 80% of total); Overweight (BMI 25-29.9) (n=2623, 6% of total); Obese (BMI ≥ 30) (n=367, 1% of total) | Followed for 38 years - obtained data on sick leave, disability pension and premature death from national registers. | Using the human capital approach, the lifetime productivity losses are for the following classes:<br><br>Underweight: 55.6; 95% CI (50.7 – 62.0) x €1000<br><br>Normal weight: 55.6; 95% CI (50.9 – 61.4) x €1000<br><br>Overweight: 72.6; 95% CI (66.3 – 80.7) x €1000<br><br>Obese: 95.4; 95% CI (89.0 – 102.9) x €1000 | "Obesity is associated with almost twice as high productivity losses to society as for normal weight over a lifetime." | "The human capital approach assumes the value of the lost production to be equal to what the employer would have paid had the individual been working." |

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| Niessen 2012 | Benefits of Addressing Obesity in the Workplace | Prospective comparative study | Two authors are directors and co-owners of NIPED (NDDO Institute for Prevention and Early Diagnostics), the institute that developed the studied program and currently markets it in the Netherlands. | 20,797 individuals employed at a large Dutch financial services company during the period Jan 2007-July 2009 | Mean age = 41.4/ 50.0% male | Those enrolled in health promotion program (n = 3,826)<br><br>vs.<br><br>Nonparticipants (control group) (n=16,971) | Followed participants for median 23.3 months, IQR 14.0-23.3.<br><br>Those enrolled followed for median 10.9 months, IQR 4.6-16.1<br><br>Non-enrolled followed for median 23.3 months, IQR 17.5-23.3. | Health promotion program participation led to a 20.3% reduction in absenteeism.<br><br>linear regression of difference between baseline and follow-up absenteeism for health program attendance, controlling for age, job level, years of employment, and program completion: β = -0.010, 95% CI: -0.014 to -0.006 | "This study showed that participating in a worksite health promotion program can lead to an immediate reduction in absenteeism. Future research is necessary to identify the mechanisms responsible f this short-term effect." | Does not discuss overweight except as possible mechanism for workplace health program participation decreasing absenteeism |

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| Nigatu et al. 2015 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | 1726 respondents who had a paid job for 8 or more hours per week at baseline were selected from the Netherlands Study of Depression and Anxiety (NESDA). | Participants were on average 41.0 (±11.7) years of age and the majority of the participants were female (64.6%). | The aim of this study was to examine the longitudinal effect of obesity, major depression, and their combination on work performance impairment (WPI).<br><br>Participants were classified into 2 BMI categories according to the standard international classification of the World Health Organization (nonobese <30 kg/m2, and obese‡30.0 kg/m2). We defined abdominal obesity as having a waist circumference of 102 centimeters or greater for men and 88 centimeters or greater for women. | Longitudinal data (2004–2013) was collected at baseline and 2-, 4-, and 6-year follow-up. | At baseline, the prevalences of general obesity and abdominal obesity were 14% and 32%, respectively. The prevalences of general and abdominal obesity in participants with major depression were 18% and 34%, respectively.<br><br>There were longitudinal associations between general and abdominal obesity at tx and high WPI at tx+1 (OR=1.45; 95% CI=1.16, 1.80, and OR=1.34; 95% CI=1.12, 1.59, respectively).<br><br>Adjustment for age, gender, and educational status slightly attenuated the estimates for the longitudinal association between general and abdominal obesity and high WPI (OR=1.35; 95% CI=1.08, 1.69, and OR=1.23; 95% CI=1.03, 1.48, respectively).<br><br>The combinations of obesity and major depression, and of abdominal obesity and major depression were associated with increased risk of high WPI (odds ratios of 2.36 [95% confidence interval=1.61, 3.44] and 1.88 [95% confidence interval=1.40, 2.53], respectively), but the relative excess risks attributable to interaction were nonsignificant. | "Obesity, abdominal obesity, and major depression were longitudinally associated with increased risk of high WPI. The longitudinal joint effect of obesity and major depression on high WPI implies that obesity intervention maybe more beneficial for individuals with major depression than those without regarding risk of high WPI." | |

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| Peake et al. 2012 | Benefits of Addressing Obesity in the Workplace | Prospective Comparative Study | No COI declared. | 679 Australian Defence Force (ADF) personnel from army, navy and air force service branches were included in the analysis. | The sample included male (n = 597) and female (n = 82) participants.<br><br>For the Obese Restricted body fat cohort, the age distributions were as follows: 36% ≤19 years, 33% 20–24 years, 14% 25–29 years, 17% ≥30 years.<br><br>For the Obese No restriction on body fat cohort, the age distributions were as follows: 33% ≤19 years, 33% 20–24 years, 17% 25–29 years, 17% ≥30 years.<br><br>In the normal cohort, most individuals (65%) were aged ≤19 years. | The purpose of this study was to compare the incidence of injury and illness, absenteeism, productivity, healthcare usage and administrative outcomes among Australian Defence Force personnel with varying BMI.<br><br>Personnel were grouped into cohorts according to the following ranges for (BMI): normal (18.5 − 24.9 kg/m2; n = 197), overweight (25–29.9 kg/m2; n = 154) and obese (≥30 kg/m2) with restricted body fat (≤28% for females, ≤24% for males) (n = 148) and with no restriction on body fat (n = 180). | Medical records for each individual were audited retrospectively to record the incidence of injury and illness, absenteeism, productivity, healthcare usage (i.e., consultation with medical specialists, hospital stays, medical investigations, prescriptions) and administrative outcomes (e.g., discharge from service) over one year. | The prevalence of injury and illness, cost of medical specialist consultations and cost of medical scans were all higher ($p<0.05$) in both obese cohorts compared with the normal cohort.<br><br>The estimated productivity losses from restricted work days were also higher ($p<0.05$) in the obese cohort with no restriction on body fat compared with the normal cohort.<br><br>Within the obese cohort, the prevalence of injury and illness, healthcare usage and productivity were not significantly greater in the obese cohort with no restriction on body fat compared with the cohort with restricted body fat.<br><br>The cost of hospital visits, consultations with medical specialists and medical scans were significantly higher ($p<0.01$) in both obese cohorts compared with the normal cohort.<br><br>The number of restricted work days, the rate of re-classification of Medical Employment Classification and the rate of discharge from service were similar between all four cohorts. | "In summary, the present study demonstrates that for young men and women entering military training, obese individuals experienced more illnesses and injuries, and incurred greater medical costs (e.g., specialist consultations, scans) compared with those individuals with normal BMI.<br><br>Among obese individuals, the prevalence of injury and illness, healthcare usage and productivity were not significantly greater in the cohort with no restriction on body fat. Obese individuals did not require more time off work and were no more likely to be classified as unfit for service or discharged from service. These findings therefore suggest that high BMI may raise the costs of healthcare, but does not disrupt workforce maintenance." | |

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| Poulsen et al. 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | KP and BC are employed by Steno Diabetes Center A/S, a research hospital working in the Danish National Health Service and owned by Novo Nordisk A/S. This study was funded by Steno Diabetes Center A/S, which receives part of its core funding from unrestricted grants from the Novo Foundation and Novo Nordisk A/S. There are no patents, products in development or marketed products to declare. This does not alter the authors' adherence to all the PLOS ONE policies on sharing data and materials. | Participants included 7,305 health care workers in the Danish National Diabetes Register. | The sample was majority female (n=7,119, 97%).<br><br>N=1,475 were 30–39 years old in 2005.<br><br>N= 2,721 were 40–49 years old in 2005.<br><br>N= 3,109 were 50–69 years old in 2005. | This study estimated the importance of work and lifestyle as risk factors for developing diabetes mellitus among healthcare workers and explores the association of work factors and obesity, which is a risk factor for diabetes.<br><br>Body Mass Index (BMI) was categorized as normal weight (18.5 ≤ BMI < 25), overweight (25 ≤ BMI < 30) and obese (BMI ≥ 30). | The cohort was followed for 7 years followed and analysis consisted of survival analysis and logistic regression models to estimate the influences of potential risk factors related to job, health and lifestyle on diabetes and obesity. | BMI was the single most important risk factor for the development of diabetes ($p<0.0001$) as 10.6% of obese participants developed diabetes. Among the 262 participants who developed diabetes, 32.8% were obese ($p=0.0001$).<br><br>The risk of developing diabetes was associated with obesity (OR 6.30, 95% CI 4.27–8.49) compared to normal weight and remained significant in the fitted model (6.53, 95% CI 4.68–9.10).<br><br>Shift work ($p=0.0004$) and having low influence ($p=0.001$) and scoring high on role conflicts ($p=0.021$) were associated with obesity. Leisure time physical inactivity ($p<0.0001$) was associated with obesity, and it is notable that a significantly lower proportion of obese employees were smokers ($p<0.0001$).<br><br>As smoking is known to reduce obesity, reanalysing the obesity data for non-smokers, we found that smoking could explain the effects of age and musculoskeletal pain. On the other hand, statistical associations of high depression scores and role conflicts with obesity are seen for non-smokers. | "The present study showed both lifestyle and occupational risk factors among healthcare workers for developing diabetes over a period of seven years. The most important risk factor was a BMI above the normal category. At baseline, obesity was associated with low level of exercise, poor self-rated physical fitness, shift work and problems with health and sleep."<br><br>"Our results suggest that the occupational setting affects diabetes indirectly through the influence of obesity and physical inactivity."<br><br>"Confirming obesity as the strongest risk factor for developing diabetes, the present study identified few occupational risk factors. However, obesity, the key risk factor for diabetes, had a more variable relation with work than did diabetes." | |

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| Rabacow 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 2201 employees from a Brazilian airline company | Mean age = 32.2 yrs (SD = 8.4).<br><br>58.0% male | The costs of sick leave (indirect costs) and healthcare (direct costs) were primary outcomes of interest.<br><br>Compared weight and effect on direct and indirect costs. Normal weight (18.5-24.9 $kg/m^2$) (reference group)<br><br>vs.<br><br>Overweight (25-29.9 $kg/m^2$)<br><br>vs.<br><br>Obese (≥30 $kg/m^2$) | 1 yr after initial survey collected data from sickness absence register of the airline company and data from health care cost register. | "Each increased unit of BMI raised direct costs by an average of US$17.00 over the 12-month follow-up." (β = 17; SD 8.26; p<0.005)<br><br>"BMI not associated with indirect costs." | "Obesity among workers in a Brazilian airline company were associated with increased health costs." | |

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| Robroek 2013 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No mention of COI | 4923 employed respondents aged ≥50 from 11 European Union countries | Mean age = 55.2 years (SD = 3.5 yrs)<br><br>44% female (n=2141) | The primary outcome measure is self-reported work status.<br><br>These statuses included paid employment; retirement at follow-up (12%); Disability (2%); unemployment (4%); or other exit (4%).<br><br>They compared different weight's effect on the work status. Normal weight (<25 kg/$m^2$) (n=2118, 43%) (reference group); Overweight (≥25 and < 30 kg/$m^2$) (n=2083, 42%); Obese (≥30 kg/$m^2$) (n=722, 15%) | Follow-up interviews 2 and 4 years after baseline to determine employment status | In univariate Cox proportional hazard analysis, obese was statistically significant on likelihood of disability pension during follow-up period after adjusting for sex, age, educational level, and cohabilitation status. However, obese was not statistically significant after adjusting for potential confounders such as health, health behaviors, or work-related factors.<br><br>Obese univariate HR = 1.67; 95% CI (1.01-2.74); p<0.05 | "In the univariate analyses, obese workers also had a higher risk of exit, and after adjustment for potential confounders the estimate of obesity on exit from paid employment still indicates an increased, although non-significant, risk on disability pension and unemployment."<br><br>"Promoting a healthy lifestyle, particularly physical activity, might be a way to prevent workers from leaving the work force prematurely." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Sanchez Bustillos et al. 2014 | Benefits of Addressing Obesity in the Workplace | Large, population-based study | No declared COI. | 56,971 subjects from the 2009-10 Canadian Community Health Survey.<br><br>20.3% of the cohort were obese. | Median age was 40-49 years.<br><br>Majority of the cohort was male (52.9%). | The primary outcome of interest was work productivity relative to BMI. | No follow up. | There was a substantially higher prevalence of presenteeism in the obese categories (16.2-18.3%) relative to normal weight people (10.1%).<br><br>Those who were overweight or obese generally had a slightly higher odds ratio of absenteeism and presenteeism relative to the normal weight.<br><br>Chronic conditions were strongly associated with presenteeism. | "This study found that obesity is an independent risk factor for reduced work productivity. Both absenteeism and presenteeism were associated with obesity. However, being overweight was weakly associated with work productivity." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Shaw et al. 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | Participants were 607 patients seeking treatment for acute low back pain (LBP) at 1 of 8 occupational health clinics in the New England region of the United States. | Within the sample, 197 were female (32.3%) and 410 were male.<br><br>Ages of participants ranged from 18 to 80 years (M = 36.0, SD = 11.0), and 90% were younger than 50 years. | Participants were categorized into groups based on BMI (kg/m2) at the initial evaluation. Groupings were (BMI<18), normal weight (18≤BMI≤25), overweight (25<BMI ≤30), and obese (BMI > 30) individuals.<br><br>Effects of body mass on LBP recovery were estimated by comparing the weight groups on follow-up outcome measures (analysis of covariance for continuous measures and logistic regression for categorical measures). | Participants were assessed at one and 3 months after the reported date of injury. | 175 (28.8%) of participants were obese.<br><br>Comparisons of normal weight, overweight, and obese patient groups showed that normal weight participants were more likely to be smokers and report severe pain, and obese patients were less likely to report their overall health as excellent or very good (P <0.05).<br><br>Unadjusted comparisons showed no significant group differences in pain, functional limitation, or return to work, with or without adjusting for covariates (age, sex, income, smoking, overall health rating, and initial pain intensity) at 1- and 3-month follow-ups.<br><br>Further dividing the obese group into categories of grade I (BMI 30–34.9) or grades II or III (BMI ≥ 35) also did not change results; even those with grade II or III obesity (n =55) showed no significant deficits (or noticeable trends) in outcomes of pain, function, and return to work.<br><br>Percentages of participants requiring modified or alternate duty showed no significant group differences (72.4% for normal weight, 69.7% for overweight, and 70.2% for obese). The average number of days away from work was also very similar (16.5, 14.1, and 14.4 days, respectively). | "While clinical wisdom would suggest that obesity should be a significant comorbidity concern for the management of acute LBP in working-age adults, we found no such effects of BMI on short term (3-month) outcomes of pain, functional limitation, and return to work in this prospective cohort of workers suffering work-related episodes of LBP." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Tao et al. 2016 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | The present study included 2301 injured workers reported to Louisiana Workers' Compensation Corporation (LWCC) in 2011 (1107 workers) and 2012 (1194 workers). | The risks of ''not closing during the study period'' associated with BMI groups were analyzed using logistic regression controlling for gender (Male vs Female), age (Age 40 to <60 years old vs <40 years old and Age _60 years old vs <40 years old), marital status, attorney involvement, and initial reserve. | The aim of this study was to assess whether the obesity was associated with an increased time lost from work and higher costs among workers' compensation claimants sustaining severe, but not minor injuries.<br><br>The data were stratified by BMI group (normal, overweight, and obese) and initial reserve group (<$15,000 signifying a less severe injury and ≥ $15,000, a more severe injury). | Cost and lost time outcomes were assessed for 2301 lost time workers' compensation claims filed in 2011 and 2012 followed to the end of the first quarter of the third post injury year.<br><br>The claimants who sustained an injury in 2011 were followed to the March 31, 2014, while the claimants of 2012 were followed to March 31, 2015. Thus, the claimants for each injury year would have the same length of follow-up. | For open claims with an initial reserve of at least $15,000, the average incurred cost was $181,413, $270,332, and $472,713 for normal-weight, overweight, and obese claimants, respectively. However, this increasing trend did not appear in the open claims with an initial reserve less than $15,000.<br>The incurred cost of closed did not differ from each of the BMI groups for both low and high initial reserve groups.<br><br>The OR of having the incurred cost at least $100,000 for overweight or obese versus normal weight was 2.12 (95% CI: 1.05 to 4.30) and 2.21 (95% CI:<br>1.12 to 4.40), respectively, for the group with initial reserve at least $15,000. There was no statistically significant difference observed between BMI groups for an initial reserve of less than $15,000.<br><br>Adjusting for gender, age, marital status, attorney involvement, and spinal procedures, the odds ratios of incurring a claim expense at least $100,000 after a severe injury for an overweight or obese versus normal weight claimant was 2.11 [95% confidence interval (95% CI): 1.04 to 4.29] and 2.23 (95% CI:1.12–4.46), respectively.<br><br>The OR for a claim remaining open by the end of the study varied with BMI group but had no statistically significant differences between groups. | "Obesity was associated with increased costs among workers' compensation claimants sustaining severe, but not minor injuries."<br><br>"This study confirms the results of our previous study that overweight and obese claimants with significant injuries had higher workers' compensation expenses. However, the association between higher BMI and delayed return to work (claim closure) found in the pilot study was not confirmed in this larger study." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Tao 2015 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 1107 individuals who filed worker's compensation claim paid by Louisiana Worker's Compensation Corporation in 2011, but only 641 and had height and weight measurements recorded | Not mentioned. | Returning to work after severe injury (claim closed at end of study period) (n=75)<br><br>vs.<br><br>Not returning to work after severe injury (claim open at end of study period) (n=1032)<br><br>*there was not BMI information for all study participants | Followed claimants until end of 1st quarter of 2014 | Those overweight or obese had higher odds of claim remaining open at end of study than normal weight.<br>Overweight:<br>OR = 2.95; 95% CI (0.99-8.73); p=0.0515.<br>Obese: OR = 3.58; 95% CI (1.26-10.14); p=0.0166.<br><br>Those overweight or obese had higher odds of claim with incurred cost of 100,000 or more by end of follow-up than normal weight.<br>Overweight:<br>OR = 2.81; 95% CI: (1.08-7.29); p=0.0337.<br>Obese: OR = 3.19; 95% CI (1.18-8.62); p=0.0226.<br><br>Analysis controlled for age, sex, marital status, and attorney involvement. | "Obesity is associated with higher workers' compensation costs and decreased ability to return to work for individuals sustaining a significant injury" | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Trogdon et al. 2009 | Benefits of Addressing Obesity in the Workplace | Simulation | No COI declared. | Researchers calculated the annual reduction in medical expenditures and absenteeism costs for a company with 1000 employees representative of the working U.S. population with respect to weight, wages, and benefits.<br><br>Medical Expenditures data were pooled from the Medical Expenditure Panel Survey Consolidated Data Files. The estimation sample included nonpregnant adults ages 18 to 64 who work full time as defined by working greater than or equal to 35 hours per week (N = 27,927).<br><br>Absenteeism as a function of BMI was estimated using NHIS Person files and the Adult files. The sample was restricted to those ages 18 to 64 who were employed full time the entire year and were not pregnant (N=34,170). | The estimation sample included nonpregnant adults ages 18 to 64 who work full time.<br><br>The model also assumes that, for any BMI, a given weight loss has the same mean effect for all age, race, and gender strata. | The goal of the simulation model is to calculate return-on-investment (ROI) from workplace obesity interventions, employers require information about costs saved by the intervention.<br><br>The toolkit provides an estimate of the number of employees in the following weight categories using industry-or state-specific prevalence data or user-entered values: normal weight (body mass index [BMI;kg/m2]<25) , overweight (BMI 25 to 29.9), obese I (BMI 30 to 34.9), obese II (BMI 35 to 39.9), and obese III (BMI >40) (from CDC's 2005 Behavioral Risk Factor Surveillance System). | Using the cost data and an algorithm that converts weight loss into annual savings in medical expenditures and reduced absenteeism, the toolkit estimates the number of years before a positive ROI is reached, if ever.<br><br>In the ROI calculation, the benefits of the intervention were compared with the costs of implementing the intervention. Intervention costs are provided by the user. Intervention costs were also examined separately for the first year and subsequent years. | Using national obesity prevalence data, this company would be expected to have 321 overweight, 191 obese I, 73 obese II, and 51 obese III employees.<br><br>Across all overweight and obese employees, 5% weight loss results in an average reduction in annual costs (medical plus absenteeism) of $90 per person. Nevertheless, there is substantial variation in savings across weight categories: 5% weight loss among the overweight (obese III) would reduce annual costs by $60 ($160) per person.<br><br>Beyond 5% weight loss, weight loss and cost savings are roughly linear even though our functional form did not impose a linear relationship.<br><br>In regards to the annual reductions in medical and absenteeism costs per person for all overweight and obese employees, medical expenditures account for between two thirds and three fourths of the savings. | "The results suggest that low-cost policy or environmental change interventions in worksites may be more likely to be cost saving than high cost, individually targeted behavioral change interventions unless they result in substantial weight loss." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Tsai 2011 | Benefits of Addressing Obesity in the Workplace | Prospective Comparative Study | No mention of COI | 6551 full-time employees of Shell's US refinery and petrochemical facilities during Jan 1st 2005 through Dec 31 2008 with or without MSD | <u>Low Back Disorders:</u><br><40 years (n=71, 18.6%)<br>40-49 years (n=134, 35.2%)<br>≥50 years (n=176, 46.2%)<br>91.6% male (n=349)<br><br><u>Non-low back Disorders:</u><br><40 years (n=81, 16.9%)<br>40-49 years (n=156, 32.6%)<br>≥50 years (n=242, 50.5%)<br><br>88.1% male (m=422)<br><br><u>Comparison group:</u><br><br><40 years (n=1287, 22.6%)<br>40-49 years (n=1857, 32.6%)<br>≥50 years (n=2547, 44.8%)<br>88.7% male (n=5051) | MSD absence from low back of 4 days or longer (n=381)<br><br>vs.<br><br>MSD absence from non- low back disorders of 4 days or longer (n=479)<br><br>vs<br><br>No MSD absence from low back and non-low back disorders (comparison group) (n=5691) | 4 year follow-up study recorded absence data from Shell Health Surveillance System | Risk of MSD absence from low back and non-low back disorders was significantly associated with overweight/obesity.<br><br>Adjusted for age and gender --<br>Low Back Disorders:<br>Overweight OR = 2.02; 95% CI (1.25-3.26)<br>Obese OR = 2.77; 95% CI (1.73-4.44)<br><br>Non-Low Back Disorders:<br>Overweight OR = 1.87; 95% CI (1.24-2.82)<br>Obese OR = 2.58; 95% CI (1.73-3.87)<br><br>Total:<br>OR = 1.93; 95% CI (1.41-2.66)<br>Obese OR = 2.66; 95% CI (1.95-3.64) | "Of the baseline personal risk factors, obesity contributed the most to the risk of absence from both low back and non-low back MSD"<br><br>"Results suggest it is possible to reduce the impact of MSD through…support for weight reduction … programs" | MSD-musculoskeletal disorders |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Uetani et al. 2011 | Benefits of Addressing Obesity in the Workplace | Prospective comparative study | No COI declared. | A total of 6886 subjects were enrolled in the study, including 4079 day workers and 2807 alternating shift workers at a Japanese steel company. | Non-overweight subjects were on average 35.8 (±10.4) years of age and overweight subjects were on average 38.5 (±9.3) years of age.<br><br>100% of the participants within the sample were male. | The aim of this study was to clarify the influence of shift work on serum total cholesterol (T-Cho) levels according to body mass index (BMI) at entry in Japanese male workers. The endpoints in the study were either a 20%, 25%, 30%, 35%, 40%, or 45% increase in T-Cho during the period of observation compared to T-Cho at entry.<br><br>Overweight was defined as BMI greater than or equal to 25.0 kg/m2 at entry. The number of non-overweight subjects was 5082 and overweight was 1804. | The study included observations made over a 14-year period from 1991 to 2005. | There were 5082 non- overweight subjects and 1804 overweight subjects within the sample.<br><br>In those who were overweight, the incidence rates of increased total cholesterol per 1000 person-years ranged from 3.3 (>45%) to 40.0 (>20%).<br><br>Alternating shift work was not associated with all six T-Cho endpoints in overweight subjects. Multiple significant OR were obtained for age (negative: >20%, >25%, >30%, >35%, and >45%). Other variables (BMI, level of creatinine (CRE), glycosylated hemoglobin A1c (HbA1c), aspartic aminotransferase (AST), g-glutamyl transpeptidase (GGT), uric acid (UA), smoking habits, drinking habits, and habitual exercise) did not show a consistent effect on any of the T-Cho endpoints for overweight subjects. | "In the present study, shift work was shown to be a potential risk factor for increased T-Cho in non-overweight Japanese male workers. However, we did not obtain a consistent association between shift work and an increase in T-Cho levels in overweight subjects. The results suggest that the effect of shift work on lipid regulation may be influenced by BMI." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Van Nuys et al. 2014 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | Karen Van Nuys, PhD, and Hoiwan Cheung, BA, are with Precision Health Economics, Los Angeles, California. Jeff Sullivan, MS, is with Precision Health Economics, Boston, Massachusetts. Denise Globe, PhD, and Daisy Ng-Mak, PhD, are with Allergan, Inc., Irvine, California. Dana Goldman, PhD, is with the University of Southern California, Los Angeles, California. | A panel database with 29,699 employees drawn from a panel of employers (N=89,097) was used. | The employees in the data are, on average, 45.86 years of age and 34.0% female. | The study used employee-level data stratified by BMI to identify the types and magnitudes of costs associated with overweight employees.<br><br>BMI was grouped into the following categories: (15–18.5], (18.5–25], (25–30], (30–35], (35–40], and (40–48]. | Participants were observed for 3 years each (2006–2008). | The probability of both types of claims is lowest among normal weight employees and rises as BMI increases. Compared to an employee with BMI=25, an employee with BMI=35 has nearly double the risk of a short-term disability claim (3.2% vs. 6.0%; p=.01) or a workers' compensation claim (1.8% vs. 3.2%; p =.00).<br><br>Compared to an employee with BMI=25, a worker with BMI=40 will miss about 77% more days of work from all three sources (from 10.3 to 18.2 days per year; p¼.00). Days lost owing to workers' compensation events show the largest increase—an employee with BMI=40 will miss more than twice the work days because of workers' compensation claims compared to an employee with BMI=25 (7.4 vs. 3.3 days per year; p=.00).<br><br>Morbidly obese (BMI =40) employees have double the total employer cost compared to normal weight, or $8067<br><br>If every employee in the sample with BMI = 29 had instead a BMI one point lower, employers' total costs associated with those employees would fall by 3.7%. | "Obesity is associated with large employer costs from direct health care and insurance claims and indirect costs from lost productivity owing to workdays lost because of illness and disability."<br><br>"Using employee-level data from large employers, we find that, compared to a normal weight employee, a morbidly obese employee (BMI =40) costs his or her employer $3880 more per year in covered health care expenditures and $358 more in short-term disability, workers' compensation, and sick days combined." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| VanWormer et al. 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | A longitudinal analysis of 1,228 employees enrolled in a worksite-randomized controlled trial was performed. Participants were all working adults in the Minneapolis, MN, area | The sample was generally middle-aged (mean ± SD = 44.2 ± 10.2 years), and female (61%). | The primary predictor was body weight change. Body weight was measured at baseline and 24-month follow-up.<br><br>For purposes of analysis, weight change was modeled categorically as: i) weight gain: gained > 1 kg between baseline and 24 months, ii) weight maintenance: 24-month follow-up weight within ± 1 kg of baseline weight, and iii) weight loss: lost > 1 kg between baseline and 24-month follow-up.<br>. | The purpose of this study was to examine the degree to which weight change predicted 2-year absenteeism. | Baseline BMI was 28.4 ± 6.2 kg/m2, and the sample was 33% obese. Over 2 years, weight change was 0.8 ± 5.0 kg, with 47%, 25% and 28% of the sample falling into the weight gain, weight maintenance and weight loss analytical categories, respectively.<br><br>The difference in absenteeism was 6.6 ± 1.1 days among obese employees who gained weight.<br><br>Further modeling revealed a significant interaction between weight change category and baseline BMI category (X2 = 12.34, p = 0.015).<br><br>The final multivariate negative binomial regression model indicated that obesity (β ± SE = 0.390 ± 0.156, p = 0.012) was significantly associated with workplace absenteeism relative to the healthy weight reference group.<br><br>Also, the main effect findings for baseline BMI were noteworthy in that obese participants generally had about 1.5 more sick days than healthy weight participants. | "In particular, the direction of the interaction suggested that weight loss was only beneficial for absenteeism among those who were obese at baseline. contrast, absenteeism was higher for both healthy weight and overweight participants who gained weight over the 2-year study, whereas weight gain appeared to matter little for obese participants." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Viester et al. 2013 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | Participants included a large working population sample using the data from The Netherlands Working Conditions Survey (NWCS).<br><br>43,221 employees were included in the analysis. | Participants were on average 40.3 (±12.1) years of age and the majority of the participants were male (54.2%). | The aim of this study was to investigate the association between BMI and musculoskeletal symptoms in interaction with physical workload and whether overweight and obesity are associated with an increase in occurrence of symptoms and/or decrease in recovery from symptoms.<br><br>BMI was classified into three categories (normal weight (BMI 18.5-24.9 kg/m2), overweight (BMI 25.0-29.9 kg/m2), and obese (BMI ≥ 30 kg/m2)), which is in accordance with the international classification system of the WHO. | The aim of this study was to investigate the association between BMI and 12-month prevalence of musculoskeletal symptoms. | Musculoskeletal symptoms were reported by 57.6% of obese employees.<br><br>For high BMI an increased 12-month prevalence of musculoskeletal symptoms was found (overweight: OR 1.13, 95% CI: 1.08-1.19 and obesity: OR 1.28, 95% CI: 1.19-1.39).<br><br>Obesity was associated with neck/shoulder (OR 1.12; 95% CI: 1.03-1.21), upper extremity (OR 1.37, 95% CI: 1.25-1.50), back (OR 1.10, 95% CI: 1.01-1.20), and lower extremity symptoms (OR 1.68, 95% CI: 1.55-1.83).<br><br>The findings on overall symptoms indicated that being obese statistically significantly increased the risk of developing musculoskeletal symptoms during 12-month follow-up (OR 1.37, 95% CI: 1.05- 1.78).<br><br>Regarding the different body regions, the relationship also existed for lower extremity symptoms for obese employees (OR 2.12, 95% CI: 1.64-2.73).<br><br>For the upper extremity there was an effect of BMI on occurrence of symptoms for obese employees (OR 1.51, 95% CI: 1.14-1.98). | "BMI was associated with musculoskeletal symptoms, in particular symptoms of the lower extremity. Furthermore, the association differed for employees with high or low physical workload. Compared to employees with normal weight, obese employees had higher risk for developing symptoms as well as less recovery from symptoms. This study supports the role of biomechanical factors for the relationship between BMI and symptoms in the lower extremity." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Wilkie 2013 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No mention of COI | 716 adults who reported hip, knee, foot pain or a combination and maintained employment through 3 year follow- up | Aged 50-59 at baseline; mean age 54.5 (S.D. 2.6 years)<br><br>54.7% female | Onset of work restriction at 3 years (n=108, 15.1%)<br><br>vs.<br><br>No work restriction at 3 years (n=608, 84.9%) | Follow-up questionnaires 3 years after baseline | Obesity was "significantly associated with the onset of work restriction at 3 years before adjusting for other factors."<br><br>But, obesity was not significant when adjusting for other factors (age, gender, etc.)<br><br>Obesity crude OR: 1.74; 95% CI (1.00-3.04)*<br><br>Obesity adjusted OR: 1.36; 95% CI (0.74-2.52), adjusted for age and gender<br><br>*while the 95% CI includes 1, it may be due to rounding that they state that it was statistically significant prior to adjustment. | "Notably health comorbidity and obesity which are known to add to the impact of osteoarthritis were not linked to work restriction, as these problems may not start to impact on function until older age." | |

| Author/Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusions: | Comments: |
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| Wolfenstetter 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI | 2581 participants of two cross-sectional, population-representative health surveys in Augsburg, Germany. | Age:<br>35-45 (22.1%);<br>45-55 (26.3%);<br>55-65 (27.4%);<br>65-75 (24.1%)<br><br>48.5% Men | They looked at health care use and productivity losses based on weight.<br><br><u>Analysis 1:</u><br>Healthy weight, 18.5≤BMI<25 (n=988) (reference group)<br><br>vs.<br><br>Overweight, 25≤BMI<30 (n= 1135)<br><br>vs.<br><br>Obesity BMI ≥ 30 (n=458)<br><br><u>Analysis 2:</u><br>BMI class change<br><br>vs.<br><br>stay in same BMI class for 10 years (reference group) | Follow-up survey 10 years after 1st survey | <u>Analysis 1:</u><br>*Total utilization of medical services:*<br>Overweight: OR= 1.40; 95% CI: 1.06-1.86; p< 0.05;<br>Obesity: OR= 1.88; 95% CI: 1.25-2.84; p<0.01<br><br>*Production losses:*<br>Overweight: OR=1.21; 95% CI: 1.00-1.46; p<0.05;<br>Obesity: OR= 1.74<br><br><u>Analysis 2:</u><br>Those who stay in healthy weight category total direct costs: Mean=981.7€; 95% CI: 854.6 - 1127.8<br><br>Change from healthy weight to obesity category total direct costs: Mean= 6446.3€; 95% CI: 1892.6 - 15,666.8; p<0.01 | <u>Analysis 1:</u><br>"the relationship between BMI class and future (in)direct costs 10 years later, show that the predicted health care and indirect costs of an overweight or obese person are higher than the costs of a previously healthy weight person, excluding the costs of hospitalization."<br><br><u>Analysis 2:</u> "Trend of higher direct and indirect costs when people gain weight and switch from one weight category to the next higher weight category." | |

| Author Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Zhao et al. 2012 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | Participants were 928 nurses selected from the Nurses and Midwives' e-cohort Study (NMeS), which is a longitudinal population-based study funded by the Australian Research Council and a range of industry partners. | Participants were aged 21 to 67 years (mean = 43.4 ± 9.9 years).<br><br>The sample was 93.1% female. | Several general health and psychological factors that might have potential confounding effects on the association between shift work and low back pain (LBP) were selected.<br><br>Overweight/obesity has been reported in relation to back injuries among nurses.18,19 Consequently, BMI was calculated from weight and height reporting and as classified as per the World Health Organization and categorized into underweight, normal, overweight, and obesity. | Participants were assessed longitudinally over 2 years. | 29.8% of participants were obese.<br><br>In terms of health and psychological factors, LBP was related to being overweight or obese (32.6 vs 30.8 and 31.5 vs 27.3, respectively; P < 0.001).<br><br>The Shift Schedule * BMI Classification interaction showed that shift workers who were overweight and obese were more likely to develop LBP than day workers (overweight: adjusted OR, 1.23, vs adjusted OR, 1.03, P < 0.01; obesity: aOR, 1.34, vs aOR, 1.10, P < 0.01). | "The interaction analysis suggested that shift workers who were overweight and obese had even higher risks of developing LBP compared with day workers, by as much as 61%."<br><br>"Our findings suggested that shift workers were at higher risk of developing LBP overtime compared with day workers. This risk was aggravated for those shift workers who were overweight or obese." | |

## ACOEM Evidence Table: Surgery – Gastric Banding

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Finkelstein et al. 2011 | Surgery—Gastric Banding | Simulation | This research was supported by Allergan Inc., maker of the LAP-BAND system. At the time this study was written, Dr. Burgess was an employee of Allergan Inc. The remaining authors are consultants to Allergan Inc. | 2,298 laparoscopic adjustable gastric banding (LAGB) eligible participants were enrolled, with 134 from the Medical Expenditure Panel Survey (MEPS) and 2,164 from the National Health and Wellness Survey (NHWS). | Mean age of participants in the MEPS was 43.2 (SE = 1.1) years, with 49.3% males. The mean age of participants in the NHWS was 44.7 (SE = .02) years, with 49.1% males. | The primary outcome of interest was the quantification of LAGB direct costs with indirect costs based on medical expenditures, absenteeism, and presenteesim among surgery eligible individuals with diabetes. | Indirect costs were estimated per quarter for 5 years postoperatively. | Net 5-year savings in medical expenditures from a gastric banding procedure were $26,570 ± $9,000 among LAGB patients with diabetes.<br><br>Including indirect absenteeism costs increased net savings to $28,670 ± $9,410.<br><br>Savings were further increased to $34,160 ± $10,380 when all three cost categories were included. | "Application of this approach to gastric banding among surgery-eligible patients with diabetes revealed that inclusion of indirect costs improved the business case for the procedure and suggests that some level of cost sharing for gastric banding is likely to be cost saving to the firm." | |

| Author Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Finkelstein et al. 2012 | Surgery—Gastric Banding | Simulation | The source of financial support for this research was Allergan, Inc. | 2,298 laparoscopic adjustable gastric banding (LAGB) eligible participants were enrolled, with 134 from the Medical Expenditure Panel Survey (MEPS) and 2,164 from the National Health and Wellness Survey (NHWS). | Mean age of participants in the MEPS was 43.2 (SE = 1.1) years, with 49.3% males. The mean age of participants in the NHWS was 44.7 (SE = .02) years, with 49.1% males. | The primary outcome of interest was the quantification of LAGB direct costs with indirect costs based on medical expenditures, absenteeism, and presenteesim among surgery eligible individuals. | Indirect costs were estimated per quarter for 5 years postoperatively. | Net 5-year savings in medical expenditures from a gastric banding procedure were $4,970 ± $3,090 among LAGB patients.<br><br>Including indirect absenteeism costs increased net savings to $6,180 ± $3,550.<br><br>Savings were further increased to $10,960 ± $5,864 when all three cost categories were included. | "Application of this approach to gastric banding among surgery eligible obese employees revealed that inclusion of indirect costs improves the business case for the procedure." | |

**ACOEM Evidence Table: Surgery – Gastric Bypass**

*Occurred in laboratory rather than real workplace setting

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: |
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| Alosco 2014 | Surgery—Gastric Bypass | Prospective Cohort* | None reported | 50 | Mean 44.0yr<br>SD 10.8yr<br>92% Female | Cognitive function compared to baseline | 12-weeks, 12-months, 24-months, and 36-months post-surgery. | Attention improved up to 24-months and then slightly declined, though still fell within the average range at 36-months. Improvements in executive function reached its peak at 36-months post-surgery. Short-term improvements in memory were maintained at 36-months. No main effect emerged for language. | "Bariatric surgery may lead to lasting improvements in cognition." |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Alosco et al. 2014 | Surgery—Gastric bypass | Prospective cohort study* | None reported | Bariatric surgery patients participating in the Longitudinal Assessment of Bariatric Surgery parent project. (N = 94)<br><br>Family history of Alzheimer's disease (AD): (n = 14)<br><br>No family history of AD: (n = 80) | Mean age 44.34 years (+/- 11.15). 16% were male | Cognitive function of attention, executive function, memory, and language 12 weeks after bariatric surgery between patients with and without a family history of AD. | 12 weeks (+/- 7 days) post bariatric surgery | Repeated measures of ANOVA analyzed BMI changes and cognitive tests from baseline to 12 weeks post-surgery.<br><br>BMI decreased significantly from baseline to posttest, but remained in the severely obese category. Baseline: 45.94 (+/- 5.27) $kg/m^2$ Follow-up: 38.03 (+/-4.92) Change: ($F(1, 93) = 1010.65$, $p < 0.001$)<br><br>In the overall sample, cognitive test scores improved from baseline to post bariatric surgery in attention/executive function: ($F(1, 93) = 39.26$, $p < 0.001$) and memory: ($F(1, 93) = 9.77$, $p < 0.01$).<br><br>Repeated measures ANOVA showed a significant improvement in time effect for memory in those without a family history of AD ($F(1, 75) = 5.03$, $p = 0.03$), and those with a history did not improve ($F(1, 9) = 0.16$, $p = 0.70$).<br><br>Patients with a family history of AD were more likely to exhibit increased cognitive impairments post operatively than those without a history of AD: long delay free recall task ($\chi2(N = 94, df = 1) = 4.79$, $p = 0.03$), switching of attention task A ($\chi2(N = 94, df = 1) = 8.48$, $p = 0.004$), letter fluency ($\chi2(N = 94, df = 1) = 6.61$, $p = 0.01$), and animal fluency ($\chi2(N = 94, df = 1) = 4.06$, $p = 0.04$). | "In the current study, bariatric surgery patients with a reported family history of AD exhibited a higher prevalence of cognitive impairment and did not show post- operative gains in memory abilities."<br><br>"In the overall sample, we found that bariatric surgery was associated with improvements in both attention/executive function and memory abilities 12 weeks post-operatively." | |

| Author/Year: | Category: | Study type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Alosco et al. 2015 | Surgery—Gastric bypass | Prospective cohort study* | None reported | Participants in the Longitudinal Assessment of Bariatric Surgery parent project that met inclusion and exclusion criteria, and had complete baseline and post-surgery data. (N= 84) | Mean age: 43.86 years (+/- 10.39)<br><br>83.3% female | Cognitive functioning tests of attention/executive function, memory and language.<br><br>Determine if serum levels of leptin and gremlin associated with changes in cognitive functioning test scores | 12 months post bariatric surgery | Repeated measures ANOVA showed a significant improvement in cognitive functioning test scores from baseline to post-surgery. Attention/executive function: ($F(1,83) = 36.20$, $p < .001$). Memory ($F(1,83) = 54.90$, $p < .001$). Language remained stable ($F(1,83) = 0.19$, $p = .67$).<br><br>12 months post-surgery: reduced serum leptin levels and increased serum ghrelin levels were associated with increased attention/executive functioning test scores (β=-0.19, *p*=0.03), (β=0.25, *p*=0.03), respectively.<br><br>Controlling for change in BMI resulted in no significant association between serum levels and cognitive scores ($p > .05$). Also, changes in BMI from baseline to post-surgery were not associated with 12 months post-surgery cognitive function ($p > .05$) | "Since serum leptin levels improved (i.e., decreased) in the present sample after surgery, it is possible that bariatric surgery in- creases the brain's sensitivity to leptin (i.e., decreased leptin resistance) in obese persons, perhaps via increased brain per- meability to leptin, to improve cognition and possibly reduce the risk of cognitive decline; future studies should explore this possibility."<br><br>"A particularly interesting finding was the association of postoperative increases (i.e., improvements) in serum ghrelin levels with better attention/executive function at the 12-month follow-up."<br><br>"Finally, the findings of the present study also show that, af- ter accounting for the pre- to postoperative change in BMI, leptin and ghrelin no longer exhibited significant effects on attention/executive function, even though the postoperative change in BMI was also not a predictor of cognitive function at 12 months postoperatively." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Alosco et al. 2015 | Surgery—Gastric bypass | Prospective comparative study* | None reported | Participants in the Longitudinal Assessment of Bariatric Surgery parent project who met inclusion and exclusion criteria, and had baseline and post-surgery test scores. (N = 67) | Mean age: 42.90 years (+/- 10.58)<br><br>89.6% female | Cognitive functioning compared between participants with a history of Major Depressive Disorder (MDD) and participants without such history.<br><br>Cognitive functioning measurements included attention/executive function, memory, and language. | 12 months post bariatric surgery | Repeated measures ANOVA were conducted to determine changes in BMI and cognitive functioning from baseline to 12 months post- surgery. History of MDD was used as a grouping variable.<br><br>Significant improvement in cognitive test 12 months post- surgery. Attention: ($F(1,65) = 27.\ 31$, $p < .001$) Executive function: ($F(1,65) = 37.60$, $p < .001$) Memory ($F(1,65) = 45.48$, $p < .001$). No significant changes in language ($F(1,65) = 0.01$, $p = 0.94$).<br><br>No significant MDD history by time interaction. Attention ($F(1,65) = 0.06$, $p = 0.80$) Executive function ($F(1, 65) = 0.42$, $p = 0.52$) Memory ($F(1, 65) = 0.77$, $p = 0.38$) Language ($F(1, 65) = 0.43$, $p = 0.52$).<br><br>Bariatric surgery patients with and without MDD both demonstrated significant improvements in attention, executive function, and memory ($p < 0.05$ for all). | "Our hypothesis that a pre- surgery history of depression would negatively impact pre- and post-operative cognitive function was not supported. In fact, both patients with and without MDD demonstrated similar and significant rates of cognitive impairment prior to surgery and cognitive improvement at 12-month follow-up. Taken in combination, such findings suggest that history of depression does not exacerbate impairment in cognitive function in severely obese persons."<br><br>"Regardless of MDD history, cognitive function improved in nearly all domains following bariatric surgery." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Galioto et al. 2015 | Surgery—Gastric bypass | Prospective cohort study* | None reported | Individuals undergoing bariatric surgery and enrolled Longitudinal Assessment of Bariatric Surgery who met inclusion and exclusion criteria (N= 82). | Mean age: 43.55 years (+/- 10.21).<br><br>Female: 81.7% | Cognitive testing of letter fluency, memory, digit span, switching of attention, verbal interference, verbal list-learning, animal fluency at baseline and 12 months post- surgery<br><br>Glycemic control measured by insulin sensitivity test: homeostasis model assessment of insulin resistance (HOMA- IR= (fasting glucose (mg/dl) x fasting<br><br>insulin ($\mu\mu$U/mL)/405) and the influence on improvements in cognitive tests | 12 months post bariatric surgery | Repeated measures ANOVA showed significant improvements from baseline to post- surgery in all cognitive tests except letter and animal fluency. Digits forward: ($F = 6.90$, $p < .01$) digits backward ($F = 7.72$, $p < .01$), switching of attention A and B ($F = 23.05$, $p<.001$ and $F = 21.47$, $p < .001$ respectively), verbal interference ($F = 21.99$, $p < .001$), memory composite ($F = 49.01$, $p < .001$).<br><br>Linear regressions tests concluded that as HOMA-IR decreased, working memory improved ($\beta = -.253$, $p < .05$). As HOMA-IR decreased, switching of attention scores A and B improved ($\beta = -.156$ $p < .05$ and $\beta = -.181$, $p < .05$, respectively). | "Importantly, there was a small effect of changes in HOMA-IR on improvements in working memory, psychomotor speed, and cognitive flexibility, suggesting that improved glycemic control may play a small role in the observation of cognitive improvement, following bariatric surgery, particularly for attention and executive function." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Hawkins et al. 2015 | Surgery—Gastric bypass | Prospective cohort study* | None reported | Participants in the Longitudinal Assessment of Bariatric Surgery parent project, who met inclusion and exclusion criteria, and had complete baseline and post-surgery data. (N=77) | Mean age 43.4 years (+/- 10.6)<br><br>83.1% female | Relationships between the changes in the inflammatory marker, High- sensitivity C-reactive protein (hs-CRP, mg/dl)), and cognitive functioning at baseline and post bariatric surgery.<br><br>Cognitive functioning tests of attention/executive function, memory, and language | 12 months post bariatric surgery | Repeated measures ANOVA showed significant improvements in cognitive function post-surgery in attention/executive function ($F(1,76) = 91.80$, $p < .001$) and memory ($F(1,76) = 48.31$, $p < .001$). No significant pre- to postoperative changes in language abilities ($F(1,76) = 0.51$, $p = 0.48$).<br><br>At baseline, 26% of participants demonstrated high CRP levels (> 1.0 mg/dl). Post-surgery showed that all but 2 participants had CRP levels within normative ranges ($F(1,76) = 84.06$, $p < .001$).<br><br>Post-surgery CRP levels did not predict follow up cognitive functioning scores. Attention/executive function ($\beta\beta = 0.11$, $p = .31$) memory ($\beta\beta = .11$, $p = .42$) language = ($\beta\beta = .02$, $p = .84$).<br>Zero-order correlations showed no association between CRP levels and attention/executive function: ($r(75) = 0.08$, $p = .48$), memory ($r(75) = .06$, $p = .61$) or language ($r(75) = -0.06$, $p = .61$). | "Although inflammation and cognition improved post-operatively, inflammation was not related to cognitive function at baseline and reductions in inflammation did not predict improvements in cognitive function at 1- year follow-up." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lavender et al. 2014 | Surgery---Gastric bypass | Prospective cohort study* | None reported | Recruited 131 bariatric surgery patients who were part of the Longitudinal Assessment of Bariatric Surgery parent project.<br><br>After inclusion and exclusion criteria, and completion of baseline and 12-month post-test (N=68).<br><br>Diagnosed lifetime history of binge eating disorder (BED) (n = 68). No diagnosis of lifetime history of BED (n=20).<br><br>Missing height and weight data post-surgery reduced analyses for BMI (N=64). | Average age 42.93 (+/- 10.74) and 89.7% female. | Neurocognitive functioning tests (attention, executive function, memory, and language)<br><br>Whether a lifetime history of BED was associated with less improvement in neurocognitive functioning test scores | 12 months post bariatric surgery | Neuropsychological measures transformed to T-scores, and composite score computed for each test. ANOVA used to examine overall BMI changes, comparisons between BED and no BED BMI change, and neurocognitive tests.<br><br>BMI of participants decreased from 46.53 (+/- 6.10) $kg/m^2$ to 30.10 (+/- 5.13) $kg/m^2$ ($F(1,63) = 936.10$, $p < .001$)<br><br>Cognitive function improved pre to post in attention ($F(1,66) = 19.48$, $p < 0.001$) partial eta-squared = 0.23), executive function ($F(1,66) = 23.43$, $p < .001$, partial eta-squared = 0.26), and memory ($F(1,66) = 20.60$, $p < .001$, partial eta-squared = 0.24).<br><br>Using ANCOVA, no significant difference was found in cognitive test scores changes between BED and non-BED patients ($p > 0.10$ for all domains). | "As hypothesized, participants as a whole displayed significant improvements in test performance from pre-surgery baseline to post-surgery follow-up across three of four cognitive domains: attention, executive function, and memory; improvements were not seen in the domain of language. However, in contrast to expectations, the BED and non-BED groups did not significantly differ in their respective degree of improvements over time." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Mullen & Marr 2010 | Surgery—Gastric bypass | Prospective cohort study | None reported | Individuals undergoing surgery during, and part of a health plan for, a specific 85-month period, and who met other inclusion and exclusion criteria. (N= 224) | Mean age: 43.2 years<br><br>82% female | Understand the costs associated with gastric bypass surgery (preoperative, during surgery, and post-operative) to analyze whether there are cost savings in terms of less used health care. Used a closed, experience network of surgeons.<br><br>Comparison between actual cost of surgical patients and the projected health plan costs for overweight and obese clients | 6 months prior to surgery, the month of the surgery, 6 months post-surgery, and 60 months post-surgery | Year 1 post-surgery: costs for patients were lower than cost the year prior to surgery<br><br>Year 2: the surgical members had incurred fewer costs than the obese health plan population<br><br>Year 3: surgical patients had incurred fewer costs than the overweight population.<br><br>3.5 years: patients broke even on surgical costs. | "The present study has shown a breakeven point of surgery at 3.5 years for RYGB, in contrast to the mean of 6 years reported by Cremieux et al. [12]."<br><br>"Although gastric bypass is a costly surgical procedure, the longitudinal costs savings and overall health improvement for patients undergoing gastric bypass surgery are cost-effective within a closed, experienced network. Weight loss surgery decreased the annual costs per patient in the years after surgery." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Rochette et al. 2016 | Surgery-- Gastric Bypass | Prospective cohort study* | Work was funded by the National Institutes of Health.<br><br>Three authors receive personal fees from organizations (UptoDate; Health Outcomes Solutions; Covidien/Ethicon, Nutrisystem, Apollo Endosurgery) for work outside of this article | Surgery sample (n=120); participants in the Longitudinal Assessment of Bariatric Surgery.<br><br>Medically and demographically similar control group (n=51).<br><br>92 of the 171 (53.8%) total participants met diagnostic criteria for mild cognitive impairment (MCI)<br><br>88 of the 120 surgery sample had complete follow up data | Mean age of surgery and control (N=171) was 43.07 +/- 11.21. 80.7% female and mean BMI of 44.91 +/- 6.70 $kg/m^2$. | Neurocognitive function scores of memory, attention, language, and executive function. Scores of surgery group compared to control group.<br><br>Measure evidence for mild cognitive impairment | Surgery patients completed cognitive tests 12 months post-surgery. | Demographic and medical characteristics compared using t test and $x^2$ test<br><br>Those with MCI had a lower BMI (M=43.79 +/- 6.15) than those without (M=46.20 +/-7.10) [t(169)=2.38, p=0.02]<br><br>At baseline, 47 of the 88 (53.4%) surgery patients met MCI diagnostic criteria. 12 months post-surgery, 24 of the 88 (27.3%)met MCI diagnostic criteria, which was a 48.9% decrease from baseline ($x^2 = 11.03$, $p = 0.001$) | "This study shows that MCI was present in a sample of adults with severe obesity and at a rate much higher than the general population (e.g. 54% vs 6% in persons 51-59 years of age)."<br><br>"In summary, the current findings demonstrate that a majority of adults with severe obesity meet criteria for MCI and that this prevalence is reduced following bariatric surgery." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Spitznagel et al. (2013) | Surgery--Gastric Bypass | Prospective cohort study* | None reported | Recruited 57 bariatric surgery patients enrolled in the Longitudinal Assessment of Bariatric Surgery parent study. Completed 24 month follow up. (N = 57) | Inclusion criteria between ages 20 – 70. Average age 43.65 years (+/- 11.24). 87.7% female | Primary outcome was if cognitive function at 12 weeks post-surgery predicted % weight loss (%WL) and BMI 24 months post-surgery.<br><br>Comparison between baseline and 12 week post-surgery Executive/Attention Function and Verbal Memory tests | 12 weeks (+/- 5 days) and 24 months (+/- 30 days) post bariatric surgery | Neuropsychological scores transformed to T scores to create composite baseline and 12-week scores.<br><br>Regression analyses showed 12 week cognitive score predicted % WL 24 months post-surgery ($F = 4.16$, $p < .01$) and BMI 24 months post-surgery ($F=11.64$, $p< .001$).<br><br>Higher cognitive function scores 12 weeks post-surgery predicted greater %WL ($\beta= .64$, $p<.01$) and lower BMI ($\beta = -.60$, $p<.001$). | "Results of the present study indicate that better cognitive test performance shortly after surgery predicts higher % WL and lower BMI 24 months after bariatric surgery."<br><br>"Similarly, clinically significant cognitive impairment in the present study rages from 9%-23%, with the greatest deficits in executive function and memory. This finding underscores that a notable subset of bariatric surgery patients exhibit significant cognitive impairment on testing." | |

**ACOEM Evidence Table: Surgery - Multiple**

*Occurred in laboratory rather than real workplace setting

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Ewing et al. 2011 | Surgery--Multiple | Prospective comparative study | None reported | Patients who underwent laparoscopic gastric bypass and laparoscopic banding between September 2003 and September 2005 at Texas University Health Sciences Center. (N = 150) | 87.5% female.<br><br>12.6% were 40-49, 28.7% were 30-39, 38.5% were 40-49, 18.2% were 50-59, 2.1% were 60-69. | Obesity costs: Lost business output, employment, income, indirect business taxes. Compared to cost-benefit analysis of bariatric surgery<br><br>Days of work lost compared the year before and after laparoscopic gastric bypass and laparoscopic banding surgeries. Days of work lost also compared to the average, non-obese worker. | Patient surveys conducted on ongoing basis prior and year after surgery. | Year before surgery: median and mean of 33 (+/- 10) days of work lost. Year after surgery: median of 0 and mean of 1 (+/- 4) days of work lost.<br><br>Obesity costs estimations: Total output lost for South Plains region: $364 million. Labor income lost: $59 million. Jobs lost or not sustained: 1,977. Indirect business tax revenue lost: $13 million.<br><br>Net benefit of surgery at 3%, 5%, 10% discount rates (to convert to today's dollars) was $9.9 billion, $5 billion, and $1.3 billion, respectively. | "Using bariatric patient data in an input-output model of the regional economy, this paper estimates the economic burden of obesity on the South Plains region of Texas and the net benefit to the region of the performance of bariatric surgery."<br><br>"The current study expands this analysis, showing that bariatric surgery provides immediate benefits to the economy at large by decreasing lost work days." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Gunstad et al. 2011 | Surgery—Multiple | Prospective comparative study* | No COI declared | 150 participants were identified from the Longitudinal Assessment of Bariatric Surgery study, (109 bariatric surgery patients and 41 obese control subjects). | Mean age of participants was 44.66 years (SD 11.24 years). The majority of the cohort were female (83.48%). | The primary outcome of interest was change in cognitive test performance. | Cognitive functions were measured at baseline and 12 weeks postoperatively. | Many bariatric surgery patients exhibited impaired performance on cognitive testing at baseline (range 4.6 –23.9%). However, the surgery patients were no more likely to exhibit a decline on ≥2 cognitive tests at 12 weeks of follow-up than were the obese controls (12.84% versus 23.26%; chi- square = 2.51, *P* = .11).<br><br>Group comparisons using repeated measures multivariate analysis of variance showed that the surgery patients had improved memory performance at 12 weeks of follow-up (F= 5.88, *P* <.001). | "Consistent with previous studies, our results have indicated that cognitive deficits are common in candidates for bariatric surgery."<br><br>"The bariatric surgery patients showed improved memory function at 12 weeks postoperatively, although this improvement was largely unrelated to their medical conditions or change in weight status." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| King et al. 2016 | Surgery—Multiple | Prospective cohort study | Dr. Coucourlas reports receipt of research grants from Covidien, Ethicon, Nutrisystem, and PCORI; and consultant fees from Apollo Endosurgery. Dr. Dakin reports receipt of consultant fees from Covidien. Dr. Pories reports receipt of research grants from Johnson & Johnson Janssen Pharmaceuticals. Dr. Wolfe reports receipt of consultant fees from EnteroMedics. Dr. Flum reports having had an advisor role with Pacira Pharmaceuticals, providing expert testimony for Surgical Consulting LLC, and receiving travel expenses from PCORI. The other authors report no disclosures. | 2458 participants with severe obesity undergoing bariatric surgery were recruited, of which 2221 completed baseline and follow-up assessments. | Mean age of participants was 47 years (SD 9 years). The majority of the cohort were female (78.5%). | The primary outcomes of interest were clinically meaningful improvements in pain and function using scores from the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) and 400 meter walk time. | Outcomes were measured at baseline, 1 year, 2 years, and 3 years postoperatively. | At year 1, clinically meaningful improvement were shown in 57.6% (95%CI, 55.3% - 59.9%) of participants for bodily pain, 76.5% (95%CI, 74.6% - 78.5%) for physical function, and 59.5% (95%CI, 56.4% - 62.7%) for walk time.<br><br>In participants with severe knee or hip pain or disability at baseline, approximately three-fourths experienced joint-specific improvements in knee pain (77.1% [95% CI, 73.5% - 80.7%]) and in hip function (79.2% [95%CI, 75.3% - 83.1%]). | "Among a cohort of patients with severe obesity undergoing bariatric surgery, a large percentage experienced improvement compared with baseline in pain, physical function, and walk time over 3 years." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Kleinman et al. 2009 | Surgery—Multiple | prospective cohort study | Ethicon Endo Surgery, Inc. sponsored this research and assisted with the design of the analytical plan, analysis, interpretation of the data, and review of the manuscript. | 34,671 participants were enrolled from the Human Capital Management Services Research Reference Database. (33,050 participants in the control group were matched (20:1) to the 1651 participants diagnosed with morbid obesity (DMO) group. | Mean age of participants was 40.4 years. The majority were female (71.4%). | The primary outcome of interest was the change in the prevalence of each Agency for Health care Research and Quality's (AHRQ) specific diagnostic category in the period 2 to 4 months before bariatric surgery compared to the period 2 to 4 months after surgery. | Prevalence trends from 90 days before surgery to 2 years after surgery were examined. | Of the 26 AHRQ condition categories (out of 106 eligible categories) which had significant decreases in prevalence in the 2 to 4 months after bariatric surgery, the category with the largest decrease was nutrition/ endocrine/ metabolic disorders (-22.7%, $p < .00001$). The conditions with the next largest decreases were other mental conditions (-11.3%, $p < .00001$), other lower respiratory disorders (-9.2%, $< .00001$), medical examinations (-8.9%, $p < .00001$), and essential hypertension (-7.5%, $p < .00017$). | "The current study found significant prevalence decreases in 26 of 106 AHRQ specific diagnostic categories within 2 to 4 months after surgery."<br><br>"Using a comprehensive examination of all AHRQ diagnostic categories, the present study suggests that bariatric surgery is effective in decreasing the rates of many comorbidities." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Maciejewski et al. 2016 | Surgery -- Multiple | Prospective cohort study* | Dr. Maciejewski received grants from the Department of Veterans Affairs and the Agency for Healthcare Research and Quality, received contract from Centers for Medicare and Medicaid Services, and owned stock in Amgen because of spouse employment. Dr. Arterburn received grants from NIH, Patient Centered Outcomes Research Institute, Department of Veterans Affairs, and Informed Medical Decisions Foundation. Dr. Olsen received grants from NIH, Patient Centered Outcomes Research Institute, Department of Veterans Affairs. Drs. Smith and Yancy received grants from NIH and Department of Veterans Affairs. | Surgical cohort: (n= 1787) undergoing Roux-en-Y gastric bypass (RYGB), (n= 379) undergoing sleeve gastrectomy (SG), (n = 246) undergoing adjustable gastric banding (AGB), and (n = 26) undergoing other procedures.<br><br>Nonsurgical matches: (n = 5305) | Patients undergoing RYGB average age 52.1 years (+/- 8.5). Nonsurgical matches average age 52.2 years (+/-) 8.4.<br><br>RYGB: 1306 (73.1%) were male<br><br>Nonsurgical: 3911 (73.7%) male | Weight loss of veterans who underwent bariatric surgery compared to severely obese veterans who did not have bariatric surgery. | Post-surgery follow ups at years 1, 2, 3, 4, 5, 7, 10 after baseline. | 1 year: Patients undergoing RYGB lost 31.0% (95% CI, 30.4% - 31.6%) of their baseline weight. Nonsurgical matches lost 1.1% (95% CI, 0.7%-1.6%) of their baseline weight.<br><br>10 years: Patients undergoing RYGB lost 28.6% (95% CI, 19.5% - 37.6%) of their baseline weight Nonsurgical matches lost 7.3% (95% CI, 1.4%-13.3%) of their baseline weight.<br><br>The difference in weight loss between groups was maintained 3, 5, 7, 10. Year 3: 26.9% (95% CI, 24.7% - 29.1%)<br>Year 5: 24.0% (95% CI, 19.9% - 28.1%)<br>Year 7: 22.2% (95% CI, 16.0% - 28.5%)<br>Year 10: 21.3% (95% CI, 11.4% - 31.1%).<br><br>RYGB patients were most successful in losing weight at 4 years.<br>RYGB: lost 27.5% (95% CI, 23.8%- 31.2%)<br>AGB: lost 10.6% (95% CI, 0.6%- 20.6%)<br>SG: lost 17.8% (95% CI, 9.7%- 25.9% | "We found that patients undergoing RYGB were able to sustain significantly greater weight loss than nonsurgical matches up to 10 years after surgery."<br><br>"We found that RYGB induced significantly more weight loss at 4 years than SG or AGB." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Sockalingam et al. 2015 | Surgery—Multiple | Prospective cohort study | No COI declared. | 164 bariatric surgical candidates were identified and enrolled from a Toronto Western Hospital Bariatric Surgery Program. | Mean age of participants was 43.5 years (SD 9.7 years). The majority of the cohort were female (81.1%). | The primary outcomes of interest were changes in employment, depression, anxiety and health-related quality of life (HRQOL) measures 12 months after bariatric surgery.<br><br>Prevalence, *t*-test, and $\chi^2$ analyses were calculated using baseline and 12 month postoperative scores. | All assessments were measured at baseline and 12 months postoperative. | Employment outcomes as measured by the Lam Employment Absence and Productivity Scale (LEAPS) showed a significant reduction in work impairment post bariatric surgery (−3.77±6.30, p<0.0001) and an improvement in work productivity (−1.21±2.74, p<0.0001).<br><br>HRQOL improved in both physical (20.08±9.05, p<0.0001) and mental domains (3.76±13.31, p=0.001).<br><br>Scores on the Patient Health Questionnaire-9 (−6.07±5.80, p<0.0001) and the generalized anxiety disorder seven-item scale (−2.98± 5.00, p<0.0001) also significantly improved after surgery. | "In sum, bariatric surgery appears to have a statistically and clinically significant impact on employment-related functioning, such that it normalizes within 12 months following bariatric surgery."<br><br>"Improvements in quality of life, depressive symptoms and anxiety symptoms were also seen 12 months post-surgery, which parallel observed improvements in work impairment and productivity." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Spitznagel et al. 2013 | Surgery—Multiple | Prospective cohort study* | None reported | Bariatric surgery patients who are part of the Longitudinal Assessment of Bariatric Surgery, who had complete baseline and 12 month follow up data, and met inclusion and exclusion criteria. (N = 84).<br><br>Patients who met 12 week follow up data: (n= 71) | Mean age: 44.75 years (+/- 9.99)<br><br>79.8% female | Baseline cognitive function in attention/executive function and verbal memory compared to cognitive function scores 12 weeks and 12 months post bariatric surgery<br><br>If cognitive function predicts % excess weight loss (%EWL) and BMI change post-surgery | 12 weeks post bariatric surgery, and 12 months post-surgery (+/-14 days) | 12 weeks: Regression analysis showed that attention/executive function did not predict BMI change ($R_2$ = .88, $R_2\Delta$ = .01, $F\Delta(4,63)$ = 1.31, P = .28) or %EWL ($R_2$ = .39, $R_2\Delta$ = .04, $F\Delta(4,64)$ = .93, P = .45). Verbal memory did not predict BMI change ($R_2$ = .88, $R_2\Delta$ = .01, $F\Delta(4,63)$ = 1.33, P = .27) or %EWL ($R_2$ = .31, $R_2\Delta$ = .01, $F\Delta(4,64)$ = .28, P = .89)<br><br>12 months: Regression analysis indicated that BMI was predicted by attention/executive function ($R_2$ = .68, $R_2\Delta$ = .04, $F\Delta(4,76)$ = 2.54, P = .05) and verbal memory ($R_2$ = .83, $R_2\Delta$ = .05, $F\Delta(4,76)$ = 3.14, P = .02). %EWL was predicted by verbal memory tests ($R_2$ = .67, $R_2\Delta$ = .08, $F\Delta(4,77)$ = 2.66, P = .04) | "The results of the present study indicate that in patients undergoing bariatric procedures, better cognitive test performance on measures of memory and executive function before surgery predicts for greater weight loss (lower BMI, greater %EWL) 12 months after surgery."<br><br>"These findings should not be misinterpreted to indicate that cognitive impairment leads to negative outcomes, but rather suggest that cognitive screening could be an objective method to identify those who might benefit from additional support or intervention to facilitate more optimal outcomes." | |

## ACOEM Evidence Table: Lifestyle Modification – Behavioral Health

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Abdi et al 2015 | Lifestyle Modification - Behavioral Health | Randomized controlled trial | No COI declared | 435 employees older than 18 years and with a body mass index greater than 25kg/$m^2$. | Mean age of participants were 42.20 (SD 7.80 years), 42.49 (SD 7.28 years) and 41.08 (SD 7.15 years) for the control, web-assisted and telephone assisted groups respectively.<br><br>The majority of participants in both the intervention and control groups were female (71.3%). | The primary outcome of interest is weight control in study participants after a 6 month educational intervention | Follow-up was at 6 months from baseline when the intervention ended, and again at 9 months from baseline. | Participants in the lifestyle intervention saw a weight loss of 1.92 and 1.08 kg in the telephone-assisted and web- assisted intervention groups, respectively.<br><br>However, there was no significant change in the intervention groups participants' blood pressure and waist circumference (P>0.05).<br><br>In the section of physical activity, mean scores of self-efficacy in the telephone-assisted group increased from 22.73±4.47 to 26.3±3.97 at follow-up, while the outcome expectancies mean scores in the web-assisted group increased from 22.70±2.61 to 26.36±2.14 at follow-up.<br><br>The mean score of outcome expectancies increased in the nutrition section in both the telephone- and web-assisted groups. | "The lifestyle intervention resulted in a weight loss of 1.92 and 1.08 kg in the telephone-assisted and web-assisted intervention groups, respectively".<br><br>"In our study, the lifestyle program did not result in significant changes in the blood pressure and waist circumference of the participants". | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow- up: | Results: | Conclusion: | Comments: |
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| Almeida et al 2015 | Lifestyle Modification-Behavioral Health | Randomized controlled trial | No COI declared | 1790 adult employees with body mass index of ≥25kg/$m^2$ across 28 worksites were identified | Mean age of participants was 46.96 years (SD 3.26 years).<br><br>The majority of participants were female (74%). | The primary outcome of interest was weight loss at 6 months from baseline. Secondary health behaviors such as physical activity and dietary behaviors were secondary outcomes | Follow- up was at 6 months from baseline | Participants in the INCENT and LMW groups on average lost 2.27lbs (SE 0.37) and 1.30lbs (SE 0.63) respectively, and decreased BMI by 0.36kg/$m^2$ (SE 0.06) and 0.20kg/$m^2$ (SE 0.10) respectively.<br><br>The differences between INCENT and LMW groups in weight loss (-0.97lbs) and BMI reduction (-0.16kg/$m^2$) were not significant. However, there was a positive time effect in achieving 5% weight loss for both INCENT and LMW groups (14.56% vs 9.67%; $p<0.001$).<br><br>Considering behavioral changes, INCENT participants saw larger improvements in their fruit and vegetable (0.20 servings) and dietary fiber intake (0.5g). Also, INCENT group participants showed a statistically significant increase in daily water consumption (1.66floz, SE 0.49) while the LMW group showed no change over the 6 months. | "This study demonstrates that an individually- targeted Internet-based and a minimal intervention can both lead to improvements in physical activity and dietary behaviors within a worksite setting". | |

INCENT= internet-based intervention with monetary incentives; LMW= livin' my weigh intervention

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Anthony et al. 2015 | Lifestyle Modification—Behavioral Health | Prospective Comparative Study | No COI declared | 12,136 subjects completed the baseline survey and 9,786 of those subjects also completed the follow-up survey in China, India, and Mexico. | Mean age of participants was 37.6 years (SD 12.6 years). The majority of the cohort was female (55.4%). | The primary outcomes of interest were tobacco use, physical activity, and dietary intake before and after intervention of health awareness posters and policies in the workplace. | Follow up occurred after 18-24 months of intervention | The proportion eating five portions of fruit and vegetables daily increased (+6.9%, p<.001) compared with the control group.<br><br>There were no differences in changes in physical activity or prevalence of overweight.<br><br>When age, gender, and education were controlled for, obesity was improved in the intervention relative to the control group.<br><br>After intervention, tobacco use was reduced in men (P<0.001). | "Workplace interventions improved risk factors in China, India, and Mexico."<br><br>"Nurses are the largest health workforce and are ideally placed to encourage healthy living through better diet, exercise and tobacco cessation both in secondary/tertiary care but even more so in primary care as a population approach is recommended and more members of the community will access primary care services." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Barbar et al. 2016 | Lifestyle Modification—Behavioral Health | Prospective comparative study | Study funded by Slimming World. | 138 subjects from the workplace and the community completed the program. | Mean age of participants was 42.3 years (SD 10.6 years). The majority of the cohort was female (94%). | The primary outcomes of interest were weight loss and mental and emotional health scores before and after starting a weight management program. | Follow up occurred at 6 and 12 months after study period. | Completers reported a mean weight change of −5.7% (SD 3.8%).<br><br>Mental and emotional health scores increased ($p<0.05$) from baseline to 12 weeks. Self-worth scores increased ($p<0.05$) from baseline to 12 weeks, 6 and 12 months.<br><br>Healthy dietary habit scores increased and unhealthy dietary habit scores decreased ($p<0.05$) from baseline to 12 weeks, six and 12 months.<br><br>Healthy physical activity habit scores improved ($p<0.05$) from baseline to 12 weeks and six months. | "The data from the current investigation supports the use of a 12-week Slimming World weight management program as a credible option for employers wanting to support employees achieve weight loss and improve psycho-social health outcomes which could lead to improvements in general wellbeing, overall quality of life and work performance." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow- up: | Results: | Conclusion: | Comments: |
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| Barrington et al. 2015 | Lifestyle modification — behavioral health | Prospective cohort study | None reported | Employees at worksites that were part of the Promoting Activity and Changes in Eating study and that had a high proportion of sedentary employees. N=1,007 | Age: 18-34: 18%<br>35-44: 29.5%<br>45-54: 28.5%<br>55-65: 23.9%<br><br>43.2% male | Evaluated longitudinal relationships among worksite neighborhood SES (NSES), worksite neighborhood built environment attributes, and individual-level obesity behaviors among adults.<br><br>Compared property value, and presence of food stores, convenience stores, dine-in restaurants, and fast food restaurants, three- or four-way street intersections, residential units, parks, fitness destinations within .5- mile radius<br><br>Individual measures: Average fruit and vegetable servings, number of fast food meals, and soft drink intake, physical activity | 2 years | Multilevel logistic models:<br><br>Worksite NSES was significantly associated with more walking (OR 1.16, (95%CI: 1.03, 1.30), p = .01)<br><br>Residential density was significantly associated with eating five or more servings of fruits and vegetables per day (OR 2.5 (95% CI: 1.27, 4.95), p =.008). | "Worksite NSES was positively correlated with worksite neighborhood built environment attributes associated with walkability."<br><br>"Here, residential density was found to be independently associated with fruit and vegetable intake as well as to completely mediate the relationship between worksite NSES and fruit and vegetable intake."<br><br>"In conclusion, residential density around worksites may independently influence dietary and physical activity behaviors of employees as well as partially explain associations between worksite NSES and these behaviors. Consideration of worksite neighborhood contextual characteristics may be one refinement of workplace intervention strategies for obesity prevention." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Breaux-Shropshire et al. 2015 | Lifestyle Modification—Behavioral Health | Prospective Comparative Study | No mention of COI | 2432 worksite weigh-in visits between 2011-13. Actual sample size not explicitly stated. | Mean age and sex not reported. | The primary outcome of interest was weight loss before and after participating in Scale Back Alabama, a state supported weight loss program. | No follow up after 10 week study period. | Subjects' weight loss after intervention was statistically significant each year (all $p<0.0001$). | Scale Back Alabama (SBA) was effective in helping participants lose a significant amount of weight in 10 weeks and for 3 consecutive years.<br><br>"SBA as a worksite program can promote weight loss among employees." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Bruno et al 2011 | Lifestyle modification—behavioral health | Prospective Comparative Study | None reported | Overweight/obese employees of the University of Medicine and Dentistry of New Jersey who had complete data N=95<br><br>In-person intervention n=47<br><br>Internet-based n=48 | In-person : Mean age 46.64 years (range 24-63)<br><br>91.5% female<br><br>Internet-based: Mean age 48.06 years (range 23-65)<br><br>93.8% female | Compare the effects of an in- person workplace health intervention vs an internet based health intervention on employee health related quality of life outcomes (HRQOL). Relationships between measures and HRQOL<br><br>Measures: weight, body fat, blood pressure, BMI, waist circumference (WC), cardiovascular risk (Framingham score)<br><br>Primary outcomes: measures of HRQOL, differences in effect of intervention | 12 and 26 weeks | "The interaction effect showed there was no significant differential effect for intervention over time for the healthy-days symptoms. There were no significant between-group differences for these variables over the course of the study."<br><br>Within-subjects comparison indicated:<br><br>Depression days decreased significantly over time ($F = 5.6$, $P = 0.020$, $\eta^2 = 0.058$).<br><br>Sleeplessness days reported decreased significantly over time ($F = 5.22$, $P = 0.025$, $\eta^2 = 0.055$).<br><br>Vitality days increased significantly over time ($F = 10.07$, $P = 0.002$, $\eta^2 = 0.100$).<br><br>Weak, negative, significant correlation between changes in activity-limitations days and changes in WC ($r = -0.260$, $P = 0.014$); as activity limitation days increased, WC decreased.<br><br>Weak, positive, significant correlations between changes in self-rated health status and changes in weight ($r = 0.246$, $P = 0.016$) and BMI ($r = 0.231$, $P = 0.024$). | "The findings of this study demonstrate that participation in a 12- week WIP had, for the most part, a positive effect on HRQOL."<br><br>"The results indicated that a work place intervention program can have a positive impact on HRQOL, independent of intervention method."<br><br>"Relationships were demonstrated between weight-related clinical outcomes and self-rated health at both the immediate and intermediate time points." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Byrne et al. 2016 | Lifestyle Modification | Prospective cohort study | No COI declared. | In 2003, a total of 10,248 of 15,070 eligible (68%) Vanderbilt University employees participated in the Go for the Gold wellness program and were incentivized to complete subsequent annual HRAs. | The mean age of participants was 41.2 (SD=10.8) years and the majority were female (68.1%). | The aim of this study was to the relative impact of daily modifiable behaviors on overall long-term outcomes, particularly for a diverse working adult population.<br><br>End points, identified from the HRA between 2004 and 2012, were: time to development of new-onset diabetes; heart disease; cancer; obesity (BMI ≥30); hypertension; stroke; hypercholesterolemia; or death.<br><br>A Cox proportional-hazards model was used to assess the relative importance of each behavior on the time to each condition or outcome.35 Time to first onset of disease or last completed HRA was used in this survival analysis. | Relationships between ten self-reported healthy lifestyle behaviors and health outcomes during the subsequent 9 years in a cohort of were assessed.<br><br>Data were collected between 2003 and 2012 and analyzed between 2014 and 2016. | 11.8% of participants developed obesity between Years 2 and 10.<br><br>For obesity, there were multiple behavioral factors that influenced the total daily-modifiable impact, and the majority of the impact was from daily modifiable behaviors (fat intake, exercise days, nonsmoker, seat belt, sleep, breakfast, snacking, strength exercise, fruit and vegetable intake, bread intake)—as opposed to age.<br><br>Having a higher proportion of low versus high fat intake had a protective effect in a dose–response fashion on development of hypertension, obesity, diabetes, and hypercholesterolemia.<br><br>A dose–response effect was seen between dietary fat intake and hypertension, obesity, diabetes, heart disease, and hypercholesterolemia. After dietary fat intake, aerobic exercise was the next most significant behavior associated with development of outcomes.<br><br>Compared with sedentary participants, those who exercised 4 days per week were less likely to develop new-onset diabetes (HR=0.31, 95% CI=0.20, 0.48); heart disease (HR=0.46, 95% CI=0.27, 0.80); and hypercholesterolemia (HR=0.61, 95% CI=0.50, 0.74).<br><br>Low-fat diet and adequate sleep were more significant than commonly promoted healthy behaviors, such as eating a daily breakfast. | "In this longitudinal analysis of a working population, a low fat intake diet, aerobic exercise, nonsmoking, and adequate sleep were the daily modifiable behaviors that were most consistently associated with prevention of chronic diseases. This provides justification for programs to include these behaviors in promotional efforts and prevention investments, especially when faced with limited resources and large populations." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Byrne et al. 2011 | Lifestyle Modification—Behavioral Health | Prospective Cohort Study | No COI declared | 3745 employees participated in Vanderbilt's "Go for the Gold" program every year from 2003-2009.<br><br>Mean BMI was 27.6 $kg/m^2$ (SD: 7.3 $kg/m^2$) in year 1 | Mean age at the start was 43 years (SD: 9.4 years).<br><br>The majority of the cohort was female (71%). | The primary outcomes of interest were weight, BMI, and overall health risk over the seven-year period. | Follow up occurred annually from 2003-2009. | Decreases were seen for poor nutrition (-11.9%), sedentary (-15.5%), smoking (3.5%), and seat belt nonuse (7.7%).<br><br>Percent of high risk (≥5 high risk factors) had a net decrease of 2.5% over seven years.<br><br>Over the 7-year period, the percent of obese employees increased by 0.7 percentage points. | "An incentive-driven voluntary wellness program can drive participation and health risk improvement in an employee population over a long time horizon of 7 years."<br><br>"Risks associated with physical inactivity, poor nutrition, smoking, and seat belt usage were reduced demonstrably over the course of 7 years…while others such as obesity did not worsen over time." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Carpenter et al. 2014 | Lifestyle modification—behavioral health | Prospective cohort study | This work was supported by Alere Wellbeing. Drs. Carpenter, Lovejoy, and Zbikowski and Ms. Hapgood are all employees of Alere Wellbeing. | Employees at business who had a BMI greater than 25, were not pregnant, had not had/planned bariatric surgery, or an eating disorder were included. Those with complete data N=437 | Mean age: 43 years (+/- 5.1)<br><br>54% female | Assesses the effect an employee web- and telephone-based weight loss program had on weight loss, health behavior changes and program utilization.<br><br>Measures: self-reported weight and height, blood pressure, breakfast consumption, fruit and vegetable consumption, physical activity, stress, program utilization, demographics<br><br>Primary outcome: weight loss at 6 months, defined clinically significant as 5% of initial body weight | 6 and 12 months | 6 months: 34% of participants lost at least 5% of initial weight and 11% lost at least 10%<br><br>12 months: 39% had lost at least 5% of weight, and 16% had lost at least 10%.<br><br>Multivariate logistic regressions showed:<br><br>Number of coaching calls independently predicted >5% weight loss at 6 months OR 1.16 [95% CI: 1.03, 1.30] p = 0.017<br><br>Number of website logins independently predicted >5% weight loss at 6 months OR1.01 [95%CI: 1.00, 1.01] p<0.001<br><br>Each additional use of the weight tracking tool contributed to at least 5% weight loss, and was associated with an OR of 1.04 (95% CI (1.02, 1.07), p=0.002<br><br>Also associated with 5% weight loss:<br>Increase in fruit and vegetable consumption (OR = 1.45, 95% CI (1.08, 1.94), p = 0.013<br>Increase in physical activity (OR = 1.38, 95%CI (1.05, 1.80), p= 0.022)<br><br>Increase in daily breakfast (OR = 1.35, 95% CI (1, 1.81), p = 0.047)<br><br>A decrease in stress levels (OR =1.53, 95% CI, (1.07, 2.19), p = 0.021).<br>37% of participants completed 6 month follow up survey. | "The current study indicates that a low intensity weight loss program that offers a relatively low number of behavioral counseling calls combined with web resources can lead to clinically significant weight loss for about one third of participants who responded to the follow-up survey at 6 and 12 months. Participation in the program, both number of counseling calls and website logins, independently predicted clinically significant weight loss."<br>"Not surprisingly, the nutrition-related health behavior changes (increasing consumption of fruits and vegetables and daily breakfast) also predicted weight loss." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Carret al 2016 | Lifestyle Modification-Behavioral Health | Randomized controlled trial | Dr. Christoph Leonhard owns proprietary rights to the activeLife Trainer, which is manufactured by DuoDesk LLC, New Orleans, LA | 54 overweight or obese employees working in sedentary desk jobs (27 to a health protection only [HPO] group and 27 to an integrated health protection/health promotion [HP/HP] group) were identified. | Mean age of participants was 45.0 ±10.7 years and 45.2 ±10.9 years for the HPO and HP/HP groups respectively.<br><br>The majority of participants were female (70%). | The primary outcome of interest was percentage of occupational time spent sedentary and physically active from baseline to 16 weeks. Secondary outcomes included cardiometabolic health outcomes. | Follow-up was post-intervention at 16 weeks from baseline. | The HP/HP group significantly increased total occupational physical activity from baseline to post-intervention by 11.5%, consistent with the percentage of work time spent using the activity permissive workstations (50.2 minutes/day =10.2% of work day).<br><br>Significant associations were observed between activity permissive workstation adherence and improvements in weight, total fat mass, resting heart rate and body fat percentage. But, no significant intervention effects were observed for any cardiometabolic disease biomarkers<br><br>There were significant inverse relations between average minutes pedaled/day and changes in weight, total fat mass, body fat percentage, and resting heart rate among HP/HP completers. | "The primary findings of this study indicate that an integrated HP/HP intervention significantly increased occupational light-intensity physical activity when compared with a non- integrated HPO group". | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Chen et al. 2014 | Lifestyle Modification | Prospective cohort study | No COI declared. | 108 workers met the inclusion criteria and were assigned to either the intervention (n = 58) or the reference group (n = 50) according to their availability to participate in health-promoting activities. | The intervention and reference groups averaged 54.5 ± 3.8 and 55.7 ± 4.0 years old, respectively.<br><br>The intervention and reference groups were 60.3% and 24% female, respectively. | The aim of the present study was to determine the effectiveness of a pragmatic health promotion program to improve the metabolic disorders in older workers in Taiwan.<br><br>The intervention group received training in behavioral modifications to improve diet, time-use, stress management and physical activity. Motivational lectures, group activities, and team competitions were used to improve participants' knowledge and skills in managing own health.<br><br>Subjects in the reference group received no intervention. | This study was a 24-week quasi-experiment in three worksites in southern Taiwan in 2010.<br><br>Lifestyle, anthropometric and biochemical indicators were measured at baseline and end-point. | All participants had at least one metabolic disorder.<br><br>The intervention significantly lowered body weight (intervention vs. reference = −1.22 vs. –0.30kg, p = 0.026), BMI (–0.46 vs. –0.02kg/m2, p = 0.006), and waist circumference (–2.68 vs. +0.79cm, p <0.001), but had no effect on biochemical parameters.<br><br>The intervention significantly increased the frequency of physical activity (+0.73 times/week, p = 0.001), but had no effect on vegetable consumption, sleep duration or sedentary time.<br><br>There was a significant time-related increase in the frequency in physical activity (+0.77 ± 1.14) and significant decreases in weight –1.22 ± 2.05), BMI (–0.46 ± 0.85), WC (–2.68 ± 4.56), triglyceride (–25.45 ± 85.6) and high density lipoprotein cholesterol (–4.35 ± 7.70) in the intervention group; and significant time-related decrease in total cholesterol (–9.44 ± 24.0) and HDL-C concentrations (–3.34 ± 5.63) in the reference group. | "These findings suggest the workplace-based health promotion can be effective and useful in reducing the risk of metabolic disorders in older workers in Taiwan."<br><br>"We have shown that worksite-based health promotion can achieve considerable success in workers' health by improving WC, BMI, and BW. Given that older SME workers have high health risks and are probably one of the most neglected groups in Taiwan, our study can serve as a basic model for WHP in Taiwan. We also believe that greater success is possible, but it is highly dependent on government's actions and employers' incentive to invest in workers' health." | |

| Author Year (Score): | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Clark et al. 2016 | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | The 676 participants in this project were wellness center members who completed a survey in 2009 and also completed surveys in 2010, 2011, 2012, and 2013. | At the time of the first survey, the study participants were middle aged on average (46 years old, SD 10.6) and mostly female (70.7%). | The present study aims to examine the association between having a high stress level and health behaviors in employees of an academic medical center.<br><br>Each year, on an annual basis, members of a wellness center were asked to complete a series of 13 questions about their current psychosocial and health status. The worksite wellness center facility provides wellness programs, education, and research for employees, volunteers, and retirees of an academic medical center. | Beginning January 1, 2009, through December 31, 2013, an annual survey was completed.<br><br>Participant demographics and the prevalence of high stress levels among medical center employees, including patterns of change were summarized at baseline and four-year follow- up with means and standard deviations (age, BMI) or frequencies and percentages (gender, self-reported health conditions). | Most participants self-reported having an overweight BMI (average 27, SD 5.6) and the average self-reported BMI and percentage of people self-reporting the various health conditions changed very little between baseline) and follow-up.<br><br>Each year, about one-sixth of members had a high stress level, high stress individuals visited the wellness center less often, and most years there was a significant relationship ($P<0.05$) between stress level and poor physical health behaviors (physical activity level and confidence, strength, climbing stairs), low mental health (quality of life, support, spiritual well-being and fatigue), poor nutritional habits (habits and confidence), and lower perceived overall health.<br><br>After adjusting for age, gender, BMI, and self-reported health conditions via linear regression (continuous 0 to 10 stress as the outcome), the associations between the domain scores and stress level remained statistically significant. | "High stress is associated with negative health behavior, and future studies, therefore, should explore strategies to effectively engage high stress employees into comprehensive wellness programs." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Clark et al. 2016b | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | One-hundred employee wellness center members were included in the analysis. | Members had an average age of 42 years and 90% were female. | The present study aims to assess potential changes in health behaviors following wellness coaching.<br><br>Topics discussed at the session include discussion of what the participant perceived was successful during the past week as well as his or her overall experience in reaching his or her goals. | Participants completed study questionnaires when they started wellness coaching (baseline), after 12 weeks of wellness coaching, and at a 3-month follow-up.<br><br>The initial session is followed by 11 weekly in person follow-up sessions to discuss and complete self-identified wellness goals. These sessions are scheduled for 30 to 60 minutes. | The average (SD) BMI at baseline was 32.3 (7.9) kg/m2, with 55% being obese and 23% being overweight.<br><br>From baseline to week 12, these 100 wellness coaching participants improved their self-reported health behaviors (11 domains, 0- to 10-point scale) from an average of 6.4 to 7.7 ($p < .001$), eating self-efficacy from an average of 112 to 142 (on a 0- to 180-point scale; $p < .001$), and goal-setting skills from an average of 49 to 55 (on a 16- to 80-point scale; $p < .001$).<br><br>On average, the Health Behaviors score increased by 13.4 points from baseline to 12-week end of treatment ($p < .0001$). In this same model, higher BMI was associated with a slightly lower health behavior score on average (1-kg/m2 increase in BMI associated with 0.39 decrease in score, $p = .03$).<br><br>In terms of weight, BMI was reduced from 32.1 (7.8) kg/m2 to 31.8 (7.8) kg/m2 ($p < .0001$) during the 12 weeks of wellness coaching and continued to decrease at the 3-month follow-up, BMI = 31.5 (8.0) kg/m2 ($p < .005$). | "The results from this single-cohort prospective study suggest that wellness coaching may improve a wide range of health behaviors, such as physical activity level, nutritional habits, support, stress management, healthy sleep, spirituality, and quality of life. Additionally, the results suggest that participants improved their self-confidence for eating, nutritional habits, and physical activity level; and given that self-efficacy is predictive of long-term success, this is an important finding. Finally, participants potentially learned goal-setting skills, which can also help them maintain these positive lifestyle changes over time"<br><br>"While the change in absolute weight was small, participants did reduce their BMI during wellness coaching and continued to reduce their BMI during the 3-month follow-up period." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Clark et al. 2013 | Lifestyle modification — behavioral health | Prospective cohort study | None reported | Employees who are members of a worksite wellness center<br><br>N=1151 | Mean age: 39.5 years (+/- 11.5)<br><br>69.7% female | Relationship between quality of life change and use of a worksite wellness center.<br><br>Assessed differences in physical, mental, nutritional, and overall domains of quality of life (QOL) from baseline to posttest | 12 months (+/- 2 months) | Physical QOL: Individuals who used the wellness an above average amount experienced a significant increase in their QOL scores (+9.8, p = .003). Those who had the highest use experienced a significant increase in their QOL scores (+21.0, p <.0001). No significance for the least use<br><br>Mental QOL: decreased for all, but more for those who used the center the least (Lowest use quartile: -16.9 p < .0001 and below average use: -11.9 p < .0001)<br><br>Health QOL: significantly increased for those who used the center the most (highest use quartile: +7.5 p = .006, above average use quartile: +5.5 p = .03). No significance for less use.<br><br>BMI: those who used the wellness center the most, significantly decreased their BMI (highest quartile: mean -0.8 (95%CI: -1.0, - 0.5), p < .0001 and above average quartile: mean -0.2 (95%CI: -0.4, 0.0) p = 0.04). | "In this project, using a large sample of employees at a worksite wellness center, wellness center use during a 12- month period was significantly associated with improvements in physical QOL and BMI"<br><br>"In contrast, wellness center members who were low users experienced a decline in both their physical and mental QOL." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Deitz et al. 2014 | Lifestyle modification — behavioral health | Randomized controlled trial | None reported | Employees of three hospitals, who had one known risk factor for cardiovascular disease and was not pregnant.<br><br>N=210 recruited into study and with pretest data.<br><br>N=188 with pre and posttest data | Age range: 21-72<br><br>86% female | Assessing whether a web-based cardiovascular health program was associated with changes in self- reported behaviors, attitudes and biometric indicators.<br><br>Compared between intervention and control: nutritional patters, attitudes towards healthy diet, diet behavioral intentions, diet behavioral change self-efficacy, physical activity habits, exercise self-efficacy, cardiac knowledge, coping with stress, symptoms of distress, state-trait personality, tobacco abstinence self-efficacy, blood pressure, heart rate, BMI | At the end of the 6 week program | Knowledge: no significant differences found (F=1.85, p = .175)<br><br>Diet: significant differences found in dietary attitudes (p = .003 and F=8.83), dietary intentions (p = .031 and F=4.72), and dietary self-efficacy (p = .015 and F=5.97).<br><br>Exercise: significant increase in exercise self-efficacy (F=9.51, p = .002) and overall level of exercise (F= 5.94, p = .016). Greatest difference between levels (light, moderate, strenuous) was for strenuous (F=8.68, p = .004)<br><br>Coping with stress was significantly greater for intervention group (F=8.85, p = .003)<br><br>Biometric: no significant changes | "Overall, study findings indicate that the Heart Healthy web-based program can be an effective means of changing dietary attitudes and intentions, promoting greater self- efficacy in the areas of dietary and exercise habits, increasing physical activity, and promoting positive coping skills for managing stress and depression in a population of employees at risk for cardiovascular disease."<br><br>"Results of the study hold promise for the use of Heart Healthy (or similar) web-based programs as an important workplace- based intervention for promoting the attitudes and skills necessary for the adoption of positive cardiac behaviors." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion | Comments: |
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| DeJoy et al 2011 | Lifestyle Modification-Behavioral Health | Prospective comparative study | No COI declared | A cohort of 1859 employees from 9 different work sites with a mean Body mass index of 28.2 (SD 5.4) and 28.8 (SD 5.4) in the two intervention groups | Mean age in environment only intervention group and environmental + YW8 group are 44.7 years and 44.0 years respectively (p=0.107).<br><br>The majority of the cohort were male: 75.3% (SD 7.8) and 71.5% (SD 8.8) in the environment only and environment+ YW8 groups respectively. | The primary outcome of interest was a change in weight- related outcomes at the end of a 2 year environmental intervention program of two levels. | Follow up was at mid-way through and again at the end of the 2 year environmental intervention | The YW8 and non-YW8 groups did not differ in terms of BMI, % overweight, % obese, or % body weight lost. About 13.5% of employees in both groups lost 5% or more of their body weight during the 2-year intervention period.<br><br>However, employees who participated in YW8 had somewhat better results in terms of physical activity, blood glucose, and cholesterol risk, though none of these findings reached statistical significance (Ps < 0.054-- 0.073).<br><br>At the moderate environmental sites, no differences in behavioral or biometric outcomes between those who did or did not participate in YW8 intervention were seen.<br>Participants in YW8 at the intense sites however, were 1.87 times as likely as nonparticipants to reduce their risk of physical inactivity (P=0.0082). Also, participants in YW8 at the intense sites saw a smaller increase in blood glucose over the 2-year intervention period (P = 0.036), although these effects did not carryover to any of the weight-related outcome. | "The overall results from this trial showed small but significant weight-related outcomes for participants exposed to the environmental interventions.<br>More specifically, participants in both treatment conditions maintained their weight and BMI whereas control participants gained 1.3lbs and increased their BMI values by 0.2 during the 2-year period."<br><br>"The addition of a low-intensity individually focused weight loss intervention does not produce an additive effect and neither intervention is likely to result in substantial weight reductions." | |

YW8= why weight challenge

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| DeJoy et al. 2013 | Lifestyle modification—behavioral health | Prospective cohort study | None reported | Employees of the Union Pacific Railroad<br><br>Complete data: N=59 | Age: 20-29: 19%<br>30-39: 9%<br>40-49: 33%<br>50-59: 31%<br>60-69: 5%<br><br>85% male | Pilot study to field test the workplace transition of the Diabetes Prevention Program (DPP)<br><br>Primary outcome: BMI<br><br>Other measures: stage of behavioral change, self-efficacy, diet, physical activity | 6 and 12 months | 6 months: Mean change in BMI was −0.33 (+/- 1.15) $t(58) = 2.21$, $p < .031$<br>Mean change in body weight was −0.94 kg (+/- 3.68), $t(41) = 1.95$, $p < .055$<br><br>12 months: Mean change in BMI was −0.45 (+/- 1.36), $t(41) = 2.16$, $p < .037$.<br>Mean change in body weight: −1.43 kg (+/- 4.38) $t(41) = 2.12$, $p < .040$<br><br>30% of participants indicated that they eating healthy and exercising regularly at baseline. These percentages increased to 67.2% for healthy eating: $\chi2(1, 116) = 12.48$, $p < .001$; and 51.7% for exercise: $\chi2(1, 117) = 3.78$, $p < .05$<br><br>For self-efficacy, participant levels of confidence in being able to maintain healthy eating and regular exercise did not change appreciably across time. | "The workplace adaptation of DPP developed and tested in this research met the criteria of being relatively simple and potentially applicable to a wide range of work settings and employee populations. The weight loss results achieved in the pilot test, although statistically significant, were relatively small."<br><br>"It does seem that the effectiveness of this intervention would be improved by making it more interactive and by providing for greater oversight and accountability.<br>Such steps appear necessary to better sustain participant engagement and to improve compliance with the self- monitoring features of the DPP." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Driver 2013 | Lifestyle Modification-Behavioral Health | Randomized controlled trial | No mention of COI. | 100 employees or dependents, with a BMI between 30 and 39.9kg/m2 were identified | Participants were aged 18 to 63 years | The primary outcome of interest was weight loss at the end of the one year intervention | Follow- up was at one year from baseline | For the combined incentive groups, mean weight loss was 9.08lbs and 2.34lbs for the combined non-incentive groups.<br><br>The estimated effect of the incentives using two-way ANOVA was 6.5lbs (SE 1.92; $p<0.001$). While the estimated effect of Lose it! (education + structured behavior modification plan) was 2.36lbs (SE 1.90, $p=0.22$) although not statistically significant. | "Participants in the financial incentive groups maintained greater participation rates and lost more weight than controls." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Estabrook et al. 2012 | Lifestyle Modification | Prospective Cohort Study | No COI declared | A representative sample of 806 employees was enrolled in the study. | Unknown | Assessment of Step Ahead (a randomized controlled trial testing ecologically based weight gain prevention interventions in the hospital workplace) was done via the RE-AIM framework, examining the intervention's Reach, Effectiveness, Adoption, Implementation, and Maintenance. | A 12- and 24-month follow-up was done. | "Subgroup analysis showed a trend toward greater effectiveness at the small and the medium hospitals, and less effectiveness a the large institution."<br><br>"Individual behavior change was observed for fruit and vegetable consumption at the 12- month assessment, but the change was not maintained at 24 months."<br><br>"Institutional size affected implementation, as well as program success." | "Although the intervention was not effective in changing BMI on a population level, a dose-response was observed, in which persons who used more of the intervention components and materials were more likely to prevent weight gain. Implementation of healthy eating interventions in the hospital setting was especially challenging because close collaboration was necessary with hospital employees and contractors, and their mission and priorities often were at odds with the intervention goals." | This study is an examination of a separate study. Therefore the age and sex of the sample size were irrelevant for evaluating the implementation of a hospital work-site obesity prevention intervention applying the RE-AIM framework. Age and sex of sample were not mentioned throughout the course of the study. |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Ferraro et al. 2013 | Lifestyle modification—behavioral health | Prospective cohort study | None reported | Overweight/obese employees at a correctional facility N=24<br><br>Comparison group: N=24 employees | Mean age 42.78 years (+/- 1.53)<br><br>75% male | Evaluate the effectiveness of an employee participatory 12-week weight loss program<br><br>Compare weight loss between participants and comparison group<br><br>Measures: responses to the Nutritional and Physical Activity Questionnaire (NPAQ) and weight, BMI, waist circumference | 12 and 20 weeks | 12 weeks participants body weight change: - 10.01 lb [+/- 2.16] (P < 0.05)<br><br>BMI change: - kg/$m^2$ [+/- 0.31] (P<0.05)<br><br>12 weeks comparison body weight change: + 4.72 lb [+/-11.16], p>.05<br><br>BMI change: + 0.43 kg/m2 [+/-1.3140], p>.05<br><br>Week 20 participants: Male waist circumference declined from mean 43.79 +/- 1.07 inches at baseline to 41.14 +/- 1.04 inches (P < 0.05).<br><br>Week 20 comparison: male waist circumference increased from mean of 41.48 inches [+/-0.91] to 44.28 inches [+/- 0.94] (P < 0.05).<br><br>Baseline participants: Class I obesity: 58% class II obesity: 12.5% class III (extreme obesity): 8.3%<br>Completion:<br>Class I obesity: 45.8% class II obesity: 16.7%<br>class III (extreme obesity): 0<br><br>Baseline comparison: Class I obesity: 50% class II obesity: 16.7% class III (extreme obesity): 4.2%<br>Completion:<br>Class I obesity: 37.5% class II obesity: 25%<br>class III (extreme obesity): 8.3%<br><br>Regression analysis showed at week 20: 73% of the variation in weight change (F = 6.477, P < 0.01) and 68% of the variation in waist circumference (F statistic = 7.055, P <0.01), could be explained by Nutrition Knowledge and Exercise Confidence scores after controlling for gender and age. | "In this study, participants had significant weight loss and reductions in BMI and waist circumference (among men) with 29% of participants moving from a higher BMI category to a lower category."<br><br>"In contrast, the comparison group showed an increase in body weight and BMI and a significant increase in waist circumference (among men), and there was greater movement from lower to higher BMI categories."<br><br>"Participation by correctional employees in the design process of a weight-loss program seemed to be crucial to the success of this intervention." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Fletcher et al. 2014 | Impact of Workplace Obesity | Prospective Cohort Study | No COI declared | 5,115 subjects participated via data used from the Coronary Artery Risk Development in Young Adults Study, which began in 1986. | Average age: 33.43 years<br><br>Female: 54%<br><br>Male: 46% | Used within-individual differences in exposure to exposure to workplace smoking bans to estimate the impact of smoking cessation on weight gain. | Follow-up occurred one year after, 5 years after, 7 years after, 10 years after and 20 years after baseline (1986). | "The first stage results suggest that workplace smoking restrictions reduce smoking participation by 2.6% points and that workplace prohibitions reduce smoking participation by 5.4% points."<br><br>"The main results suggest large effects of smoking cessation on weight outcomes for those individuals who quit due to workplace restrictions. Smoking is shown to reduce BMI by 4 units over the 2-3 years between waves for affected workers. Weight is reduced by 30 pounds, though the estimates for overweight and obesity are not statistically significant." | "Findings suggest that individuals affected by the smoking bans gained more weight in the short-term than suggested by OLS estimates." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Flint et al. 2016 | Lifestyle Modification—Behavioral Health | Large, population-based study | No COI declared | 156,555 subjects with BMI data were identified from 2006-2010 UK Biobank.<br><br>Mean BMI was subjects was 26.9 $kg/m^2$ (SD: 4.4 $kg/m^2$). | Mean age of subjects was 52.4 years (SD: 6.9 years).<br><br>Majority of the cohort was female (53%). | The primary outcomes of interest were BMI and body fat percentage relative to mode of commuting to work. | No follow up. | The most prevalent method of commuting was car travel (64% of men; 61% of women).<br><br>Compared with their car-only counterparts, mixed public and active transport commuters had lower BMI and body fat percentages, as did cycling or cycling and walking commuters (all $p<0.0001$). | "This study shows robust, independent associations between active commuting and healthier bodyweight and composition. These findings support the case for interventions to promote active travel as a population-level policy response for prevention of obesity in mid-life." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Geaney et al. 2016 | Lifestyle modification—behavioral health | Randomized Controlled Trial | None reported | Full time employees at four worksites that had >250 employees. Employees that purchased at least one meal from the worksite per day were included. N=517<br><br>Control: n=67<br>Education: n=107<br>Environment: n=71<br>Combined: n=272 | Total:<br><br>18-29: 8.5%<br><br>30-44: 64%<br><br>45-65: 27.5% | The Food Choice at Work (FCW) study assessed the effectiveness of a workplace environmental dietary modification intervention and a nutrition education intervention both alone and in combination versus a control workplace.<br><br>Primary outcomes: changes in employees' dietary intake of salt and BMI<br><br>Secondary outcomes: changes in employees' dietary intakes of total fat, saturated fat, total sugars and fiber, nutrition knowledge, weight, waist circumference and resting blood pressure | 7-9 months | Significant reductions in salt<br>−1.4 g/day (SD 4.4), p = 0.000)<br>and BMI −0.3 kg/m2 (SD 0.8), p<br>= 0.001) in the combined intervention<br><br>Increased dietary intakes of salt and BMI levels reported in the control: (salt: +0.7 g/day (SD 4.4), p = 0.208; BMI: +0.2 kg/m2<br>(SD 0.9), p = 0.097)<br><br>Combined: Significant reductions in dietary intakes of total fat (−14.2 g/day<br>(SD 41.8), p = 0.000), saturated fat (−7.0 g/day (SD 17.6), p = 0.000) and total sugars (−11.1<br>g/day (SD 63.0), p = 0.004)<br><br>ANCOVA indicated that at follow-up:<br><br>Significant positive changes in dietary intakes of salt between combined and control: (−1.3 g/day (95% CI −2.3, −0.3), p = 0.010). BMI (−1.2 kg/m2 (95% CI −2.4, −0.1), p=0.047)<br><br>Significant positive changes in dietary intakes saturated fat (95% CI: (−3.0, −0.5), p = 0.006) and nutrition knowledge (95% CI: (0.3, 8.2), p = 0.034) in combined versus the control workplace. | "The combined intervention was associated with reduced dietary intakes of salt and a lower BMI in addition to reduced intakes of saturated fat, a lower energy proportion from saturated fat and higher nutrition knowledge in the fully adjusted multivariate analysis when compared to the control workplace at 7–9 months follow-up."<br><br>"The FCW combined dietary intervention is scalable and wide scale implementation should be considered in local, national and international workplaces." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Giese et al. 2014 | Lifestyle Modification —Behavioral Health | Prospective cohort study | No COI declared | 35 overweight and obese employees at a New Mexico manufacturing plant. | Mean age not reported.<br><br>The majority of the cohort was female (89%). | The primary outcomes of interest were weight loss and BMI before and after intervention of the Diabetes Prevention Program Lifestyle Core Curriculum. | Follow up occurred after 16 weeks of the program. | Subjects achieved reductions in body weight and BMI (both $p<0.001$).<br><br>Weight change ranged from +3.1% to -9.7% (median= -2.5%; IQR: -0.2% to -3.6%).<br><br>Session attendance (mean: 9, SD: 3.01) correlated with body weight loss (P=0.002). | "Translation of the Diabetes Prevention Program Lifestyle Core Curriculum is an effective worksite obesity intervention."<br><br>"Authentic relationships built between on-site health services providers and participants may be more effective in promoting weight related lifestyle change than third-party telephonic counseling."<br><br>"Factors unique to the worksite, such as competing work demands and overtime, can affect individual attendance." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Gifford 2013 | Lifestyle modification—behavioral health | Prospective Cohort Study | None reported | Employed adults in families that were part of the multiyear Panel Study of Income Dynamics<br><br>N=2917 | 61.2% female<br><br>Born 1921-1942: 5.9%<br><br>Born 1943-1960: 36.4%<br><br>Born 1961-1984: 57.7% | Reporting on relationship between health risks and illness absences from work, and the changes between surveys.<br><br>Measures of health risk: body mass, smoking, and physical activity, and demographics. | Two years | Used regression models to determine:<br><br>Those who responded better health at two years than at baseline had 1.05 fewer absences (90% CI = −1.60 to −0.48 days; $p < 0.01$, one-tailed)<br><br>BMI: observed change in BMI increases with observed change in illness absences. A 10% increase in BMI would increase estimated illness absences by .44 days (90% CI = 0.02 to 0.9 days; $p = 0.043$, one- tailed).<br><br>Respondents who reported doing more light exercise at 2 years than at baseline had 0.33 fewer illness absences (90% CI=−0.7 to 0.02 days; $p = 0.06$, one-tailed) | "Taken together, the results lend support to the proposition that modifiable health risks—exercise and body weight in particular—contribute to one's capacity to attend work consistently."<br><br>"Although the results of this study certainly do not prove the "business case" for workplace promotion of healthier behaviors—doing so would require knowledge of wages, program costs, reductions in employers' share of health care expenses, improved job performance, etc—they do support the underlying proposition that employers could experience better attendance and lower labor input costs with a healthier workforce." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Graham et al 2013 | Lifestyle Modification - Behavioral Health | Randomized controlled trial | No COI declared | 1356 employees across 6 worksites | Mean age of participants was 43.5 years (SD 10.4).<br><br>The majority of participants were female (63.8%). | The primary outcome of interest is long- term change in physical activity (stair use) after a 2 year environmental intervention. | Follow-up was at the end of the 2 year intervention. | There was an objective stair use decrease of 124.06 stair counts per day at control sites in contrast to an increase in stair use by 346.77 stair counts per day in intervention sites. While for self-reported stair use, the control group saw an increase of 0.73 stair-use trips per week and the intervention group showed an increase of 2.28 trips per week.<br><br>Furthermore, for participants reporting low daily stair use at baseline, a Generalized estimated equation model of change in stair use over time indicated that the intervention significantly increased stair use (b=1.51, SE=0.46). But for those reporting daily stair use, intervention status was not a significant predictor of change in self- reported stair use over time (b=0.71, SE=0.48).<br><br>Comparing participants with low stair use at baseline, control group change in self-reported stair use was an increase of 1.55 stair-use trips per week while the intervention group change was twice as large at 3.06 trips per week. | "Simple and inexpensive environmental modifications made in and around worksite stairwells were associated with long- term increases in objectively-measured and self-reported stair use".<br><br>"The intervention was most effective at increasing stair use among those participants who engaged in the lowest levels of stair use at baseline". | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow- up: | Results: | Conclusion: | Comments: |
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| Guo et al 2015 | Lifestyle Modification- Behavioral Health | Prospective Cohort Study | All authors are employees of Healthways, Inc. | 2265 employees aged 18-65 years enrolled in Consumer driven health plan for at least 2 years between the years 2009 to 2013 were identified. | Mean age of participants was 44 years.<br><br>The majority of participants were female (70%). | The primary outcomes of interest were a decrease in the prevalence of obesity and increase in wellbeing of employees during the 5 year study period. | Follow- up occurred annually for the 5 year duration of the study | During the study period, average individual wellbeing score trended upward by 9.8 points or 13.5% reaching a stable period in the last 3 years.<br><br>With the exception of 1 year, the prevalence of obesity declined every year of the study to the lowest point in 2013 at approximately 30%. The prevalence declined by 4.8% on average each year between 2009 and 2013.<br><br>An average cost reduction of $5.01 per member per month on the basis of the average annual improvement in well- being of 3.3% and baseline values [3.3%x72.4x (-0.46%) x $455.9 - $5.01] was found.<br><br>For each one-point increase in well-being, the odds of being obese significantly declined (P<0.001). | "This study reports positive findings for population well-being amidst a shift to a Consumer driven health plan. In addition to cost savings and well-being improvement, clinical (obesity), behavioral (smoking), and productivity (presenteeism and absence) outcomes improved". | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Gussenhoven 2011 | Lifestyle Modification -Behavioral Health | Randomized Controlled Trial | None declared | 1386 | Mean 43.3yr SD 8.6yr 67% male | assigned 462 to phone intervention, 464 to Internet intervention, 460 to control | 12 months | No significant differences in weight loss or cost between the groups<br><br>The incremental cost effectiveness ratio of the Internet group compared with the control group was 59 euros per kilogram of weight loss based on gross lost productivity day costs. The probability of cost effectiveness of the Internet intervention was 45% at a willingness-to-pay of 0 euros per extra kilogram weight loss and 75% at a willingness-to-pay of 1500 euros per extra kilogram body weight loss. | "The intervention was not cost effective in comparison with usual care from the company perspective. Due to the large amount of missing data, it is not possible to draw firm conclusions." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Hansen et al. 2016 | Impact of Workplace on Obesity | Prospective cohort study | No COI declared. | The Danish Nurse Cohort included 28,731 participating female nurses recruited in 1993 (19,898) or 1999 (8,833). | The mean age of participants was 51.4 years and entire sample was female (100%).<br><br>Mean age for day shift workers at recruitment was 51.3 years, 53.0 years for evening shift workers, 54.3 years for night shift works and 50.2 years for rotating shift workers. | The aim of this study was to assess the association between shift work and incidence of diabetes in Danish nurses.<br><br>Nurses reported whether they worked night, evening, rotating or day shifts. The study analysed the association between working time and diabetes incidence using a Cox proportional hazards model adjusted for diabetes risk factors, separately with and without adjustment for body mass index (BMI (underweight, normal, overweight, obese) which might be an intermediate variable. | Self-reported baseline information on diabetes prevalence, lifestyle and working time were collected, and followed them in the Danish Diabetes Register for incidence of diabetes until 2013 (mean follow-up of 15.1 years, or 308 078 person-years). | At follow-up the diabetes incidence rate was 2.7 per 1000 person-years.<br><br>Nurses who developed diabetes during the follow-up worked more often night shifts, had higher BMI, smoked more tobacco, were less physically active, consumed more fatty meat, and had more often hypertension than nurses without diabetes.<br><br>There was statistically significantly increased risk for diabetes in nurses working night shift when compared with those working day shifts, both in age (HR=1.84; 95% CI 1.46 to 2.31) and fully adjusted models (1.73; 1.37 to 2.19). The association attenuated, but remained statistically significant after adjustment for BMI (1.58; 1.25 to 1.99).<br><br>There was statistically significantly increased risk of diabetes in nurses working evening shifts, in fully adjusted model without (1.21; 0.99 to 1.52) and with (1.29; 1.04 to 1.59) adjustment for BMI. Nurses working rotating shift did not have an increased risk of diabetes when compared with nurses working day shift, with HR of 1.06 (0.75 to 1.07) and 1.08 (0.91 to 1.28), respectively, in fully adjusted models without and with BMI. | "Danish nurses working night and evening shifts have increased risk for diabetes, with the highest risk associated with current night shift work." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Huang et al 2013 | Lifestyle Modification-Behavioral Health | Prospective Cohort study | No COI declared | A cohort of 283 employees with one or more cardiovascular risk factors were identified from the worksite health center | Mean age was 48.3 years (SD 5.1).<br><br>All the participants were male (100%). | The primary outcome of interest was a change in cardiovascular health risk behaviors and physical indicators including healthy diets, Physical activity, blood pressure and BMI, 6 months after intervention. | Follow-up was at 6months after program implementation | A change in diastolic blood pressure (DBP) was seen in the greatest percentage of participants .Those with DBP≥100mmHg dropped from 264 to 101. Also participants with a systolic blood pressure <140mmHg increased by 16.3%.<br><br>7%, 12.1% and 8.1% of participants showed decreased BMI, body fat and waist-hip ratios respectively. Additionally, the mean healthy diet score increased from 42.8 to 44.7 after the intervention.<br><br>In the health behaviors category based on participants' reports, 34% improved in regular exercise 36% in healthy diet and 40% in antihypertensive or antihyperlipidemia medication adherence | "This study indicated positive changes in cardiovascular health risk behaviors and physical indicators among participants in the Workplace Multiple Cardiovascular Disease Risk Reduction Program". | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Hwang et al 2011 | Lifestyle Modification —Behavioral Health | Prospective Cohort | None declared | 95 | Mean 33.6 (SD 7.4)<br>88% men, 12% women | Pre versus post incentive- based obesity management program | 12 weeks | BMI decreased from 28.8 to 27.8 $kg/m^2$ ($p<0.001$)<br>Body fat weight decreased from 25.4 to 23.3 kg ($p<0.001$)<br>Systolic/diastolic blood pressure decreased from 130.5/86.4 to 125.1/81/7 mmHg ($p<0.01$)<br>Percentage exercising more than 3 times per week increased from 27.3% to 52.3% ($p<0.001$). | "This incentive-based obesity management program was effective at improving not only BMI but also health status" | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Jaime et al. 2012 | Lifestyle modification — behavioral health | Prospective Comparative Study | None reported. | Employees at four companies in Sao Paulo, Brazil. Three composed the intervention group and one was control. Employees at each of the worksites were invited to join.<br><br>Complete cases for intervention: (N=188)<br><br>Complete cases for control: (N=93) | Intervention : 59% female.<br><br>Age: 18-29 years: 33.5%; 30-39: 32.4%; Over 40: 34.1%<br><br>Control: 53.8% female<br><br>Age: 18-29: 48.4%; 30- 39: 36.5%; Over 40: 15.1% | Whether a computer interactive software would aid in the self-monitoring of weight and if email messages would incentivize adopting a healthy lifestyle. | Monthly check-ins by the assessment software for 12 months.<br><br>In-person data collections occurred 6 months after baseline. | There was a significant change in weight for those who were more active on the program (i.e. 2nd and 3rd tertile: CI: -1.36, -.50 p < .001 and CI: - 1.38, -.28, P < .001, respectively).<br><br>Linear regression model revealed an adjusted mean change in BMI that was significantly more for participants than control (Regression coeff= -.28 kg/m$^2$ CI: -.53, -.03). There was a significant change in weight (regression coeff= -.77 kg, CI:-1.47, -.08) and waist circumference (regression coeff= -1.05 cm, CI: -1.99, -.14). | "The proposed intervention was effective, resulting in significant reductions in weight, BMI and waist circumference in the IG compared with the CG."<br><br>"In addition, the analysis of sustainability revealed that the majority of participants either maintained or lost weight throughout 12 months and that those who showed greater adherence obtained better results at the end of the programme." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Jamal et al. 2016 | Lifestyle modification--Behavioral health | Randomized Controlled Trial | None reported | Public university employees in Malaysia with BMI of 27.5kg/$m^2$ or more and able to walk briskly for at least 10 minutes without assistance N=194<br><br>Completed data in intervention: n=81<br><br>Completed data in dietary counseling: n=80 | Mean age 40.5 years (+/-9.3)<br><br>72.7% female | Compare the effects of a group support lifestyle modification (GSLiM) obesity intervention versus a dietary counseling program.<br><br>Measurements: weight, height, blood pressure, self-efficacy in weight management, quality of life, social support, negative thoughts | 36 weeks | Week 24: 19.6% achieved 6% targeted weight loss in the intervention compared to 4.1% in the comparison group, Risk Ratio (RR) of 4.75 (95% CI: 1.68, 13.45).<br><br>Within GSLiM means changes(SE): 0- 24 weeks Weight: -2.42 (0.49) p<001 BMI -0.96 (0.19) p<.001<br><br>Within comparison means changes(SE): 0-24 weeks Weight: - 0.69 (0.27) p<.05. BMI -0.27 (0.11) p<.05.<br><br>Median attendance was six sessions with inter-quartile range of five sessions. There was positive correlation between attendance and weight loss (r = 0.491, P< 0.001).<br><br>Intervention group had significantly higher negative thoughts (mean difference 1.51 (95% CI: 0.004, 3.02), Cohen d=0.020 p=0.049) and physical discomfort scores (mean difference 1.31 (95% CI: 0.05, 2.56) Cohen d=0.022 p=0.041), and higher friend support (mean difference 0.41(95% CI: 0.08, 0.75) Cohen d=0.030 p=0.015) scores than comparison.<br><br>0-24 weeks: Intervention groups ingested less carbohydrates than comparison group (mean difference -1.84(95% CI: -3.25, -0.43) Cohen d=0.053 p=0.011). | "The intervention proved to be more effective in achieving the targeted 6% weight loss, improved self-efficacy in dietary control, and achieved better friend support and quality of life than the comparison (dietary counseling) group."<br><br>"The incorporation of group based approach and psychological sessions managed to achieve psychological change needed to achieve weight loss." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Johnson et al. 2016 | Lifestyle modification--Behavioral health | Prospective cohort study | None reported | Four workplaces in northern British Columbia that had >50% male employees<br><br>N=139 | Mean age 43.71 years (+/- 12.51)<br><br>100% male | Assessing the changes in physical activity, healthy eating behavior and self-efficacy for those behaviors of male employees who participated in the POWERPLAY intervention, which was offered at all 4 sites and focused on increasing activity and healthy eating. | 6 months | Vigorous physical increased by 58.98 minutes per week, F (1,137)=20.65, P<0.001<br><br>Moderate physical activity increased by 53.30 minutes per week, F (1, 137)=24.92, P<0.001<br><br>6 months: 72% of men met recommended levels of moderate to vigorous physical activity (ie, 150 min/week) compared with 58% at baseline, $x^2$ (1, 137)=11.86, P=0.001.<br><br>No significant differences between time points were found for the number of servings of fruits and vegetables. Mean = 3.40, 95% CI [3.07, 3.74] (P=0.23).<br><br>Self-efficacy for physical activity increased (F [1, 138].4.04, P=0.046.<br><br>Self-efficacy for fruit (P=0.76) and vegetable (P=0.41) intake did not change. | "Our pilot study revealed an increase in weekly MVPA but no change in fruit and vegetable intakes at the 6 months follow-up."<br><br>"In summary, the geographic location and the workplace served as a valuable environment for achieving positive change in physical activity among men. The gender-sensitive approach used in POWERPLAY holds great potential for extending health promotion programs to a range of male-dominated workplaces and may have application to other Types of underserved men's groups." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Judice et al. 2015 | Lifestyle Modification—Behavioral Health | Randomized controlled trial | No COI declared | 10 participants with a mean BMI of 32.6 $kg/m^2$ (SD: 5.5 $kg/m^2$) | Mean age of participants was 50.4 years (SD 11.5 years). Half of the cohort was male (50%). | The primary outcome of interest was physical activity and number of sit-to-stand transitions following reduction of sitting time. | No follow up. Baseline measured for a week and then intervention and control crossover for two weeks. | During the intervention, subjects had less sitting-time (P=0.001) and more standing (P=0.036), and more stepping (P< 0.001).<br><br>There was no change in number of sit/stand transitions despite successfully reducing sitting-time and increasing time spent standing and walking.<br><br>There was no difference between dietary patterns between conditions. | "When overweight/obese adults attempted to reduce sedentary-time by walking and standing for approximately 2h/day more than usual, they did not actually get up from sitting more often, but instead remained on their feet for longer during each non-sitting bout. "<br><br>"This supports the concept that when overweight/obese people are sitting, people seem to prefer not to interrupt the sedentary behavior to get-up from sitting." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Kitchen et al. 2011 | Lifestyle Modification—Behavioral Health | Large, population-based study | No COI declared | 130,880 subjects from the 2001 Canadian Community Health Survey. | 33.6% were ages 20-34; 45.6% were ages 35-49; and 20.8% were ages 50-64.<br><br>Majority of the cohort was male (55%). | The primary outcomes of interest were levels of walking and health outcomes. | Analysis also done on 2006 CCHS data. | There was a strong inverse relationship between income and likelihood of walking to work ($p<0.01$).<br><br>Adults within the normal weight range were more likely to be high-duration walkers.<br><br>Females and younger people were more likely to be lower-duration walkers but less likely to be high-duration walkers.<br><br>There were no differences among nonwalkers, lower-duration and high-duration walkers with respect to the presence of diabetes or high blood pressure. | "It is clear that for many people walking to work is not possible. However, strategies can be developed to encourage adults to incorporate walking into their daily work and commuting routines. These include mass transit walking and workplace walking programs." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Koepp et al. 2011 | Lifestyle Modification—Behavioral Health | Prospective cohort study | No mention of COI | 18 healthy volunteers at a staffing company in MN.<br><br>Mean BMI was 25.5 $kg/m^2$ (SD: 4 $kg/m^2$) | Mean age was 39.1 years (SD: 7.0 years).<br><br>Sex of subjects not specified. | The primary outcomes of interest were weight, fat mass, and health risk before and after office-based healthcare intervention. | Follow up occurred after 6 months. | Subjects achieved reductions in body weight, BMI, and body fat (all $p<0.001$).<br><br>For the overweight/obese subgroup, triglycerides and total cholesterol decreased ($P<0.01$) while physical activity increased ($P<0.05$).<br><br>Weight loss was predominantly fat mass with lean mass being preserved. | "Scalable office based health care delivered directly to the work space is feasible for small businesses. It is likely that this approach could benefit health in a cost efficient manner." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Kramer et al. 2015 | Lifestyle modification—behavioral health | Randomized controlled trial | None reported | Employees at the Bayer Corporation who met inclusion and exclusion criteria. N = 89<br><br>Intervention N=60<br><br>Delayed Control N=29. Received interventi on 6 months later | Mean age: 52.3 years<br><br>55% female | If the behavior lifestyle intervention delivered in the workplace reduced risk factors for type 2 diabetes and cardiovascular disease. Evaluation of the program's feasibility and long-term effectiveness<br><br>Primary outcome: change in weight from baseline to 6 months<br><br>Also measured BMI, physical activity, HbA1c, fasting glucose, serum insulin and lipids, blood pressure, waist circumference. | 6 months, 12 months, 18 months | Intervention group significantly greater: mean change +/- SD, median(IQR)<br><br>Mean weight loss (lb): -10.4 +/- 8.7, - 9.6(IQR: -15.1 - -5.2), p = .0001<br><br>HbA1c (%): -.1 +/- .2, -.1(IQR: -.2 – 0, p = .009<br><br>systolic blood pressure (mmHg): -1.8 (12.4), -1 (IQR: -10 - +5, p = .005)<br><br>BMI (kg/m$^2$): -1.7 (1.4), - 1.5 (IQR: -2.5 – -.8), p = .0003<br><br>Waist circumference (in): -1.6 (2.2), - 1(IQR:-2.5 – +.25), p = .0006<br><br>5% weight loss: 45% of intervention, 7% control (p <.001)<br><br>7% weight loss: 29% intervention, 4% control (p<.001)<br><br>Regardless of treatment assignment at 12 months: mean change +/- SD, median(IQR) Weight: -10.3 (13.6), -8.2(-17 – -1.6, p <.0001<br>HbA1c: -.06 (.17) -.1(-.2 —0), p = .003<br>SBP: -5.1(11.4), -5(-13 – + 1), p = .001<br>DBP: - 3.6 (7.5), -3(-10 – +2), p = .0004<br>Waist: -1.9 (2.5), -1.5(-3.4 – -.1), p < .0001<br>BMI: -1.6 (2.1), -1.3 (-2.7 – -.25), p < .0001<br>Physical activity (median hr): +1.8(IQR: -1.6 – +9.5), p = .003<br><br>18 months: significant decrease in weight of 8.6 lbs (4.2%, p<.0001), waist circumference (-1.6 inches, 3.9%, p <.0001), and increase in physical activity (+25 minutes, IQR -47.5 – +115, p = .04). | "Findings from this worksite effort clearly demonstrate that a worksite behavioral lifestyle intervention is not only feasible and convenient for employees, but effective in significantly improving key behavioral risk factors along with several important physiological risk factors for diabetes and CVD."<br><br>"Specifically, participants who were randomly assigned to the DPP-GLB immediate intervention had significantly greater improvements in weight, physical activity and other risk factors for diabetes and CVD at 6 months than those assigned to the control delayed group." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion | Comments: |
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| Kullgren et al 2012 | Lifestyle Modification - Behavioral Health | Randomized controlled trial | No COI declared | 105 employees with Body mass index between 30 and 40kg/$m^2$ who were interested in losing weight | Mean age of participants is 45.3 years (SE 1.0).<br><br>Majority of the participants are female (88.6%) | The primary outcome of interest is weight loss at 24 weeks.<br><br>Additional outcomes were intervention period changes in eating behaviors and physical activity. | Follow-up weigh-in at 24 weeks to obtain mean weight loss from baseline. | Group arm participants lost more weight (mean 10.7lbs, SE 1.8) than participants in the control (mean 1.1lbs, SE 2.0) and individual (mean 3.7lbs, SE 1.9) arms.<br><br>Participants in the group arm also experienced a greater increase in cognitive restraint around eating [mean 19.9 (measured on a 0 to 100 scale), SE 4.4] than control (mean 4.6, SE 2.8) and individual (mean 7.3, SE 2.5) arm participants.<br><br>No significant differences across arms was seen in changes in emotional eating, uncontrolled eating and physical activity. | "A monthly financial incentive that involved competition within a group was significantly more effective than an individual incentive in promoting weight loss and greater cognitive restraint around eating among obese employees at 24 weeks". | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion | Comments: |
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| Kullgren et al 2013 | Lifestyle Modification-Behavioral Health | Randomized controlled trial | No COI declared | 132 employees wo wanted to lose weight all with a Body mass index between 30 to 50 | - | The primary outcome of interest was weight loss at 24 weeks and again at 36 weeks from baseline. Other outcomes of interest include changes in eating habits and physical activity at 24 weeks. | Weekly weigh- ins were done up to 24 weeks. Follow up at 24 weeks from baseline and again at 36 weeks from baseline | Control arm participants gained an average of 1.0lb (SD 7.6) at 24 weeks compared to mean weight losses of 4.3lbs (SD 8.9), 5.3lbs (SD 10.1) and 2.3lbs (SD 9.8) for the no match, 1:1 match and 2:1 match arms respectively.<br><br>While at 36 weeks, control arm participants gained an average of 2.1lbs from baseline (SD 7.9), compared to mean weight losses of 5.1lbs (SD 11.1), 3.6lbs (SD 9.6) and 2.8lbs (SD 10.1) in the no match, 1:1 match and 2:1 match arms respectively.<br><br>There were no significant differences in changes in eating habits and physical activity at 24 weeks. | "Relatively few study participants assigned to deposit contract conditions took up opportunities to enter into deposit contracts designed to promote weight loss, and employer matching of deposits did not increase participation" | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Kullgren et al. 2013 | Lifestyle modification—behavioral health | Randomized controlled trial | Dr. Volpp has served as a consultant to CVS Caremark and VAL Health and receives research funding from Humana, Horizon BCBS, Mckinsey, and CVS Caremark, none of which is related directly to the subject of manuscript. Dr. Asch has served as a consultant to VAL Health. Dr. Loewenstein also has served as a consultant to CVS Caremark and VAL Health and receives research funding from Humana and CVS Caremark. | Employees of the Children's Hospital of Philadelphia with BMI of 30-40 kg/$m^2$<br><br>Control- provided with a weight-control website link and weighed monthly (N=35)<br><br>Individual- could receive $100 at baseline, 4 weeks, 8 weeks, 12 weeks, 16 weeks, and 20 weeks if they met or exceeded target monthly weight loss goal (N=35)<br><br>Group- groups of 5 would evenly split $500 among those who were at or below target weight loss at the aforementioned monthly times (N=35) | Control: 91% female, 44.5 years (+/- 10)<br><br>Individual: 86% female, 44.4 years (+/- 11)<br><br>Group: 89% female, 47 years (+/- 9) | Comparison between two financial incentive designs for promoting weight loss among employees<br><br>Primary outcome: weight loss<br><br>Secondary outcomes: physical activity, eating behaviors, participation in weight related wellness programs | Monthly weigh ins at 4 weeks, 8 weeks, 12 weeks, 16 weeks, and 20 weeks. Follow up at 24 weeks, 36 weeks after baseline | 24 weeks: Significantly more weight loss in group than control (mean 9.7 lbs, 95% CI, 4.4 to 14.9; $p < 0.001$). And significantly more weight loss in group than individual (mean 7.0 lbs, 95% CI, 1.9 to12.2; p=0.008)<br><br>Group participants significantly greater increase in cognitive restraint around eating compared to control (difference in mean change 15.4, 95% CI, 5.9 to 24.8; P = 0.002) and individual (difference in mean change 12.6, 95% CI, 3.3 to 22.0; P = 0.009).<br><br>36 weeks: significantly greater weight loss in group than control (mean 6.5 pounds, 95% CI, 1.2 to 11.7; P = 0.016)<br><br>Participants in the group arm earned a mean $514.7 (SD $522.6); those in the individual arm earned a mean $128.6 (SD $165.5) (between-group difference = mean $386.1, 95% CI, $201.0 to $571.3; P<0.001). | "In summary, this weight loss trial comparing 2 forms of financial incentive with an equal upfront allocation of resources found that a group-based incentive was more effective than an individual incentive in promoting weight loss among obese employees at 24 weeks."<br><br>"As employers' use of financial incentives to motivate healthy behaviors accelerates, this study demonstrates that varying features of incentive design can lead to important differences in the costs of incentives and their effects on health outcomes." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lahiri 2011 | Lifestyle Modification—Behavioral Health | Prospective Comparative Study | None declared | N=72 nursing home workers | Not given | Incentivized weight loss (n=35) versus nonincentivized weight loss program (n=37) | 28 weeks | Incentivized sites achieved weight loss on average compared to baseline (-7.4 lbs, p<0.01) Nonincentivized site tended to lose weight compared to baseline (-2.2 lbs, p=0.06). This weight loss was significantly greater for incentivized than non-incentivized sites (p=0.03). Incentivized site had lower average cost-effectiveness ratio per pound lost than non-incentivized sites ($25.5 versus $58.1) | "In general, incentivized behavioral weight management program were more cost effective. To generate a business case, enhancement in productivity becomes a critical factor and future research needs to investigate it further." | Cost analysis based upon direct costs of the intervention. Authors also analyzed net savings based upon subjective reports of presenteeism, absenteeism, and productivity and found cost savings of $1048 per participant for incentivized sites compared to just $700 for nonincentivized sites |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lara et al. 2016 | Lifestyle modification — behavioral health | Randomized Controlled Trial | None reported | Employees near retirement age, or had recently retired, who met inclusion and exclusion criteria.<br>N=75<br><br>LEAP Interventio n: n=50<br><br>Control: n=25 | Mean age 61 years (+/- 4)<br><br>76% female | Evaluating the effectiveness of the pilot study of the web-based platform (Living, Eating, Activity and Planning through retirement; LEAP) promoting healthy eating (based on a Mediterranean diet (MD)), physical activity (PA) and meaningful social roles.<br>Compared to the usual care control group.<br><br>Outcomes: dietary intake, physical activity, feasibility and acceptability, BMI, waist circumference | 8 weeks | Food consumption: demonstrate very similar changes in consumption in healthy and unhealthy foods. Desserts: control baseline 1.6 (95%CI: 1.2 to 2.1), follow up 1.3 (95%CI: 0.8 to 1.4) and intervention baseline 1.1 (95%CI: 0.8 to 1.4) and follow-up 0.9 (95%CI: 1.7 to 1.1). Nuts: Control baseline 0.2 (95%CI: 0.0 to 0.3) follow-up 0.3 (95%CI: 0.1 to 0.5) Intervention baseline 0.2 (95%CI: 0.1 to 0.3) and follow-up 0.3 (95%CI: 0.1 to 0.4).<br><br>Physical activity: Control increased physical activity more than intervention. Steps (number per day) Control baseline 7691 (4586 to 10795) Follow-up 7181 (3978 to 10384). Intervention baseline 7056 (4986 to 9126) Follow-up 6916 (4909 to 8922)<br><br>Qualitative interview results:<br>• Exploring reasons for participation or non-participation in the study. Participants described 'full' and 'active' lives, loneliness was considered more an issue of 'later life' and participating in research was an example of 'actively pursuing interests' and 'getting involved'.<br>• Intervention website (LEAP). LEAP modules were regarded as addressing key concerns through retirement<br>• Design, navigation and technical issues such as understanding 'how the site worked' were problematic for a few users<br>• Diet and PA modules were regarded as important and entirely acceptable within the context of healthy ageing. The use of the pedometer was described as a 'good motivator'.<br>• Prompting about social roles and activities was regarded as important, particularly for those individuals who had not given much thought to how they would structure their retirement | "Overall participants reported that the LEAP domains of 'eating well', 'moving more' and 'being social' were important for their health and wellbeing in retirement, a finding which is supported by data on the most accessed components of LEAP."<br><br>"The findings from this pilot study suggest that people in the retirement transition are motivated to participate in an internet-delivered intervention to improve diet and PA and to strengthen social roles/social connections, lifestyle changes which are expected to enhance healthy ageing." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lassen et al 2012 | Lifestyle Modification-Behavioral Health | Prospective cohort study | No COI declared | 27 employees aged 18 years and older were identified from a worksite. | The mean age of participants was 40 years (SD 6years).<br><br>A little more than half of the participants were female (52%). | The primary outcome of interest is the nutritional quality of employees' meal intake during a 7 week Canteen take away (CTA) intervention. | Follow-up was at the end of the 7 week intervention. | The energy density of the food was significantly lower on CTA meal days compared to non-CTA meal days with regard to evening meal intake (mean difference: -187 (-225 to -149 kJ/100 g) and on a daily basis (mean difference: -77 (- 132 to -221) kJ/100 g).<br><br>In addition, CTA meals when compared to non- CTA meals showed a higher content of dietary fiber, fruits and vegetables as well as a lower content of fat and saturated fat.<br><br>A gender-related effect on energy intake was seen (0.7 MJ and 2.9 MJ lower for women compared to men) in the dinner digital photographic and 24 hour dietary recall methods of assessment respectively. | "The nutritional quality of the employees' evening meals as well as the overall quality of their diet was significantly enhanced on days receiving CTA compared to days not receiving CTA". | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lassen et al 2014 | Lifestyle Modification - Behavioral Health | Prospective cohort study | Funded by the Danish Ministry of Consumer and Family Affairs and the Nordic kitchen, Herlev University Hospital. No mention of COI. | 270 employees were recruited from worksite canteens | The average age was 41 years (SD 12).<br><br>The majority of participants were male (54%). | The primary outcome of interest was a change in nutritional variables including energy intake and density, total fat, salt, whole grain, refined sugar and fruit and vegetable intake from baseline to program end-point (6 weeks) and follow-up (6 months from end-point) | Follow-up was at 6months from program endpoint. | Intervention group participants, at end-point consumed on average 20 E% less fat (40.4 E% to 20.4 E%) compared to baseline, 47% more fruit and vegetables (31g/100g to 46g/100g), 40% less salt (0.9g/100g to 0.5g/100g) and 30% less total energy (2.3 MJ to 1.6 MJ). Total energy at follow-up was significantly higher compared to end- point.<br><br>The proportion of intervention group participants consuming meals with wholegrain increased from 53% to 74% and 73%, respectively, at end-point and follow-up, in contrast to no significant effect seen in the control group.<br><br>Mean estimated energy density was significantly lower in intervention group participants at end- point and follow-up with values of 368 and 407KJ/100g respectively. | "Several significant positive nutritional effects were observed at the intervention canteen including a mean decrease in energy density in the consumed meals from 561 kJ/100 g at baseline to 368 and 407 kJ/100 g at end-point and follow-up, respectively (P < 0.001)". | |

E%= percentage of total energy intake

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: |
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| Lemon et al. 2014 | Lifestyle modification—behavioral health | Randomized Controlled Trial | None reported | Employees at public high schools in Massachusetts<br><br>Multilevel intervention: n=446<br><br>Comparison site: n=336 | Intervention: 70.2% female.<br><br>Age 21-34: 26.9%; 35-44: 26%; 45+: 47.1%<br><br>Comparison: 62.8% female.<br><br>Age 21-34: 20.8%; 35-44: 26.2%; 45+: 53% | Primary outcome: change in body weight and BMI<br><br>Compare the differences between a multilevel intervention (addressed individual, interpersonal, and organizational influences) and a materials-only (print and electronic) intervention. | 12 and 24 months | 24 months statistically significant differences in mean outcomes between intervention and comparison:<br><br>Weight loss (lbs): -3.03 (95% CI: -5.85, -.22) p=.04<br><br>BMI $kg/m^2$: -.48 (95% CI: -.96, 0) p=.05<br><br>Participation in program: Employee participation was greatest in physical activity related opportunities, and remained mostly steady from year 1 to year 2.<br><br>Schools participated in the majority of program requested changes, but only 1 of 6 provided nutritional information, reduced the number of sugar sweetened beverages in vending machines, and moved fresh fruit to a high traffic area of the cafeteria. | "Comparison condition participants gained an average of 1.5 pounds over the two-year follow-up period, slightly less than the national average. In contrast, intervention participants lost an average of 1.5 pounds, which we hypothesized would remain steady (see Figure 2)."<br><br>"This study observed a modest impact on weight outcomes, demonstrating weight gain prevention can be achieved in a low intensity, school worksite-based intervention that targets employee physical and social environments." |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Levesque et al. 2014 | Lifestyle Modification – behavioral health | Prospective Cohort Study | No COI declared | 787 employees participated in the pilot project. | Average age: 44.6 years<br><br>Female: 19.8%<br><br>Male: 80.2% | An in-house competition to favor peer support in the adoption of healthier lifestyle habits was implemented. Participating companies offered a comprehensive cardiometabolic/ cardiorespiratory health assessment performed at the workplace with a mobile risk assessment unit before and after the competition (nutritional/physical activity questionnaires, resting blood pressure (BP), anthropometric measurements, lipid profile, and submaximal treadmill test). | Study was based on a 3-month competition | "After 3 months, nutritional quality index (by 15%; $p<0.0001$) and physical activity improved. Reductions in waist circumference ($p<0.0001$), in heart rate at a standardized submaximal workload ($p<0.0001$) as well as in resting systolic (-6 mm Hg) and diastolic (-4 mm Hg) blood pressure were also observed. Improvements in waist circumference and cardiorespiratory fitness were associated with improvements in the cardiometabolic risk profile." | "Results of this study show the added value of measuring/targeting waist circumference and cardiorespiratory fitness as a relevant approach to reduce cardiometabolic risk at the workplace. Results also suggest that putting in place a permissive "in-house ecosystem" within the company is relevant to promote the adoption of healthier lifestyle habits." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Linde et al. 2012 | Lifestyle modification — behavioral health | Randomized controlled trial | None reported | Employees who worked at least 50% of a daytime shift at one of 6 enrolled worksites. The worksites averaged 450 employees, had a food service, a stable workforce. Workers who had complete data, (N= 1672).<br><br>Intervention (n = 723) and control (n = 949) | 60.7% female<br><br>Under 30: 16.8%<br><br>31-40: 25.3%<br><br>41-50: 31.5%<br><br>51-60: 23.1%<br><br>Over 60: 3.3% | Worksite measures: Environmental assessments- observed food inventory (what's available, portion sizes, calories per portion), daily stair traffic, and health media presence<br><br>Participant measures: height, weight, demographics<br><br>Measurements between control and intervention. Intervention aimed to increase healthy food choices, physical activity, sent out health positive information via newsletters, etc. Control only received DVD with suggestions for healthy workplaces. | 12 months and 24 months from baseline | Mixed effect ANCOVA model showed an adjusted mean increase in BMI of 0.13 $kg/m^2$ more in the intervention than the control; however, it was insignificant (95% CI: -0.21, 0.46, p = .36).<br><br>Two of three intervention sites met goal of increasing healthy options in vending machines to 50% of all options.<br><br>No site implemented a 15% price reduction on healthy foods and a 15% price increase on unhealthy foods.<br><br>All sites met goal of promoting walking and pedometer use, adding balance beam scale, and publicizing the intervention around the workplace. | "Although a multi-component intervention effort was sustained over the desired length of time, with most of the elements of the intervention successfully implemented and weight change outcomes assessed in all study participants, weight gains over the course of the study did not differ between treatment and control worksites."<br><br>"The results of this study underscore that changing the environment in which people live is not an easy task. Aspects of the work environment may be constrained by the entrenched nature of workplace routines and policies, security needs, and economic considerations that are likely resistant to changes advocated by outside partners in particular." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lombardi et al. 2012 | Lifestyle Modification —Behavioral Health | Large, population-based study | No COI declared | 101,891 employed adults from the 2004-2010 US National Health Interview Survey.<br><br>Mean BMI was 27.31 kg/$m^2$. 25.6% of subjects were obese (BMI≥30). | Mean age was 41.1 years (SE: 0.08 years).<br><br>Majority of the cohort was male (51.7%). | The primary outcome of interest was whether BMI has an effect on sleep duration or work-related injury risk. | NHIS done annually. Data was pool from seven consecutive years (2004-2010). | No significant interaction was found between usual daily sleep duration and BMI.<br><br>Those who slept <7h had elevated injury risks than the referent category of 7-8 h sleep ($p<0.05$).<br><br>With regards to BMI, the adjusted injury risk OR comparing workers who were obese to healthy weight workers was 1.34 (95% CI: 1.09-1.66). | "These results from a large representative sample of US workers suggest increase in work-related injury risk for reduced sleep regardless of worker's body mass. However, being an overweight worker also increases work-injury risk regardless of usual daily sleep duration. The independent additive risk of these factors on work-related injury suggests a substantial, but at least partially preventable, risk." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| McHugh and Suggs 2012 | Lifestyle modification—behavioral health | Prospective cohort study | None reported | Obese or overweight employees from a Fortune 500 company who participated in a Health Risk Assessment (HRA), and then a second HRA two years later.<br><br>Intervention: completed two HRAs and enrolled in weight management program n=101<br><br>Control: completed two HRAs, but did not enroll in weight management program n=137 | Intervention: Mean age: 41 years and 69% male<br><br>Control: Mean age 41 years, 62% male | Effects of an online commercial weight management program for employees who completed two worksite HRA programs, two years apart. Measured body weight, BMI, blood pressure, cholesterol and blood glucose.<br><br>Compared effects of those who participated to those who did not | 2 years | The treatment group mean difference in systolic blood pressure increased (- 3.772; HRA1:112.39, HRA2:118.61; p= .013)<br><br>Mean cholesterol decreased (7.020; HRA1:57.98, HRA2:50.96; p= .033).<br><br>Blood glucose level mean difference increased (-3.7; HRA1:90.39, HRA2:94.11; p= .028).<br><br>For overweight participants in the treatment condition (n= 50), blood sugar was significant and negative (p= .044) with a mean difference of - 3.159 (HRA1:87.56; HRA2:91.07).<br><br>For obese participants in the treatment group (n= 51), we observed significant and positive differences for systolic blood pressure (p=.000) with a difference of 7.882 (HRA1:126.84, HRA2:118.96).<br><br>For intervention women: Systolic blood pressure was positive and significant with a difference of 3.986 (HRA1:121.91, HRA2:117.93; p=.042).<br><br>HDL cholesterol was also positive and significant with a difference of 9.66 (HRA1:61.84, HRA2:52.19; P= .038).<br><br>Blood glucose scores were negative and significant with a mean difference of -4.366 (HRA1:89.37, HRA2:93.73; p= .039). | "Overall, the results of the TWMP (tailored weight management program) were not entirely congruent with other tailored health communication research."<br><br>"Workplaces are an appropriate setting for health interventions and findings of previous studies testing tailored communication on health behavior change are generally positive, yet the tailored program evaluated in this study cannot be described as particularly effective in terms of improved biometric health measures. We observed statistically significant mean differences for systolic blood pressure, HDL cholesterol, and blood glucose. However, the change in scores between HRA1 and HRA2 rarely occurred in the predicted direction."<br><br>"It is noteworthy that women had more statistically significant differences than did men." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Merrill et al 2011 | Lifestyle Modification - Behavioral Health | Prospectiv e Cohort Study | No mention of conflict of interest | 3737 workers continuously employed during 2007 through 2009 were identified from the Reaping Rewards program. | The average age of employees on the 1st of January 2007 was 44.1 years (SD 10.2 years).<br><br>The majority of the cohort were men (70.9%). | The primary outcome of interest was a mean change in biometric measures as a result of the influence of a worksite wellness program on program participants by the end of the study period. | Follow-up for this study was at the end of the year 2009. | There were clinically significant improvements in those who were underweight, those with high systolic or diastolic blood pressure, high total cholesterol, high low-density lipoprotein, low high-density lipoprotein, high triglycerides, and high glucose in the study.<br><br>A mean increase was seen for each BMI classification in this study, but the increase was significantly lower for obese individuals. For all other measures, significantly greater improvement was seen among those with the poorest classified scores at baseline.<br><br>Nevertheless, among participants in the program who were already healthy, blood pressure increased, HDL cholesterol decreased, and LDL cholesterol increased. | "After adjusting for initial health status and age and sex, significant improvements in blood pressure, cholesterol, triglycerides, and glucose scores occurred in those with higher baseline classifications of these risk factors" | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow- up: | Results: | Conclusion: | Comments: |
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| Merrill et al 2014 | Lifestyle Modification- Behavioral Health | Prospective cohort study | No COI declared | 2411 employees were identified from the WellSteps worksite intervention | Mean age of participants was 50 years (SD 10.4 years).<br><br>Majority of participants were female (74.6%). | The primary outcome variables of interest include systolic and diastolic blood pressure, BMI, glucose and total cholesterol at the end of a 12 month intervention period. | Follow-up was at one year from baseline | 46.0% of participants lowered their BMI, 34.7% lowered their systolic blood pressure, 56.3% lowered their diastolic blood pressure, 65.6% lowered their blood glucose, and 38.6% lowered their total cholesterol.<br><br>11.1% and 11.6% of participants moved from the obese to overweight group and from the overweight to the normal weight group respectively. But, 4.1% and 7.6% of participants moved from the normal weight to overweight and from overweight to obese groups respectively.<br><br>11.6%, 39.4%, 70.7%, 38.9%, and 40.7% of participants moved out of the high-risk categories for body weight, systolic blood pressure, diastolic blood pressure, blood glucose and total cholesterol respectively at the end of the intervention.<br><br>Individuals with higher baseline biometric readings were more likely to improve health status by the end of the intervention than those with normal baseline readings. | "Among employee participants, a large percentage lowered their BMI, systolic blood pressure, diastolic blood pressure, blood glucose, and total cholesterol. A high percentage also moved from high- to lower-risk categories for each of the biometric measures, particularly f o r diastolic blood pressure". | |

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| Mishra et al. 2013 | Lifestyle modification—behavioral health | Randomized Controlled Trial | NDB, JG, JX, UA and SML are on the staff of the Physicians Committee for Responsible Medicine, a nonprofit organization that promotes the use of low-fat, plant-based diets and discourages the use of animal-derived, fatty and sugary foods. NDB also writes books and articles and delivers lectures about therapeutic diets, including vegan diets, and has received royalties and honoraria from these sources. The remaining authors declare no conflict of interest. | Employees of GECIO with a BMI of >25 kg/$m^2$ or a previous diagnosis of type 2 diabetes, who met other inclusion and exclusion criteria. N=271<br><br>5 intervention sites n=130<br><br>5 control sites n=141 | Intervention: Mean age 43.3 years (+/- 10.6)<br><br>79% female<br><br>Control: Mean age 45.1 years (+/- 11.5)<br><br>88% female | Tested an intervention of a low-fat vegan diet taught through group sessions on body weight and other health indicators<br><br>Measured nutrient intake and cholesterol intake to assess adherence to the program | 18 weeks | Cholesterol intake at 18 weeks was < 75 mg/day for 85% of intervention and 21% of control ($p < 0.001$).<br><br>Cholesterol intake was < 50 mg/day for 74% of intervention- and 13% of control ($p<0.001$).<br><br>Total fat intake was <35% of the total calorie intake for 86% of intervention and 40% of the control ($p<0.001$).<br>Fat intake was <25% for 49% of intervention and for 8% of control ($p<0.001$).<br><br>Saturated fat (SFA) intake was <10% of total calorie intake for 88% of intervention and 38% of control ($p<0.001$).<br>SFA intake was <5% of total calorie intake for 51% of intervention and for 5% of control ($p<0.001$).<br><br>Intervention significantly changed mean intake of:<br>Fat: -5.4(95%CI: -9.8, -.9), p=.02<br>SFA: -2.9(-4.7, -1.1), p=.006<br>Monounsaturated: -2.2(-3.8, -.6) p=.01<br>Carb: 8.6(3.2, 13.9), p = .006<br>Fiber: 4.5(2.3, 6.7), p =.002<br>Protein: -2.4(-4.4, -.4), p=.03<br>Cholesterol: -50.2 (-83.6, -16.8), p=.009<br>Vitamin C: 17.0(5.9, 28.1), p=.003<br>Potassium: 185(69.7, 301), p =.002<br>Magnesium: 29.2(2.4, 56.1), p=.04 | "The 18-week nutrient intake data indicate that some intervention group participants continued to include some animal products in their diets and consumed more fat than had been recommended. Nonetheless, the two groups diverged markedly in their reported dietary behavior, suggesting that the intervention elicits significant changes even for those participants who do not fully adhere to the prescribed guidelines."<br><br>"In summary, the present study demonstrated that a simple nutrition education program using modest group support at the place of employment yields significant improvements in nutrient intakes." |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Morgan et al. 2011 | Lifestyle modification—behavioral health | Randomized Controlled Trial | No COI declared | 110 overweight/obese subjects took part in this study. | Average age: 44.4 years<br><br>Female: 0%<br><br>Male: 100% | Subjects were randomized to either the Workplace POWER (WP) program or a 14-week wait-list control group.<br><br>Subjects were assessed at baseline and at follow-up for weight (primary outcome), waist circumference, BMI, blood pressure, resting heart rate, self-reported physical activity and dietary variables, and physical activity and dietary cognitions | Follow-up occurred 14 weeks after baseline. | "Intention-to-treat analysis using linear mixed models revealed significant between group differences for weight loss after 14 weeks ($p<0.001$). Significant intervention effects were also found for waist circumference ($p<0.001$), BMI ($p<0.001$), systolic blood pressure ($p=0.01$), resting heart rate ($p<0.001$), physical activity ($p=0.03$), sweetened beverages ($p<0.02$) and physical activity-related cognitions ($p<0.02$)." | "The WP program was feasible and efficacious and resulted in significant weight loss and improved health-related outcomes and behaviors in overweight male shift workers." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Morgan et al. 2012 | Lifestyle Modification – behavioral health | Randomized Controlled Trial | No COI declared | A total of 110 overweight/obese employees were enrolled in this study. | Average age: 44.4 years<br><br>Female: 0%<br><br>Male: 100% | Evaluating the impact of a workplace based weight loss program for shift workers on a number of work-related outcomes.<br><br>Subjects were assessed for weight, quality of life, sleepiness, and productivity at work, absenteeism, and workplace injuries. | Follow-up occurred at 14 weeks after baseline. | "Retention was 81%. Intention-to-treat analysis using linear mixed models revealed a significant intervention effect for weight, quality of life (mental), presenteeism, absenteeism, and injuries."<br><br>"Significant treatment effects were found from baseline to 14 weeks for quality of life (mental) (p=0.01), work-based physical demands (p=0.04), overall productivity loss or presenteeism (p=0.01), absenteeism (p=0.01), and injuries in the workplace (p=0.04)." | "The weight loss program improved a number of important work- related outcomes in shift workers." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Morton et al. 2011 | Lifestyle Modification | Prospective Comparative Study | No COI declared | A total of 42 individuals participated in the study. | Average age: ~30 years<br><br>Female: 71.4%<br><br>Male: 28.6% | Determining if team based competition (without incentive) is more effective than traditional workplace education and behavioral programs in achieving weight loss. Two established self-help diet groups were randomly assigned to complete a Healthy Lifestyle Workshop, either on an individual basis (A) or was assigned to a team based competition intervention (B).<br><br>Baseline age, weight and BMI and subsequent weight and BMI were recorded.<br><br>Independent t-test were used to compare the final percentage weight loss between competing and non-competing groups and differences in weight and BMI at baseline and follow- up. | Follow-up occurred at 3 weeks after baseline. | "The competing group (B) achieved significantly greater percentage weight loss after 3 weeks than the group participating as individuals (A) (p=0.025)." | "Over a 3-week period, a team based weight-loss competition was found to have a more beneficial effect on weight-loss than traditional work place interventions and, provides new evidence to suggest that unlike incentive based programs this can be achieved through competition alone.<br><br>"Team weight loss competitions should be considered in addition to educational and behavioral functions when designing an effective workplace program." | |

| Author /Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Newman et al. 2015 | Lifestyle modification—behavioral health | Prospective cohort study | None reported | Participants in the Health Risk Management (HRM) program offered for free by Pinnacol Assurance, a Colorado workers' compensation agency. Small businesses (fewer than 500 employees) N=260<br><br>Employee participants: N=6507 | Mean age: 41.4 years (+/- 13)<br><br>55.7% male | Frequencies of Health Risk Assessment scores to assess whether a health risk management program is needed. Categories include: health history, physical activity, nutrition, substance use, mental/social health, injury prevention practices, readiness to change, job satisfaction, attendance, absence, job performance, overall wellness score. | 21% of policyholders who participated in HRM took follow-up survey, but does not specify when. Companies enrolled at any time during 3-year period. Does not indicate how long the program ran. | Calculated overall wellness score (OWS) based on various questions.<br><br>Self-reported overall health: Excellent (15.1%), very good (39.5%), good (37.2%), fair (7.4%), poor (0.5%).<br><br>OWS: Excellent (17.6%), doing well (53.7%), needs improving (28.7%), caution high risk (0%)<br><br>Weight: 38.9% normal, 34.3% overweight, 25.6% obese<br><br>82.1% ate 3 servings of fruits and vegetables daily and 62% exercise 3 times a week<br><br>76.6% reported moderate to high stress over work, home, or finances<br><br>Health conditions: depression (22%), chronic fatigue (20.4%), chronic sleeping problems (18.4%), headaches (17.2%), arthritis (16.3%), high cholesterol (15.7%), and hypertension (15.3%), diabetes (3.8%), cancer (3.3%), osteoporosis (2.9%), coronary heart disease (1.7%), and chronic lung disease (0.7%).<br><br>97% of follow up surveys indicated that wellness was important for workplace safety. Priorities for enrolling in HRM include: improve employee health status and a desire to reduce costs. | "We have demonstrated that Colorado small businesses are prepared to adopt worksite wellness programs, if the program is provided free of charge and are given company-specific advice in program design and execution. The cohort's self-reported health risks and disease rates suggest that there are opportunities to address important modifiable health risks in the small business workforce."<br><br>"Our data strongly support the need for effective interventions to address modifiable health risks among people who work in small businesses." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Nishinoue et al 2011 | Lifestyle Modification-Behavioral Health | Prospective cohort study | Study was supported by occupational health nurses in the fields of this study. No mention of COI. | A cohort of 628 employees (206 in the intervention group and 422 in the control group) who were within the desired age range were identified. | Mean age of participants was 40 years for the intervention group and 35 years for the control group at the time of analysis.<br><br>Majority of the participants were male (490 out of 628). | The primary outcome of interest was a comparison of changes in body weight and health indices including body mass index, blood pressure, fasting blood sugar and γ-glutamyl transpeptidase (γ-GTP) 5 years after the end of a 2 day and a night intervention. | Follow-up was at 5 years after the implementation of the group health education plan. | In males, body weight, body mass index, systolic and diastolic blood pressure, γ-GTP and fasting blood sugar were significantly lower in the intervention group than in the control group.<br>In females, a similar outcome was seen for γ-GTP only.<br><br>Also, the percentage of male subjects who gained less than 5% of body weight from 35 to 45 years was significantly higher in the intervention group than the control group (83.8% vs72.5%).<br><br>Additionally, the evaluation index of self-management ability for both GSES and HLC significantly improved with participants in the high GSES group experiencing significant inhibition of weight gain (high group vs low group: 0.41±0.49 vs 1.02 vs0.49kg). | "We found that the group health education program conducted in this study at age 35 years inhibited weight gain in males at 40 years. In contrast, no effect was observed in females". | |

GSES= general self-efficacy scale; HLC= health locus of control

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Novotny et al 2012 | Lifestyle Modification - Behavioral Health | Randomized Controlled Trial | No COI declared | 1612 adult employees of predominantly Asian and Pacific Islander ancestry were identified from the Work, Weight and Wellness (3W) program. | Mean age of participants was 46.0 ±10.2 years.<br><br>Males were in the minority among participants (48%). | The primary outcomes of interest were changes in level of physical activity, BMI and dietary intake | Follow-up was post-intervention at 24 months from baseline | Controlling for other factors, physical activity increased in the intervention group and decreased in the control group (control −53.7 ± 89.0 metabolic equivalent (MET) minutes/week, intervention 1000.1 ± 94.5 minutes/week, F=12.2, p<0.0005).<br><br>An extra unit of BMI was associated with 0.08 ± 0.03 more daily servings of sweetened drinks (t= 3.00, p=0.003). Those with a unit higher BMI had −0.0001 ± 0.00002 fewer MET adjusted minutes/week of physical activity (t=4.94, p<0.0001). There were no significant changes in BMI across the intervention.<br><br>Fruit intake increased with each year of study intervention (F=9.98, p=0.002) and for each additional daily serving of fruit, participants also ate more servings of meat (0.07 ± 0.02, t=3.33) and dairy (0.21 ± 0.02, t=9.85). | "At baseline acculturation was positively associated with body mass index, physical activity level; and fruit, meat, and sweetened drink intake level".<br><br>"The intervention was successful in increasing physical activity, even after adjusting for socio-demographic factors (including acculturation) and dietary behaviors". | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Osondu et al. 2016 | Lifestyle Modification – Behavioral Health | Prospective cohort study | No COI declared. | A total of 297 employees of Baptist Health South Florida participated in the program and 160 participants completed all procedures through 12 months of follow-up. | The participant population was majority female (78%). Mean age at baseline was 48.1 (9.7) years. | This is a single-arm, pre and post effectiveness study that evaluated the impact of a comprehensive workplace lifestyle program on severe obesity among high cardiovascular disease risk individuals in a large, diverse employee population.<br><br>Participants received a personalized diet plan and physical activity intervention (My Unlimited Potential (MyUP)) and data on anthropometric measurements, blood pressure, blood glucose, and other biochemical measures were collected.<br><br>Participants' body mass index (25.0 to 29.9kg/m2 as overweight, 30.0 to 34.9kg/m2 as obese class I, 35.0 to 39.9kg/m2 as obese class II, and 40.0kg/m2 and above as obese class III) was calculated and their eligibility for bariatric surgery (BS) also assessed. | The intervention lasts for 12 weeks with follow-up continuing for up to 12 months from entrance into the program.<br><br>Measurements were taken at baseline, 12 weeks, 6 months, and 1 year after entering the program. | At baseline, 34% (n=100) of all participants were eligible for BS. In an intention-to treat analysis, 27% (n=27) of BS eligible participants at baseline became ineligible after 12 months. Considering program completers only, 46% of BS eligible participants at baseline became ineligible.<br><br>Among program completers (n=160), significant mean weight loss of 4.7kg, 5.5kg and 3.9kg were observed at 3-, 6- and 12-month follow up respectively.<br><br>At baseline, about 43% of participants who completed the program were categorized as Class II or III obesity. After 12 months, the prevalence of Class III obesity (BMI >40) decreased from 21% to 15%, while the prevalence of Class II Obesity also decreased from 22% to 17%. Conversely, prevalence of normal weight and overweight (BMI <30) increased from 28% to 33%, and Class I obesity prevalence also increased from 30% to 35%. Overall, 25% (n=48) shifted to a lower obesity category at 12-month follow- up, while 5% (n=10) moved to a higher obesity class. | "The aim of this study is to evaluate the impact of a comprehensive workplace wellness program on BS eligibility among high-risk employees in a large, diverse health care organization. At the end of the 12-month program, more than one quarter of participants who met criteria for BS at baseline no longer met the criteria, and almost half of BS-eligible completers became ineligible.<br><br>In addition, participants who became ineligible for BS after 12-month follow-up had significantly improved cardiometabolic indices/risk factors when compared to those who still met the criteria for BS. These results show that workplace wellness programs can obviate the need for BS in individuals with severe obesity with comorbidities. This study also observed significant changes in overall participants' cardiometabolic indices after 12 months of follow-up." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Ostbye et al. 2015 | Lifestyle Modification – Behavioral Health | Randomized Controlled Trials | No COI declared | 550 obese employees were subjects in this study. | Average age: 45 years<br><br>Female: 84%<br><br>Male: 16% | Evaluating the effectiveness of two employee weight management programs offered within Duke University and the Health System.<br><br>Standardized, measured weights and heights were collected. Dietary intake was measured at baseline and follow-up using self- reported measures. Physical activity was assessed at baseline and follow-up using accelerometers worn during waking hours.<br><br>Participants were randomized into two weight management programs; Weight Management (WM) and Weight Management Plus (WM+). WM+ has a difference in that it is focused on behavior modification and is informed by social cognitive theory and the transtheoretical model. | A follow-up visit was completed 14 months after baseline. | "There was no clinically and statistically meaningful difference between the two arms in change in BMI (mean difference of 0.10 units; p=0.65)."<br><br>"Both arms showed a decrease in mean daily ounces of sugar-sweetened beverages consumed: 6.49 ounces in WM (Weight Management) and 5.66 ounces in WM+. The WM+ arm showed a decrease in mean BMI of 0.36 units (p=0.02), an increase in mean daily servings of fruit and vegetables of 0.3 servings (p=0.02), and decrease in mean percentage of energy intake of fat of 1.52% (p<0.0001). The WM arm showed an increase in mean moderate-to- vigorous physical activity of 0.17 min/hr/d (p=0.007) and a reduction in mean sedentary time of 1.3 min/hr/d (p=0.02)." | "Although there were no salient changes between the more intensive, behavioral interventional arm (WM+) and the less intensive, educational, arm (WM) … there was a clinically significant trend indicating greater reductions in weight with greater participation in the intervention."<br><br>"The modest positive effects observed in this study may suggest that to achieve weight loss through the workplace more intensive interventions may be required." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Ostbye et al. 2016 | Lifestyle Modification – Behavioral Health | Prospective Comparative Study | No COI declared | There were 209 subjects in the weight management education plus counseling program, 211 subjects in the weight management education program and 923 observational controls. In total there were 420 subjects in the obesity study and 1343 subjects overall. | Average age Obesity Study: 43.6 years<br><br>Average age Observational Controls: 45.1 years<br><br>Female Obesity Study: 83.7%<br><br>Female Observational Controls: 79.4%<br><br>Male Obesity Study: 16.3%<br><br>Male Observational Controls: 20.6 | Comparing the impact of two worksite weight management (WM [education] and WM+[education plus counseling]) programs, on health care utilization and costs.<br><br>Secondly comparing the intervention groups to an observational control group of obese workers.<br><br>Evaluating the impact of actual weight loss on these outcomes. | The programs went on for 12 months each but varied in that WM employees received follow-up meetings in months 6 and 12 | "No significant differences between the two intervention groups, or between these intervention groups and the observational control group. Those who lost weight reduced their overall health care costs."<br><br>"Those who lost weight reduced their monthly health care costs by $191 more than those who did not (p=0.049)."<br><br>"There was a marked reduction in costs for obesity-related major diagnostic categories for those who lost weight (from $204 to $131), and again an increase for those who did not lose weight (from $135 to $171), that represents a mean reduction of $108 monthly for weight loss (o-0.017). | "To achieve weight loss and associated morbidity reductions, more extensive and intensive interventions with more attention to motivation and compliance, are required." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Ott et al. 2015 | Lifestyle modification — behavioral health | Prospective cohort study | None reported | Employees of 8 Utah companies participating in the WISTAH Distal Upper Extremity (DUE) cohort and the BackWorks Low Back Pain (LBP) parent studies. Completed study N=146 | Mean age: 49.6 years (+/-10.6)<br><br>50.7% female | Assess if worker characteristics had impact on weight loss and total cholesterol<br><br>Primary outcomes: changes in weight and total cholesterol (TC)<br><br>Measures: demographics, physical activity, dietary intake, height and weight, serum non-fasting TC, low density lipoprotein (LDL), high density lipoprotein (HDL), triglycerides, C- reactive protein, HbA1c levels, and blood pressure | 5 and 10 years | Multivariate linear regression and linear regression models<br><br>Mean TC: significantly lower from baseline to posttest (194.3 +/- 36.3 vs. 182.1 +/- 37.8, p<.0001)<br><br>Mean weight: significantly higher (86.9 +/- 23.6 vs. 90.5 +/- 24.5, p=.003)<br><br>Workers who believed they were overweight or obese at study completion gained significantly more weight (6.7kg increase, p=.02) compared to those who believed they were of normal weight<br><br>Workers who believed their TC levels were “not good” increased their TC levels (17.6 mg/dl, p=.02) than those who indicated “good”<br><br>TC levels among female workers increased more than males throughout the course of the study (16.0 mg/dl, p=.007)<br><br>Eating breakfast <6 times per week was associated with reduced TC levels as compared to eating breakfast everyday (-16.9 mg/dl p=.005)<br><br>TC level changes for workers who indicated “always” feeling depressed (n=2) were significantly higher (112.4 mg/dl, p=.009) than those who indicated “never”<br><br>Workers who indicated “often” having family problems experienced lower TC levels (-36.5 mg/dl, p=.002) compared to those who said “never.” | “This study found the sole characteristic associated with weight gain over the study duration is a belief they are overweight or obese.”<br><br>“Characteristics associated with increases in TC levels over the study duration included: female gender, belief that their TC levels were “not good”, and feeling depressed. Characteristics associated with TC reductions included: having family problems and consuming breakfast <6 times per week.”<br><br>“Results suggest that most of the reported associations with increases in weight and TC levels among production workers are amenable to interventions and may be a target for workplace intervention programs.” | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: |
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| Patel et al. 2016 | Lifestyle modification—behavioral health | Randomized Controlled Trial | Mitesh, Patel, David Asch, and Kevin Volpp were supported in part by the Department of Veteran Affairs. Patel and Asch were also supported in part by the Robert Wood Johnson Foundation. The funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. Patel had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Volpp and Asch are principals at the behavioral economics consulting firm VAL Health.<br>Andrea Troxel serves on the scientific advisory board of VAL Health. Volpp has received consulting income from CVS Caremark and research funding from Humana, CVS Caremark, Discovery (in South Africa), and Merck, none of which is related to the work described in this article. | Employees from the University of Pennsylvania who had a BMI of at least 30, and had health benefits, and met other inclusion and exclusion criteria. N =197<br><br>Control n=50<br><br>Delayed premium discount n=49<br><br>Immediate premium discount n=48<br><br>Daily lottery incentive n=50 | Mean age 44.9 years (+/- 9.8)<br><br>81.7% female | Whether financial incentives would stimulate weight loss goal of 5%.<br><br>Control: no financial incentive<br><br>Delayed premium adjustment group: if met goal, would receive $550 in the form of 26 biweekly premium discounts starting at next year's billing cycle<br><br>Immediate premium adjustment group: If met goal, would immediately start receiving receive $550 in the form of 26 biweekly premium discounts<br><br>Daily lottery group: given daily weight loss goal that would amount to 5% reduction. If achieved, could enter daily raffle to win $10 or $100<br><br>Primary outcome: weight loss at 12 months<br><br>Secondary outcomes: weight loss at 6 months and 5% of baseline weight loss | 12 months | No significant weight loss in any of the intervention groups or control<br><br>Delayed: Mean −2.5 (95%CI: −5.7, 0.7) p=0.44<br><br>Immediate: Mean 0.0 (95%CI: −2.9, 2.9) p=0.81<br><br>Lotto: Mean −0.9 (95%Ci: −3.9, 2.0) p=0.83<br><br>Adjusted multivariate model indicated no difference in weight loss between the study groups or control (p=.49)<br><br>The 5% weight loss goal was achieved by 37 participants in the study (18.8%), but there were no significant differences across the study groups.<br><br>At least 1x/week weigh ins: 50% of premium discount groups at start, never above 20% for the remainder.<br><br>Daily weigh in for lotto group: 90% at beginning, never about 25% for remainder. | "Financial incentives valued at $550 did not improve weight loss outcomes for obese adults after twelve months of participation in a workplace weight loss program, whether the incentives were offered as a premium adjustment (either immediate or delayed) or a daily lottery-based reward. This suggests that employers involved in widespread efforts to encourage employee weight loss would benefit by testing alternatives to a standard premium adjustment approach— such as alternative incentive designs, changes in incentive magnitude, or both." |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Prestwich et al. 2012 | Lifestyle Modification—Behavioral Health | Randomized control trial | No COI declared | 204 local government employees in the UK.<br><br>Mean BMI was 26.3 $kg/m^2$ (SD: 4.9$kg/m^2$) | Mean age of participants was 42.2 years (SD 10.7 years). The majority of the cohort was female (77%). | The primary outcome of interest was weight loss and self-reported physical activity by type of intervention (partner only, implementation intentions, collaborative implementation-intention, neither). | Follow up occurs at 1, 3, and 6 months. | Subjects who had a fitness partner and a plan to increase physical activity (collaborative implementation-intention) were the most physically active at the all three follow ups (all $P<0.05$).<br><br>Collaborative implementation-intention group also lost the most weight and had the greatest reduce in their waist size over 6 months. | "A methodologically rigorous study demonstrated that collaborative implementation intentions promoted physical activity through 1-, 3- and 6-month follow-ups and helped reduce weight at 6 months."<br><br>"In contrast, asking participants to form implementation intentions was largely ineffective, and recruiting a partner to help increase physical activity (without forming collaborative implementation intentions) could be detrimental, relative to other approaches, in the long term." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Procter et al 2014 | Lifestyle Modification-Behavioral Health | Randomized controlled trial | No COI declared | 187 employees (100 in the intervention and 87 in the control arm) in sedentary occupations were identified from the "Walk to work" program | The ages of the participants ranged from 22 to 65 years.<br><br>Females were in the minority among participants (45%). | The primary outcome of interest was the effectiveness of the intervention in encouraging employees to walk to work during the 10 weeks of the intervention | Follow-up occurred post-intervention at 10 weeks | There appeared to be individuals who found each of the 9 Behavior change technique (BCT) employed to be useful in helping them to increase walking to work and those who did not.<br><br>Pedometers offered as an optional self-monitoring tool, were useful for some participants and not for others. Also, the availability of parking was identified as an important barrier to walking to work.<br><br>Walk to work promoters, whose role was to encourage and support participants were trained to understand and use the 9 BCTs utilized in this intervention. However, participants had varying reflections on the adequacy of support provided by the promoters suggesting that additional training to develop skills and competencies by promoters may be needed. | "Walk to work interventions employing BCTs should include sufficient techniques to enable participants to choose a 'package' to suit their individual needs". | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Proper et al. 2013 | Problem of Obesity in the Workplace | Large, population-based study | No declared COI. | 35,022 subjects from the 2008-2009 Netherlands Working Conditions Survey.<br><br>9.4% of the cohort were obese. | Mean age was 39.6 years (SD: 12.1 years).<br><br>Majority of the cohort was male (55%). | The primary outcome of interest was sick leave and emotional exhaustion relative to BMI. | No follow up. | Obesity was associated with increased sick leave prevalence and higher sickness absence rates in men and women.<br><br>Obese workers have a higher risk for emotional exhaustion than healthy weight workers (OR: 1.28, 99% CI: 1.11 to 1.48).<br><br>Emotional exhaustion partially mediates the association between BMI and sick leave. | "The association between BMI status and sick leave can be explained partially by the presence of emotional exhaustion. Workplace health promotion initiatives should take this into account." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion | Comments: |
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| Quist et al 2014 | Lifestyle Modification- Behavioral Health | Prospective cohort study | No COI declared | A cohort of 4730 employees from 250 workgroups in the eldercare health sector | Mean age was 46.46 years (SD 8.86 years) and 48.06 years (SD 8.85years) at baseline and follow- up respectively.<br><br>The majority of participants were female (96.30%). | The primary outcomes of interest were variations in body mass index and variations in leisure time physical activity as a result of the influence of a workgroup for the one year duration of the intervention. | Follow- up was at one year from baseline. | 2.62% of variation in baseline BMI (1.20 to 3.97) was explained by workgroup. Also, 1.11% (0.43 to 6.77) of the variation in leisure time physical activity was explained by workgroup, although only borderline significant.<br><br>Furthermore, change in BMI within the workgroup was found to be associated with average BMI in the group (0.0411, SD 0.02) thereby, weight gain was seen in workgroups with high BMI levels.<br><br>But change in leisure time physical activity was not associated with the average activity level in the group (p=0.8113). | "We found evidence for cluster effects regarding current health behaviors; part of the variation in BMI was explained by workgroups (2.62%)."<br><br>"We found no significant workgroup clustering in physical activity or life-style changes." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Radler et al. 2015 | Lifestyle modification—behavioral health | Prospective cohort study | None reported | University employees who were overweight or obese, and were not pregnant, breastfeeding or within 3 months post-partum. | Mean age: 49.9 years (95% CI: 47.5, 52.3)<br><br>87.3% female | Changes in cardiometabolic risk factors immediately after worksite wellness intervention.<br><br>Participants served as their own controls. Measurements include: BMI, waist circumference, blood pressure, blood glucose, total and HDL cholesterol, cardiovascular disease risk. | Immediately after the 12 week program (within 10-14 weeks from baseline) | Paired sample t test used to detect significant differences<br><br>Significant weight loss (change= -3.64 lbs, $p < .0001$)<br><br>Significant reduction in waist circumference ( -2.41 cm, $p < .0001$)<br><br>Positive correlation between weight change and waist circumference ($r= .571$, $p < .001$) and between lost weight and waist circumference ($r= .5778$, $p <.001$).<br><br>Significant decrease in BMI (change = -.85, $p < .0001$)<br><br>Significant decrease in systolic and diastolic blood pressure (-4.26 mmHg, $p = .014$ and -3.57 mmHg, $p = .001$, respectively).<br><br>Significant reduction in % body fat (-.61, $p = .042$).<br><br>Significant reduction in blood glucose (-7.08 mg/dL, $p <.0001$). | "The results of this study demonstrate that participants experienced significant reductions in cardiometabolic risk factors following baseline counseling and the active intervention phase of the program."<br><br>"The hypotheses that weight and waist circumference significantly improved from baseline to 12 weeks are supported. Similarly, among those who lost weight, changes in percentage body fat, waist circumference, SBP, DBP, and glucose reflected statistically significant improvements."<br><br>"The potential impact of the within-participant improvements in health and reductions in cardiometabolic risk on health care costs and productivity support the value of offering WWPs." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Ranby et al. 2011 | Lifestyle Modification – behavioral health | Randomized Controlled Trial | No COI declared | 397 firefighters participated in the randomized trial. | Average age: 41 years<br><br>Female: 7%<br><br>Male: 93% | Examining the mechanisms by which PHLAME (Promoting Healthy Lifestyles: Alternative Models' Effects), a health promotion intervention, improved healthy eating and exercise behavior among firefighters, a population at high risk for health problems due to occupational hazards.<br><br>"Participants either engaged in a PHLAME intervention with their work shift, or a control condition. Intervention session taught benefits of a healthy diet and regular exercise and sought to improve social norms and social support form coworkers for healthy behavior."<br><br>Five hypothesized mediating variables: knowledge of fruit and vegetable benefits, knowledge of exercise benefits, personally monitoring diet, dietary coworker norms, and exercise support. | A follow-up assessment occurred 1 year post-test. | "At post-team intervention participants had increased their fruit and vegetable consumption as compared to control participants (estimated multiplied effect estimate = 0.2). An increase in knowledge of fruit and vegetable benefits (estimated multiplied effect estimate = 0.025) and improved dietary coworker norms on vegetable consumption (estimated multiplied effect estimate = 0.092) partially mediated these effects." | "[The] findings illustrate how an effective program's process can be deconstructed to understand the underpinnings of behavior change and refine interventions. Further, fire stations may improve the health of firefighters by emphasizing the benefits of healthy diet and exercise behaviors while also encouraging behavior change by coworkers as a whole." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow- up: | Results: | Conclusion: | Comments: |
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| Rolando et al 2013 | Lifestyle Modification- Behavioral Health | Prospective Cohort Study | No mention of COI. | A cohort of 3125 employees were identified from the "Go for the gold" (GFTG) program | Mean age of participants for those who did and did not develop diabetes was 43.6±9.3 and 45.5±8.8 years respectively.<br><br>The majority of participants were female (70.4% and 75.5% for those who did and did not develop diabetes respectively). | The primary outcome of interest was the effect of a change in body weight on the likelihood of developing diabetes among participants of the GFTG program.<br>A secondary outcome of interest was the effect of a change in physical activity and other risk factors on the likelihood of developing diabetes. | Follow- up was at year 4 and again at year 8 from baseline. | Employees who were obese at baseline but lost that risk in years 2-4, were about a quarter as likely to develop diabetes as those who remained obese (2.4% vs. 10.1%; OR 0.22[0.05 to 0.93]).<br><br>In addition, employees who were not obese at baseline, but became obese in years 2-4, were almost 8 times more likely to develop diabetes at follow- up, compared to those who remained non-obese (9.4% vs. 1.2%; OR 8.85 [2.53 to 31.0]).<br><br>There was a dose-response relationship between the number of years a worker remained obese and the likelihood of developing diabetes.<br><br>Employees who were sedentary at baseline but became physically active in the following 3 years reduced their risk of diabetes from 8.1% to 3.5%. A dose-response relationship was also seen with physical activity but this lost its statistical significance after adjusting for other factors. | "Our analysis showed that development of diabetes was influenced primarily by two modifiable risk factors: obesity, and to a slightly lesser degree, physical inactivity" | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Ross and Wing 2016 | Lifestyle modification—behavioral health | Prospective cohort study | Intervention content used in this study has been licensed to commercial partners by Rena R. Wing. The investigators on the project are employees of Lifespan. | Employees or dependents of employees enrolled in worksite wellness program at a healthcare corporation in Rhode Island who met inclusion and exclusion criteria. N=75 | Mean age: 50.76 years (+/-10.38)<br><br>69.3% female | Primary outcome: Weight (kg)<br><br>Also assessed adherence to program, caloric intake, fat intake, and minutes of physical activity | Month 3 (after intervention) and month 6 (follow-up) | Intent to treat analysis was done for all participants.<br><br>Paired samples t-test assessed weight change over time: mean -5.78 kg +/-0.6 kg over 12 weeks $t(74) = -9.70$ $p < .0001$<br><br>From month 3 to month 6: gained mean 1.1 +/- .31 kg $t(74)=3.6$, $p = .009$<br><br>53.3% of participants maintained a weight loss of ≥5% 3 months after end of intervention<br><br>Participants who viewed 8 of the 12 lessons experienced weight loss ($r= -.319$, $p = .009$<br><br>Reporting body weight (83.24% of the time), reporting caloric intake (82.44% of the time), and reporting physical activity (80.37% of the time) was associated with weight loss ( $r= -.362$, $p = .034$; $r = -.374$, $p = .030$; $r = -.409$, $p = .014$, respectively) | "The current study demonstrated that a 12-week, Internet based weight loss intervention can be successfully implemented in a workplace setting and produce clinically significant weight losses."<br><br>"Both the number of video lessons viewed and adherence to self-monitoring (via self-monitoring of weight, caloric intake, and physical activity) were significantly associated with weight loss at the end of the intervention." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Rouseff et al. 2015 | Lifestyle Modification – behavioral health | Prospective cohort study | No COI declared. | This study was conducted among 230 employees of Baptist Health South Florida with high cardiovascular disease (CVD) risk.<br><br>Employees were considered at high risk and eligible for the study if they had two or more of the following cardio-metabolic risk factors: total cholesterol ≥200 mg/dl, systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg, hemoglobin A1C (HbA1c) ≥6.5%, body mass index (BMI) ≥30 kg/m2. | Participants at baseline were largely female (78%) with mean age of 48 years. | This is a single group, pre- and post-effectiveness study of an ongoing multi-component workplace health promotion intervention aimed at improving cardio-metabolic health among employees at a large healthcare organization.<br><br>The MyUP program is an intense lifestyle modification program that is targeted at the individual needs of the participants. | This study details the cardio-metabolic outcomes of an intense 12-week workplace lifestyle intervention program, the My Unlimited Potential (MyUP), conducted in a large healthcare organization.<br><br>Measurements were taken at baseline, 12 weeks, 6 months, and 1 year after entering the program. | There was significant reduction in the average BMI (35.3 to 33.7, p<0.001), weight (96.3 to 92.3, p <0.001) and body fat percentage (39.8 to 38.6 p<0.001) over the 12-week period, although these changes were modest.<br><br>There was sustained reduction of BMI (-1.2 (95% CI -0.9, -1.5)), weight (-3.3 (95% CI -2.5, -4.2)), and body fat percentage (-0.7 (95%CI -0.4, -1.0)) at 12 months, although not as large as seen at 3 and 6 months.<br><br>At the end of 12 weeks, 47% had achieved weight loss of 5% or more from their baseline weight. This figure increased to 51% at 6 months then declined to 31% at 1 year. Only 1% achieved weight loss of 10% or greater at the end of 12 weeks however by 6 months, this had increased to 15% and at 1 year 9% had lost ≥10% of their baseline weight.<br><br>Over the 12-month period, there was significant reduction in the prevalence of BMI>35 kg/m2 from 43% to 34% (P=0.007).<br><br>Over the 12-month period, 27 participants (18%) had reduction or discontinuation of their medication (antihypertensive, antidiabetic and lipid lowering medication) by the program's ARNP or their primary care providers because of improvements in their blood glucose, blood pressure, or lipid profile. | "This intensive 12-week lifestyle change program was successful at improving cardiometabolic risk factors at 1 year. This study provides a template for other workplace programs aimed at improving CVD risk in high-risk employees." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Rubinstein et al 2016 | Lifestyle Modification - Behavioral Health | Randomized controlled trial | Funding by US National Institutes of Health and Medtronic Foundation. No mention of COI. | 637 individuals (316 and 321 in the intervention and usual care groups respectively) with systolic blood pressure between 120-137mmHg, diastolic blood pressure between 80-89 mmHg or both were identified from healthcare centers. | Participants were aged 30 to 60 years. | The primary outcome of interest is mean between-group difference in systolic and diastolic blood pressure from baseline to 12 months. Secondary outcome measures were changes in body weight, waist circumference and target behaviors from baseline to 12 months | Follow-up was at 12 months from baseline | The intervention did not affect change in systolic or diastolic blood pressure (mean net change -0.37mmHg [-2.15 to 1.2] and 0.01mmHg [-1.29 to 1.32] respectively) compared with usual care.<br><br>But there was a significant net reduction in body weight (-0.66kg [-1.24 to -0.07]) and intake of high fat and high sugar foods (-0.75 [-1.30 to -0.20]) in the intervention group compared to the control group.<br><br>Furthermore, participants in the intervention group had increased intake of fruits and vegetables and a decrease in diets high in sodium, fat, and simple sugars relative to control group participants.<br><br>Intervention group participants who received >75% of the calls saw a greater reduction in body weight (-4.85[-8.21 to -4.18]) and waist circumference (-3.31[-5.95 to -0.67]) than control group participants. | "Our mHealth-based intervention did not result in a change in blood pressure that differed from usual care, but was associated with a small reduction in bodyweight and an improvement in some dietary habits." | |

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| Sakane et al. 2012 | Lifestyle modification—behavioral health | Randomized controlled trial | None reported | Overweight and obese males in 8 healthcare offices of 3 enterprises, and met inclusion and exclusion criteria.<br><br>N=216 | Mean age: 45 years<br><br>100% male | Compare the effects of a web-based weight- loss program alone or together with measurement and awareness of visceral fat on weight loss<br>Outcomes: waist circumference (WC), dietary and physical activity behaviors.<br><br>Control group, web-based weight loss program, and Web+VFA (visceral adiposity measured by bioelectrical impedance and awareness of visceral adiposity) | 3 months | The mean 3-month weight losses were 0.7, 1.9, and 2.8 kg, respectively.<br><br>Decreases in WC were -0.1, 1.7, and 3.3 cm, respectively.<br><br>Dietary and physical activity behaviors in the Web+VFA group improved compared to the Web and control groups | "Our findings suggest that measurement and awareness of visceral fat are effective in weight reduction in overweight and obese males in the workplace." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Salinardi et al. 2013 | Lifestyle modification—behavioral health | Randomized controlled trial | None reported | 2 intervention worksites and 2 delayed intervention control worksites<br><br>Intervention employees with BMI >25.0 kg/$m^2$ meeting inclusion and exclusion criteria, N=84<br><br>Control employees N=34 | Intervention: mean age: 48.6 years (+/- 1.2)<br><br>75% female<br><br>Control: mean age: 49.0 years (+/-2.1)<br><br>76% female | Compare a multicomponent lifestyle weight-loss intervention for worksites. Focused on changing dietary intake and eating behavior patterns.<br><br>Primary outcome: change in body weight compared between intervention and control<br><br>Secondary outcome: changes in cardiometabolic risk factors (blood pressure, fasting glucose, triglycerides, and total, LDL and HDL cholesterol). | 6 months from baseline, and 6 months later after conclusion of weight loss maintenance program | ANCOVA analysis demonstrated:<br><br>Weight loss mean: intervention changed -8.0 +/- .7 kg compared to control change of +.9 +/- .5 kg (p<.001)<br><br>Mean BMI: intervention change (-2.8 +/- .2) compared to control (+.3 +/- .2), p < .0001<br><br>No significant weight gains in the follow up structured maintenance program (0.5 +/- 0.7 kg; p = 0.65)<br><br>Systolic blood pressure (mmHg): intervention change significantly more than control (-9 +/- 2) and (6 +/- 2) respectively (p < .0002)<br><br>Diastolic blood pressure (mmHg): intervention change significantly more than control (-8 +/- 1) and (-1 +/-1) respectively (p = .001)<br><br>Total cholesterol (mg/dL): intervention change significantly more than control (-13 +/- 3) and (1 +/- 4) respectively (p=.02)<br><br>Glucose (mg/dL): intervention change significantly more than control (-6 +/- 2) and (6 +/- 4) respectively (p < .001). | "This RCT, which evaluated a worksite weight-loss intervention that was offered free of cost to overweight and obese employees, measured significant effects of the intervention on body weight and cardiometabolic risk factors over 6 mo."<br><br>"In conclusion, this study shows that worksites can be successful locations for the implementation of interventions that cause substantial mean weight loss and improve cardiometabolic risk factors." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Sammito 2013 | Lifestyle modification—behavioral health | Prospective cohort study | None reported | German military servicemen and servicewomen with BMI greater than 30 kg/$m^2$, or greater than 27 kg/$m^2$ and one risk factor for cardiovascular disease N=665 | Mean age 40.0 years (+/- 9.4)<br><br>95% male | Assess the Obesity Intervention Program of the German Army on its ability to enhance physical activity, adjust diet behavior, and reduce risk factors<br><br>Measured BMI, waist circumference, blood analysis, physical capacity, diet, | 3, 6, 9, 12, 18, 24 months | ANOVA analysis and paired samples t-test indicate significant changes from baseline to 24 months:<br><br>Bodyweight, kg: baseline: 109.8 ± 16.5 to 106.7 ± 16.6 p <.0001<br><br>BMI kg/$m^2$: 33.8 ± 4.2 to 32.9 ± 4.4, p < .0001<br><br>Waist Circumference, cm: 112.0 ± 11.2 to 108.9 ± 11.8 p < .0001<br><br>Physical capacity, W: 223.8 ± 49.8 to 234.4 ± 52.2 p < .0001<br><br>Systolic blood pressure, mmHg: 140.0 ± 16.4 to 135.5 ± 15.9, p <.0001<br><br>Diastolic blood pressure, mmHg: 89.3 ± 10.4 to 86.7 ± 10.3, p <.0001<br><br>Cholesterol, mmol/L: 5.40 ± 1.07 to 5.27 ± 1.02, p<.0001<br><br>Triglyceride, mmol/L: 2.10 ± 1.51 to 1.91 ± 1.44, p <.0001<br><br>Only 20% of the program remained after 12 months | "In this study, a significant improvement for all examined parameters for participants in the outpatients intervention trial was found."<br><br>"Furthermore, our study showed the simultaneous increase in physical fitness due to changes in lifestyle, consisting of increased physical activity and adjusted diet."<br><br>"Although the calculation of the economic benefits is difficult, such results underline the positive outcome of an interdisciplinary intervention structure." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Schuna et al 2014 | Lifestyle Modification-Behavioral Health | Randomized controlled trial | No COI declared | A cohort of 41 employees (21 in the intervention group and 20 in the control group) with a BMI≥25kg/m2 were identified from a workplace setting | Mean age of participants was 40.1 ± 10.1 years.<br><br>The overwhelming majority of participants were female (98%). | The primary outcome of interest was a change in physical activity and sedentary behavior after a 3 month intervention. Secondary outcomes were changes in BMI, body fat percentage and body mass. | Follow-up was at 3 months from baseline | The intervention group when compared with the control group, increased daily steps (1622 steps/day; P=0.013) and light physical activity (1.6 minutes/hour; P=0.008), and decreased sedentary time (−3.6 minutes/hour; P=0.047) during working hours.<br><br>The differential group changes in ambulatory behavior appeared to be driven by increases in time spent at stepping rates of 40 to 99 steps/minute (purposeful steps, slow walking, and medium walking) in the intervention group.<br><br>There was no significant differences in BMI, body mass and body fat percentage between the intervention and control groups. | "Among the intervention group, treadmill desk use in the workplace was associated with increases in ambulatory behavior during the full day (steps/day) and working hours only (steps/day and steps/minute) relative to the control group." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Scoggins et al. 2011 | Lifestyle Modification—Behavioral Health | Prospective, Cohort Study | No COI declared | 7840 health plan members completed an HRA every year from 2006-2011.<br><br>Mean BMI was 27.9 $kg/m^2$ at the beginning. | Mean age at the start was 47.2 years.<br><br>Half of the cohort was male (50.2%). | The primary outcome of interest was weight management from the Health Incentives wellness program in King County, Washington. | Follow up occurred annually from 2006-2011. | Relative to the control, the 5-year cohort also lost weight on average from 2006 to 2011 (−0.47%, P<0.01) but not as much as participants in their first year. (-0.80%, P=0.01).<br><br>More obese first-year subjects lost 5% of their body weight than the control group, (28.5% vs. 23.2%; P<0.01). Over 5 years of the program, 38.0% of obese participants lost at least 5% of their body weight. | "Healthy Incentives achieved significant weight management benefits for both first-year and 5-year participants."<br><br>"To be successful, weight management programs must be convenient and affordable for participants." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: |
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| Seely et al. 2013 | Lifestyle modification—behavioral health | Randomized controlled trial | Kieran Cooley has provided expert advisory commentary on microbiota for gastrointestinal health for Bayer. He holds grants from the Canadian Complementary and Alternative Medicine Research Fund, the Lotte and John Hecht Memorial Foundation, SickKids Foundation, HomeoNet Research Fund, the Interdisciplinary Network of Complementary and Alternative Medicine Research Fund and the First Nations Inuit Health Branch, Health Canada. Heidi Fritz has received payment for manuscript preparation from Integrative Healthcare Practitioners. Serenity Aberdour is scientific advisor for SISU, a distributor of natural health products. Patricia Herman has received consulting fees and payment for writing or reviewing manuscripts from the Canadian College of Naturopathic Medicine. Philip Rouchotas has served as a consultant for Nutritional Fundamentals of Health and is Editor-in-Chief of Integrated Healthcare Practitioners. Ryan Bradley has served as a consultant for Standard Process and has been employed by the Diabetes Action Research and Education Foundation. No competing interests declared for Dugald Seely, Orest Szczurko, Craig Herrington, David Lescheid, Tara Gignac, Bob Bernhardt, Qi Zhou and Gordon Guyatt. | Members of the Canadian Postal Union, who met inclusion and exclusion criteria (not pregnant, 6 mo. history of myocardial infarction, liver or kidney disease)<br><br>Control n = 122<br><br>Intervention n=123 | Not reported | Effects of naturopathic care on cardiovascular disease.<br><br>Control: Enhanced usual care (usual care plus biometric measurement)<br><br>Intervention: Enhanced usual care plus naturopathic care, health promotion counseling, nutritional medicine or dietary supplements<br><br>Measured: body weight, waist circumference, lipid profile, fasting glucose levels, and blood pressure.<br><br>Primary outcome: changes in 10 year risk of cardiovascular disease (using Framingham risk algorithm) and metabolic syndrome (using Adult Treatment Panel III diagnostic criteria) | 1 year | Repeated measures showed:<br><br>Proportion with metabolic syndrome in control group was 48.48% and the proportion in the naturopathic group was 31.58%, reflecting a risk reduction of –16.90% (95% CI – 29.55% to –4.25%); p= 0.002.<br><br>Cardiovascular risk: the proportions were 10.81% in the control group and 7.74% in the naturopathic group, a risk reduction of – 3.07% (95% CI – 4.35 to –1.78%); p < 0.001. | "We found a significant reduction in the risk of cardiovascular disease following counselling about nutritional and physical activity provided by naturopathic doctors."<br><br>"The baseline-adjusted prevalence of metabolic syndrome was reduced by 16.9% over the course of 1 year in comparison to enhanced usual care alone."<br><br>"We have shown that naturopathic care is a feasible and potentially effective adjunct to usual medical care in reducing the incidence of metabolic syndrome and cardiovascular risk." |

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| Shurney et al 2012 | Lifestyle Modification-Behavioral Health | Prospective comparative study | No COI declared | 21 adult employees with a clinical diagnosis of type 2 Diabetes mellitus | The age range was 35 to 65 years. Majority of the participants were female (18 of 21). | The primary outcome of interest is changes in biometric and laboratory data including body weight, HBA1C, LDL, HDL, cholesterol and triglycerides at 8 weeks, and again at 26 weeks from baseline.<br><br>Additionally, a wellbeing assessment which included physical health and healthy behaviors was also of interest. | Follow up was at 8 weeks from baseline at the end of the CHIP intervention, and again at 26 weeks from baseline to document both immediate and long- term changes in health outcomes and health risk behaviors. | 54.17% of participants lost an average of 9.4lbs (median 7 lbs) while 37.5% of them had gained an average of 13.7lbs (median 9.4 lbs).<br><br>There were favorable changes in laboratory data among participants. Mean changes from baseline values were: HBA1C (0.9, 0.5); LDL (20.9, 30.6); HDL (3.0, 5.7); total cholesterol (28.2, 30.0); triglycerides (36.8, 54.0), at 8 weeks and 26 weeks respectively.<br><br>There was no change across the healthy behaviors category but a statistically significant change in self-reported physical health (mean % change=14.5%, 36.4%) and overall wellbeing (mean % change=7.4%, 16.2%) indices at 8 weeks and 26 weeks respectively at p values ≤0.01. | "Positive changes were seen among study participants in HBA1C and cholesterol results as well as positive changes in self-reported physical health and well-being". | |

HBA1C= glycated hemoglobin; LDL= low density lipoprotein; HDL= high density lipoprotein; CHIP= the complete health improvement project

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| Silberman et al. 2011 | Lifestyle Modification—Behavioral Health | Prospective Cohort Study | No mention of COI | 43,035 adult employees (38,767 participated in the obesity intervention). | Mean age was 44.5 years (SD: 11 years).<br><br>The majority of the cohort was female (74%). | The primary outcomes of interest were improvements in health status and productivity impairment before and after Web-based interventions (specific for either management of weight, chronic pain, insomnia, or depression). | Follow up occurred after 30, 90, and 180 days after using the program. | For all interventions (weight, pain, sleep, depression), over 50% of subjects reported improvements at all follow ups.<br><br>Improvements in employee health were associated with reductions in employee productivity impairment (all $P<0.05$). | "The use of Web-based health promotion programs was associated with reductions in productivity impairment and improvements in employee health. After the implementation of Web-based health promotion programs, reductions in productivity impairment may be observed before reductions in direct health care costs." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Sliter and Yuan 2015 | Lifestyle modification — behavioral health | Randomized Controlled Trial | None reported | Undergraduate students at a large, Midwestern university N=180<br><br>Sitting n=47<br><br>Standing n=44<br><br>Cycling n=38<br><br>Walking n=51 | Average age: 21.22 years (+/- 3.99)<br><br>66% female | Assess differences in task stress and arousal, task boredom, task satisfaction, performance, BMI, exercise habits based on type of workstation: seated workstation, standing workstation, walking workstation, and cycling workstation. | After 35 minute performance assessment | Between subject ANOVAs and Bonferroni post hoc tests indicated:<br><br>Walking participants reported significantly higher arousal when compared to both the seated ($M_D$ = .34, $p < .001$) and standing ($M_D$ = .30, $p < .001$) conditions.<br><br>Cycling participants also reported significantly higher arousal compared with seated ($M_D$ = .44, $p < .001$) and standing ($M_D$ = .39, $p < .001$)<br><br>Walking participants reported significantly less boredom when compared with seated ($M_D$ = -.48, $p < .001$) and standing ($M_D$ =-.45, $p < .001$) conditions<br><br>Cycling participants reported less boredom than those in the seated ($M_D$ =-.52, $p < .001$) and standing (MD=-.48, $p < .001$)<br><br>Walking participants reported significantly lower stress when compared to the seated ($M_D$=-.57, $p < .001$) or standing ($M_D$=-.38, $p < .01$)<br><br>Walking participants reported significantly greater satisfaction ($M_D$= .41, $p < .05$) than standing<br><br>Cycling participants performed significantly lower ($M_D$ =-16.97, $p < .05$) than standing participants | "Results from the current laboratory study suggest that physical activity—via the use of active workstations—is associated with increased psychological arousal and decreased boredom."<br><br>"Moreover, walking led to lower levels of appraised task stress compared with sitting or standing."<br><br>"In addition, the use of walking workstations was also associated with higher task satisfaction."<br><br>"Active workstations, based on our first-step, pilot study may be a viable mechanism for promoting both physical and psychological health at work without causing decrements in performance." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Smith et al 2015 | Lifestyle Modification - Behavioral Health | Prospective cohort study | No mention of COI. | 22 overweight and obese office workers aged 18-60 years were identified from a worksite | The majority of participants were male (54.5%) | The primary outcome of interest was the effectiveness of ergonomically improved equipment at improving work tasks and reducing body discomfort among obese and overweight workers after the intervention | Follow-up was done post-intervention at 6 weeks from baseline. | All participants reported significant increases in their ability to type for long periods of time before getting uncomfortable especially significant among obese participants (t 3.56, P=0.004).<br><br>After switching from their standard work keyboard to an alternative keyboard, all participants reported significant decreases in lower back discomfort (t 2.14, P =0.044); although obese participants reported significant decreases in both upper (t 2.46, P= 0.032) and lower (t 2.39, P= 0.036) back discomfort.<br><br>There was no reduction in performance after the alternative keyboard was introduced. However, typing performance measures somewhat declined among obese participants even though they scored better than their overweight counterparts in performance tests at 3 and 6 weeks. Overweight participants, on the other hand, had more typing errors but increased typing performance measures. | "A major conclusion worthy of further study is the fact that workers reported liking the new keyboard and that it was associated with reduced body discomfort, which have worker productivity and cost implications". | |

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| Solenhill et al. 2016 | Lifestyle modification--Behavioral Health | Randomized controlled trial | None reported | Employees of four Swedish transportation companies N=981<br><br>Control: n=357<br><br>Web: n=301<br><br>Web + telephone: n=324 | Total average age 44 years (+/- 10.2)<br><br>66.7% male | Evaluate the effect of web-based health feedback and offered telephone coaching versus no health feedback or telephone coaching on improved health<br><br>Primary outcome: BMI<br><br>Secondary outcomes: eating breakfast, carbohydrates intake, sugar intake, saturated fats intake, unsaturated fats intake, physical activity (days and minutes per week), stress feelings, sleeping, alcohol consumption (time and drinks/week), smoking and snuff behaviors | Nine months post baseline | Follow-up: Intervention groups significantly decreased motivation<br><br>Web: **p** <.001 for change in diet; **p** <.001 for change in physical activity<br><br>Web + telephone: **p=** .007 for change in diet; **p** <.001 for change in physical activity<br><br>Control: Started receiving health feedback at follow-up. Significant increase in motivation to change (**p** <.001 for change in diet; **p** <.001 for change in physical activity)<br><br>No significant differences in health outcomes | "The results from this randomized Web-based intervention suggest no significant health improvements from tailored Web-based health feedback and the offering of optional telephone coaching, in comparison to no health coaching among employees in the Swedish transport industry."<br><br>"However, our findings point toward an impact of automatic tailored health feedback on increased motivation to change behaviors. More specifically, at baseline, the intervention groups receiving feedback reported higher motivation to improve dietary and physical activity habits compared with the control. At follow-up, all the groups received feedback, but only the control group, now receiving feedback, reported an increased motivation to change dietary and physical activity habits. It may thus be proposed that tailored health feedback positively alters participants' motivation to engage in healthier lifestyle habits, but, the effect does not last over time, not even if the feedback is offered again." | |

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| Terry et al 2011 | Lifestyle Modification - Behavioral Health | Prospective cohort study | No mention of COI | 1298 overweight or obese employees recruited from worksite settings | Mean age of participants was 45.1 years (SD 10.0 years).<br><br>The majority of participants were female (53.9%). | The primary outcomes of interest are body weight, body mass index and lifestyle behaviors at the end of the telephone based weight-management coaching program | Follow-up was at one year from baseline | Program completers lost an average of 2.6 times more weight than non-completers (21.25 kg vs.20.49 kg, respectively), with an average weight loss of 6.6 kg (SD 7.7kg) among program completers who lost weight.<br><br>In addition, the highest effect of the program was seen on participants' physical activity with 55.5% of completers increasing their weekly amount of moderate or vigorous physical activity, compared to 42.4% of non- completers (p=0.019), and 41.7% and 37.2% of program completers reporting increased moderate and vigorous activity respectively.<br><br>Program completers had significantly fewer risks on average compared to non-completers at follow-up (3.77 vs 4.17, respectively; p=.026) despite having a similar number of risks at baseline (4.11 vs. 4.25 respectively).<br><br>Completers were more likely to report increased fruit or vegetable intake and increased whole grains intake (48.2% vs 41.2% and 38.3% vs 33.3% respectively) though these results were not statistically significant. | "For participants successful in losing weight, the magnitude of weight loss along with the significant improvements in physical activity and nutrition practices suggests that completing a telephone-based weight management program of modest intensity can have a positive impact on the weight and health of obese or overweight worksite participants" | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion | Comments: |
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| Thorndike et al 2011 | Lifestyle modification- Behavioral health | Prospective cohort study | No COI declared | 757 employees were identified from the Be Fit wellness program.<br><br>At baseline, 63% were obese (BMI>30) or overweight (BMI 25-29.9) | Mean age of participants was 42 years. The majority of the cohort are female (91%). | The primary outcome of interest was change in cardiovascular risk factors after a 10 week program and a year from baseline. | Follow-up was done at the end of a 10 week program and again at 1 year from baseline. | Mean weight loss during the program differed significantly by baseline BMI category and was 1.9 kg at end of program ($p<0.001$) and 0.4 kg at 1 year ($p=0.002$).<br><br>Participants in the obese and overweight categories reported fewer hours of physical activity per week than normal weight participants<br><br>Also, at the end of the program, participants who were obese lost 3.0% body weight vs. 2.7% for overweight and 1.7% for normal weight participants ($p<0.001$), but weight loss at 1 year did not differ by BMI. | "Because their baseline cardiovascular risk was higher, the obese and overweight employees may be less likely to experience long-term clinical benefit than normal weight employees, despite achieving similar absolute reductions in cardiovascular risk factors".<br><br>"More intensive interventions are needed to make significant improvements in the health of higher risk, obese employees". | |

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| Thorndike et al. 2012 | Lifestyle Modification—Behavioral Health | Randomized controlled trial | No COI declared | 330 employees at Massachusetts General Hospital.<br><br>27% of participants were classified as obese (BMI≥30 $kg/m^2$). | Mean age of participants was 43.0 years (SD 12.7 years). The majority of the cohort was female (86%). | The primary outcomes of interest were weight loss, physical activity duration, and frequency of consumption of fruits/vegetables, fatty foods, and sugary foods relative to intervention type (internet contact vs personal contact with a nutritionist or personal trainer). | One year follow up after completion of study. | Compared to baseline, both groups lost weight during the 10-week program and maintained 65% of weight loss at 1 year ($p<0.001$).<br><br>There was no difference in weight loss between groups at end of the 10-week program or end of 1 year.<br><br>Weight, BMI, waist were significantly lower (all $P<0.001$) and total and LDL cholesterol moderately lower ($P<0.05$) for both groups at 10 weeks and 1 year. Blood pressure was lower for both groups at 10 Weeks ($P<0.01$).<br><br>All subjects had improvements in physical activity and nutrition at 1 year ($P<0.001$) but did not differ by group. | "An intensive 10-week team-based worksite exercise and nutrition program resulted in moderate weight loss and improvements in diet and exercise behaviors at 1 year."<br><br>"A 9-month maintenance intervention immediately following the 10-week program did not improve 1-year outcomes more than usual care. The Internet-based maintenance program did appear to be effective for the subset of participants who actively participated in the program, but overall usage of the website was low." | |

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| Vermeer et al. 2011 | Lifestyle Modification—Behavioral Health | Randomized control trial | No COI declared | 308 consumers at worksite cafeterias.<br><br>6.9% of subjects were obese. | Mean age of subjects was 39.2 years (SD: 11.3 years)<br><br>Half of the cohort was male (50%). | The primary outcomes of interest were daily sales of small and the total number of meals, consumers' self-reported compensation behavior and frequency of purchasing small meals. | Follow up occurred monthly for four months with cafeteria sales. Consumers completed surveys before, during, and after the study period. | The ratio of small meals sales in relation to large meals sales was 10.2%.<br><br>19.5% of the participants who picked a small meal frequently purchased more products than usual in the cafeteria.<br><br>Women ($P<0.001$) were more likely to purchase small meals.<br><br>No effect of proportional pricing was found. | "Offering smaller meals in addition to the existing size did help a relevant group of consumers to reduce their food intake."<br><br>"In worksite cafeterias proportional pricing was not effective." | |

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| Verweij et al. 2012 | Impact of Workplace Obesity | Randomized Controlled Trial | No COI declared | 16 occupational physicians and 523 employees in the Netherlands between 2009 and 2011 were involved in the study, making a total of 539 subjects. | Average age: 47 years<br><br>Male: 63%<br><br>Female: 37% | Comparing guideline- based care to usual care among occupational physicians and employees. Occupational physicians in the intervention group followed the draft guideline by providing advice to employers on how to assess and intervene on the obesogenic work environment and conducted five face-to-face behavioral change counseling sessions with employees to improve their lifestyle. Data of employees were collected by questionnaire and physical measurements at baseline and follow- up. Linear and logistic regression analyses were performed to determine effects." | 6-month follow-up occurred for further data collection. | "The intervention showed significant effects on sedentary behavior at work (-28 min/day) and on fruit intake (2.1 pieces/week). No significant intervention effects were found for physical activity, sedentary behavior in leisure time or during weekend days." | "Guideline-based care resulted in a more favorable sedentary behavior at work and increased fruit intake but did not improve employees' physical activity, snack intake or body weight-related outcomes." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Verweij et al. 2013 | Lifestyle modification — behavioral health | Randomized controlled trial | None reported | Occupational physicians- to deliver the intervention or usual care. Employees of medium or larger size companies who did not comply with daily physical activity recommendations, were overweight, and were not on sick leave or pregnant.<br><br>Control: care as usual (n=9 occupational physicians) (N=249 employees)<br><br>Intervention: guideline based care. (n=7 occupational physicians) (N=274 employees) | Intervention: 62% male. Mean age: 46 years (+/- 8)<br><br>Control: 65% male. Mean age: 48 years (+/- 9) | Effectiveness of an occupational health practice guideline aimed at preventing weight gain among employees compared to usual care. Guideline consisted of prevention at environmental level, prevention at the individual level, and evaluation and maintenance.<br><br>Outcomes: body weight-related factors, cardiovascular disease risk factors, and quality of life. | Environmental and individual- 6 months<br><br>Outcomes measured at 6, 12 and 18 months | No significant differences found for intervention changes in BMI (ββ 0.1, 95% CI -.3 - .5), waist circumference (ββ 1.2 95% CI -.6 – 2.9), or body weight (ββ .3 95% CI 1 —1.6)<br>CVD: No significant differences found for intervention for systolic (ββ 1.7, 95% CI -2.4-5.8) or diastolic blood pressure (ββ .3, 95% CI -1 – .6), or total serum cholesterol (ββ 0 95% CI -.2 – .2).<br><br>Quality of Life: no significant differences found for intervention. Health today (ββ 1.0, 95% CI -.8 – 2.8), Health in general (OR 1.0 95% CI .6 – 1.6). Pain (OR 1.1 95% CI .7 – 1.7). However self-care was positive (OR 3.2 95% CI .8 – 14.0). | "The draft occupational health guideline was not effective in preventing weight gain, reducing CVD risk factors, or improving quality of life during 18-months follow-up among the intervention compared to the control group. Thus, we cannot recommend implementation of the guideline in its current form." | |

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| Weinhold et al. 2015 | Lifestyle modification—behavioral health | Randomized Controlled Trial | None reported | University employees 18-65 years old with prediabetes<br><br>Experimental (n=35)<br><br>Usual care control (n=33) | Age 18-65 | Assess a 16-week group based lifestyle intervention adapted from the Diabetes Prevention Program led by a university dietitian/health coach.<br><br>Measures: Dietary intake and physical activity | 3 months | Repeated measures ANOVA:<br><br>Mean % weight loss:<br><br>Significantly greater for experimental than control: (-5.50 +/- 0.63% vs. -0.35 +/- 0.49%; P<0.0001)<br><br>Mean change in fasting glucose significantly greater for the experimental than control group (-8.62 +/-1.55 mg/dL vs. -3.66 +/- 1.58 mg/dL; P=0.02)<br><br>Significant difference between groups for the change in systolic and diastolic blood pressure and intake of total fat, fiber, and sugars (all P<0.05)<br><br>Experimental group: change in weight was negatively associated with total number of sessions attended (r=-0.60; P<0.001). | "The findings indicate that it is feasible to implement an intensive lifestyle intervention at the worksite and the intervention facilitated weight loss and risk reduction for type 2 diabetes. Sustainability and cost effectiveness of the intervention require further research." |

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| Widmer et al. 2016 | Lifestyle modification—behavioral health | Prospective cohort study | Authors Keane and Dallas are employed by CareHere, LLC, but had no financial contribution to the study | Employees whose employers have a health care plan with CareHere, LLC<br><br>Total N= 30,974<br><br>No use n=14,173<br><br>Very low use (<12 logins/year) n=12,260<br><br>Monthly use n=3,630<br><br>Weekly use n=651<br><br>Semi-weekly use n=260 | Total mean age 48.1 years (+/-11.7)<br><br>42.4% male | Efficacy of the work health program, Digital Health Intervention (DHI), on weight change, BMI, waist circumference, blood pressure, lipids, and blood glucose | 1 year | Higher level of participation significantly associated with greater mean weight loss. (change, delta from increased frequency, p)<br><br>None (+2.34)<br><Monthly (+1.47, -0.87±0.32, p=0.007)<br>Monthly (-.25, -1.71±0.37, p<0.001)<br>Weekly (-1.83, -1.59±0.67 p = 0.018)<br>Biweekly (-5.24, -3.39±1.06 p=0.0013)<br><br>Increased used significantly associated with mean glucose change:<br><br><Monthly (-2.70)<br><br>Monthly (-4.37, -1.67±0.74 p = 0.025)<br>Increased used associated with mean change in systolic blood pressure<br><br>Monthly (-1.43)<br>Weekly (-2.56, -1.13±0.88, p = 0.20)<br><br>Increased use associated with mean change in HDL:<br><br>Monthly (-.08)<br>Weekly (+.90, 0.98±0.69 p = 0.15)<br><br>Poisson regression model indicates that women, on average, tended to have 3.07 more total log-ins (p< 0.001) than men | "Participants using the DHI with greater frequency have more pronounced weight loss and improvements in blood pressure as well as in lipids."<br><br>"These results show promise in implementing employer-sponsored programs in an effort to ameliorate the nation-wide burden of CVD, and provide insight into the demographics behind those who are successful with such programs." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion | Comments: |
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| Wier et al 2012 | Lifestyle Modification-Behavioral Health | Randomized controlled trial | No COI declared | 524 individuals (275 to intervention and 249 to control) with unhealthy physical activity and/or dietary behavior or who were overweight. | Mean age of participants was 47 years (SD 8.7 years).<br><br>The majority of participants were male (65%). | The primary outcome of interest was a change in baseline waist circumference, with change in body weight being a secondary outcome. | Follow up measurements were done at 6 months, at the end of the intervention period and again at 12 months and 18 months. | Compared with the control group, the intervention group gained 1.6 cm (0.27 to 2.90) in waist circumference and 1.1 kg (0.01 to 2.15) in weight. | "An occupational health care guideline to prevent weight gain among employees had unfavorable effects on weight-related out-comes". | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Williams et al 2014 | Lifestyle Modification – Behavioral Health | Randomized controlled trial | The 3W Program was funded by NHLBI Grant No. 5R01HL079505. No mention of COI. | 1207 hotel employees (intervention 598, control 610), with baseline body mass index (BMI) ≥25kg/$m^2$ were identified from the Work, weight and wellness (3W) study. | Mean age of participants was 46.11(SD 10.16) years in control hotels and 46.0 (SD 9.65) years in intervention hotels.<br><br>The majority of participants were female (50.16% and 53.34% in control and intervention hotels respectively) | The primary outcomes of interest were rate of change in BMI and waist to height ratio (WHtR) at the end of the intervention. | Follow-up was at 1 year from baseline and again at 2 years from baseline when intervention ended. | Mean BMI of participants at control hotels was virtually unchanged during 12 months and increased by 0.12kg/$m^2$ during 24 months. In contrast, mean BMI at intervention hotels decreased by 0.10kg/$m^2$ and 0.28kg/$m^2$ during 12 and 24 months respectively.<br><br>Mean WHtR decreased among employees by 0.28 and 0.17 during 12 and 24 months, respectively, at control hotels, and by 0.55 and 0.72 during 12 and 24 months respectively at intervention hotels. | The effects of the 3W program on change in BMI and WHtR were in the expected direction, but were not statistically significant.<br>The 3W program did not reduce the BMI or WHtR of overweight and obese hotel employees". | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Wilson et al. 2016 | Lifestyle Modification | Randomized controlled trial | No COI declared. | A total of 649 employees across the three sites completed baseline data collection with 418 included in the final analyses.<br><br>The employee populations ranged from 881 to 2532 city/county government employees from of three large counties in Georgia. | Participants were mostly female (61%) and the mean age was 46.62 years. | The study employed an experimental control group design with the three study sites randomly assigned to one of three conditions: telephone coach, small group coach, self-study (control).<br><br>The primary objective of the adapted Fuel Your Life (FYL) program was similar to DPP—to facilitate weight loss (7% of body weight) while fostering healthy eating and physical activity of participants.<br><br>The primary outcomes of body mass index and weight were examined in a randomized control trial conducted with city/county employees. | Data were collected at baseline, 3 months (midpoint), 6 months (posttest), and 12 months (follow-up). | Average weight was 212 lb and BMI was 33.6 kg/m2, indicating a very obese / overweight sample (64% with a BMI 30 kg/m2 or greater).<br><br>Although the majority of participants in all three groups lost some weight, the phone group lost significantly more weight (4.9 lb), followed by the small groups (3.4 lb) and the self-study (2.7 lb). Of the total participants, 28.3% of the phone group, 20.6% of the small group, and 15.7% of the self-study group lost 5% or more of their body weight.<br><br>At the end of the 6-month intervention, 76% of participants in the phone group, 68% in the small group, and 68% in the self-study group had lost some weight. By the end of the 6-month maintenance period, the percentages of successful participants had dwindled to 70%, 63%, and 60%, respectively.<br><br>The phone condition lost 3.9 lb (0.6 kg/m2 BMI) during the first half of the intervention and another 1.7 lb (0.3 kg/m2 BMI) during the second half for a total of 5.6 lb over the intervention period. Both of these changes (baseline to midpoint and midpoint to posttest) were statistically significant.<br><br>All groups lost weight during the first 3 months, with the self-study gaining more of it back by follow-up and the phone and small groups demonstrating better maintenance. | "Fuel Your Life (DPP) can be effectively disseminated using different implementation strategies that are tailored to the workplace."<br><br>"These results suggest that the FYL translation of the DPP using phone and small group formats was effective for weight loss in employed populations. Although overall outcomes were at a lower level than the original clinical trial of DPP, the results were meaningful enough to have a significant impact on population health." | |

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| Wilson et al. 2016b | Benefits of Addressing Obesity in the Workplace | Prospective cohort study | No COI declared. | For the formative study, 11 workplace representatives who were contacted agreed to participate in a series of individual or small group interviews.<br><br>For the feasibility trial of Parents Working Together (PWT) intervention, nine participants participated in the study at the pilot site. | Of the 11 workplace representatives interviewed for the formative study, all were female (100%).<br><br>For the PWT feasibility trial, of the nine participants who remained in the study, 5 were male fathers (55.6%) and 4 were mothers. | This study involved two phases. The objective of the first phase was to explore interest in and preferred delivery mode of a workplace program that addresses general parenting and health behaviours.<br><br>The objective of the second phase was to adapt and test the feasibility and acceptability of a pre-existing program that has been successfully run in community settings for parents in their workplace. The program was tested using a pre/post uncontrolled feasibility trial<br><br>The aim of the PWT intervention was to deliver a program integrating general parenting and health behaviour messaging as an effective childhood obesity prevention strategy in the workplace. | The present study tested the program using a pre/post uncontrolled feasibility trial with employees of a large manufacturing company.<br><br>The PWT intervention consisted of 7 sessions delivered over 7 weeks.<br><br>Baseline surveys were provided to employees at the initial recruitment session and final surveys were provided at the end of week 7. | Results from the qualitative phase showed that a workplace parenting program that addresses general parenting and health behaviour messages is of interest to workplaces.<br><br>Results from the feasibility trial suggest that PWT is feasible and well received by participants; attendance rates were high with 89 % of the participants attending 5 or more sessions and 44 % attending all 7 sessions offered.<br><br>All participants stated they would recommend the program to co-workers. Just over half of our parent participants were male (55.6 %), which is a unique finding as the majority of existing parenting programs engage primarily mothers.<br><br>Impact evaluation results suggest that changes in children's and parents' weight-related behaviours, as well as parents' reports of family interfering with work were in the desired direction post-intervention; however, confidence intervals substantially overlapped zero.<br><br>Contrary to expectations, parents also reported an increase in restrictive feeding practices. | "Our results indicate that a workplace-based program that addresses general parenting skills and weight-related behaviours may be a feasible way to engage and educate parents, including fathers. A full-scale trial is needed to examine the effectiveness of this approach." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Wilson et al. 2016 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Participants were 200 adult employees from the Union Pacific Railroad. | Participants had a mean age of 39.7 years (SD, 11.6) and 93.5% were male. | The present study aims to evaluate the translation of the Diabetes Prevention Program, an evidence-based weight management program, to a worksite setting and determine program effectiveness.<br><br>The Core Components of the Fuel Your Life (FYL) intervention were weight loss and physical activity goal based behavioral intervention, ”lifestyle coach” delivery, frequent contact, individual tailoring of the intervention, materials and strategies for an ethnically diverse population, and network support for the interventionists. | Data were collected at baseline, 3 months (midpoint), 6 months (posttest), and 12 months (follow-up).<br><br>The primary outcomes were BMI and weight, and secondary outcomes were food intake and physical activity. | At baseline, the average BMI was 30.6.<br><br>From T1 to T2, the control group BMI increased from 29.7 to 29.97 (F=5.968 p=.018). The BMI for the FYL group decreased from 31.87 to 31.84 (F=.510 p=.477) The BMI for the Intervention 2 group decreased from 30.17 to 29.98 (F=10.466 p=.002).<br><br>From T1 to T2, the control group weight (lbs) increased from 200.8 to 203.0 (F=5.175 p=.028). The weight for the FYL group decreased from 218.5 to 218.1 (F=.485 p=.488) The weight for the Intervention 2 group decreased from 208.8 to 207.4 (F=9.083 p=.004).<br><br>In terms of categorical weight loss, 68.1% of control, 47.4% of FYL, and 37.9% of Intervention 2 participants experienced zero weight loss or weight gain.<br><br>23.4% of control, 44.2% of FYL, and 56.9% of Intervention 2 participants experienced 0.0% - 4.9% weight loss.<br><br>8.5% of control, 6.3% of FYL, and 5.2% of Intervention 2 participants experienced 5.0% - 9.9% weight loss.<br><br>2.1% of FYL intervention participants experienced 10% or more weight loss. | FYL intervention was effective for some employees, but overall just helped participants maintain weight.<br><br>Lifestyle coach providing support, resources, and accountability was a key component of the intervention. | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Yang et al. 2012 | Lifestyle Modification—Behavioral Health | Simulation | No mention of COI | 612,332 adult smokers enrolled in the TRICARE Prime health plan in 2008 | Current smokers were aged 18-64. No data reported on mean or sex of cohort. | The primary outcomes of interest were lifetime disease risk, medical expenditures, and life expectancy if smokers were to quit smoking with or without weight gain. | No follow up. Study used simulation model. | Smoking cessation reduces life time risk for many diseases.<br><br>Smoking cessation with weight gain would increase average life expectancy by 3.7 years. The average lifetime reduction in medical expenditures from improved health ($5,600) would be offset by additional expenditures resulting from prolonged life ($7,300).<br><br>Relative to smoking cessation with weight gain, smoking cessation without weight gain slightly increases life expectancy by four months and extra spending of $700 due to prolonged life. | "Although the permanent cessation of smoking appears not to substantially affect aggregate medical expenditures, because savings from reduced disease incidence are offset by increased expenditures from prolonged life, the study finds substantial improvements in health and longevity."<br><br>"The gains of cessation for smokers and society far outweigh the relatively small estimated net increases in lifetime health care costs." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Zinn et al. 2012 | Lifestyle Modification | Prospective comparative study | No COI declared. | Overweight and obese employees at two New Zealand worksites (n = 102) received the 12-week intervention. | Among those who completed the intervention-plus-maintenance, 70% of participants were male and the average age was 45 (11) years.<br><br>For noncompleters of the intervention-plus-maintenance, 71% of participants were male and the average age was 42 (11) years.<br><br>Among those who completed the intervention-only, 39% of participants were male and the average age was 47 (11) years.<br><br>For noncompleters of the intervention-only, 60% of participants were male and the average age was 37 (10) years. | This New Zealand–based 12-month quasi-experimental study comprised a small-changes intervention conducted in one organization with two geographically separate, but similar sites.<br><br>Both sites participated in the same novel 12-week weight loss initiative. During the remaining 9 months of the study, the intervention-plus-maintenance group received a maintenance component whereas the intervention-only group did not.<br><br>Maintenance-phase participants received a series of mini interventions addressing aspects of nutrition, physical activity, and behavior change over a subsequent 9-month period. | Both study sites received the 12-week intervention and one site received an extra 9-month weight-maintenance component.<br><br>Data for all outcome measures were taken at baseline, 12 weeks, and 12 months for both groups. | Both groups showed modest weight loss during the initial 12 weeks, when the same intervention was applied (ie, 3.8% to 3.9%).<br><br>Despite the incorporation of a maintenance component in one of the groups, both groups were able to maintain their weight equally well during this time (-6% vs. -7% at 12 weeks and -11% vs. -10% at 12 months for intervention-plus-maintenance and intervention only, respectively.<br><br>The small reductions in absenteeism over the 12-week and the 12-month periods in the intervention-plus maintenance group both represented unclear effects. This group did show a small, improvement in work performance over 12weeks, but the change was trivial over 12 months. In contrast, the intervention-only group increased absenteeism a trivial amount at 12 weeks and a small amount at 12 months, representing possibly, and likely, harmful effects, respectively.<br><br>The differences between groups in the change in absenteeism at 12 weeks and the change in work performance at both time-points were small; however, effects were unclear. For absenteeism at 12 months, there was a moderate, likely beneficial, change for the intervention-plus-maintenance group relative to the intervention-only group. | "The small-changes intervention has been successful in bringing about sustained weight loss, irrespective of the inclusion of a maintenance component. We believe that this approach should be exploited more widely in future weight loss maintenance interventions; we endorse the simultaneous use of behavior change strategies to facilitate these small changes in the three key areas of diet, exercise, and mindfulness of health behaviors. Further investigation to better understand the impact of weight loss interventions on productivity outcomes is warranted." | |

**ACOEM Evidence Table: Lifestyle Modification – Diet/Nutrition**

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Appleton and Baker 2015 | Lifestyle modification—Diet/nutrition | Prospective Cohort Study | None reported. Funding provided by Bournemouth University, UK | Mentally and physically healthy, non-smoking, students who were not on an energy restrictive diet. (N= 16) | Age: 18-22 years<br><br>100% female | Hunger, distraction, mood and perceived work performance on two consecutive fasting days was recorded. Compared to recorded hunger, distraction, mood and perceived work performance two earlier and two subsequent consecutive non-fasting days. | Two days of not fasting, two days of fasting, and two days of not fasting. One week between days of measurement, for a total of three weeks. | Used repeated measures ANOVA and regression analysis.<br><br>When analyzed alone, higher positive mood was associated with non-fasting rather than fasting on the second day of measurement (β = 18.67, 95% CI = 13.77, 23.57, p < 0.01).<br>Inclusion of hunger and distraction variables removed influence of not fasting (β = 1.38, 95% CI = −8.59, 11.35, p = 0.77). Higher positive mood was associated with lower current distraction (β = −0.38, 95% CIs = −0.46, −0.29, p < 0.01).<br><br>When analyzed alone, greater perceived work performance was associated with non-fasting vs fasting (β = 23.19, 95% CIs = 12.11, 34.27, p < 0.01). Inclusion of hunger and distraction variables removed influence of not fasting (β = −1.13, 95% CI = −18.24, 15.99, p = 0.89).<br><br>Greater perceived work performance was associated with lower current distraction (β = −0.25, 95% CI = −0.47, −0.03, p = 0.03) and lower whole day distraction (β = −0.49, 95% CI = −0.74, −0.24, p < 0.01). | "In conclusion, this study demonstrated impacts of fasting on mood and perceived work performance in association with distraction, where poorer positive mood and poorer perceived work performance on fast days compared to non-fast days were associated with higher distraction, as opposed to the act of fasting or higher hunger."<br><br>"This study thus suggests that intermittent fasting offers no benefits for mood or perceived work performance over traditional dieting as a result of reduced distraction during fast days." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Backman et al. 2011 | Lifestyle modification — Diet/nutrition | Randomized Controlled Trial | None reported. Funding from Preventive Health and Health Services Block Grants of the Centers for Disease Control and Prevention. | Low wage workers (average of $7.75/hr) at worksites that were part of the Worksite Wellness Los Angeles program but had not yet received food wellness information.<br><br>Intervention worksites (n= 391)<br><br>Control worksites (n=137) | Not all identified as male or female, so totals were not given. For intervention group: 164 were female with mean age of 33.2 years (+/- 8.8) and 135 were male with mean age 32.6 years (+/- 8.3).<br><br>Control: 84 were female with mean age 33.4 years (+/- 8.9) and 46 were male with mean age 33.9 years (+/- 10.1). | Fruit and vegetable consumption, job satisfaction, perceived health of low wage workers who work at a location that receives fruit deliveries 3 times a week. Compared to fruit and vegetable consumption of workers who work at locations that did not receive fruit deliveries. | Assessed at 4 weeks, 8 weeks, and 12 weeks after baseline | Growth curve analysis found that intervention participants showed a significant increase in fruit (slope coeff= .09, p = .02), vegetable (slope coeff=.09, p < .01), and total fruit and vegetable (slope coeff= .13, p <.01) consumption as a result of the intervention, and the control did not.<br><br>Statistically significant increases in self-purchasing of fruit (slope coeff = .16, p < .01) and family purchasing of vegetables (slope coeff = .14, p < .01) in intervention.<br><br>Perceived health: self-efficacy for eating 2 servings of fruit daily increased significantly in the intervention compared to the control (slope coeff= .18, p = 0.03) | "The results of this study demonstrate that improving access to fruit during the work day has a positive effect on fruit and vegetable consumption, fruit purchasing habits, family vegetable purchasing habits, and self-efficacy for fruit consumption among low income workers."<br><br>"As business owners and worksite wellness professionals consider health promotion benefits for employees, the findings of this study may help inform future decisions about the role a fruit snack program could play as part of a comprehensive worksite wellness approach." | |

| Author/ Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Lake et al. 2016 | Lifestyle Modification -- Diet/ Nutrition | Randomized Controlled Trial | None reported | Regional local government office employees. N=409<br><br>Intervention- Daily access to free fruit n=206<br><br>Control- No fruit n=203<br><br>N= 23 face to face interviews were conducted with intervention group members | Of those interviewed, 73% were women. 60% were women in the total intervention group. No other demographic data was given | Face to face interviews were conducted with intervention members to gather information food availability at the workplace. Also asked about their participation in the intervention, their work environment, and any perceived changes in behavior as a result of the intervention, in particular if they were eating more fruit. | At the end of the 18 week intervention | Nine themes from the interviews were:<br><br>The workplace food environment and eating habits<br>• Respondents indicated it was cheaper and more time efficient to bring their own lunch to work and avoiding queuing in the canteen. The canteen was associated with queuing, having cooked meals and lack of availability of healthier choices.<br>Perceived behavior changes: Effect of the intervention on participants<br>• The majority agreed that participation in the intervention meant they were eating more fruit.<br>Perceived behavior changes: Other health behaviors<br>• In addition to eating more fruit respondents saw their participation in the study as a way to initiate other health behaviors<br>Effect of the intervention on others<br>• Aside from their colleagues, respondents noted that their partners and children were eating more fruit as a result of them taking part in the study<br>Fruit consumption<br>• There was a large proportion of the respondents who perceived the study as an opportunity to have the fruit that they were already consuming supplied to them without incurring any cost.<br>Reasons for not taking part<br>• There was a range of reasons given including reflections on personal characteristics<br>Expectations after the intervention ends<br>• Trying to maintain the healthy behaviors developed during the intervention seemed important to some participants<br>Sustainability of the intervention<br>• Given that the expectation to receive free fruit would not be realistic, one respondent suggested that the council provide more fruit in the canteen and at a reduced price<br>How to make the workplace healthier<br>• There was an acceptance that with flexi-time, people were not going to want to 'waste' time getting food. Therefore, the solution would be to make desk-based eating healthier | "This research has highlighted participants' perspectives on an intervention in the UK workplace setting, adding considerably to the few qualitative studies that exist around food in the workplace."<br><br>"Individuals had perceived some behavior changes related to their participation in a fruit intervention, changes included increases in the variety of fruit consumed, healthier eating, increasing physical activity. Some reported eating more fruit at home, while a minority saw fruit as a week-day food. Participants had concerns about the sustainability of these changes once the intervention stopped."<br><br>"These findings will be used to help design and develop future workplace dietary interventions." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Sihvola et al. 2013 | Lifestyle modification — Diet/ Nutrition | Randomized controlled trial | None reported | Healthy Finnish men and women who met inclusion and exclusion criteria. (N = 10) | Median age = 26 years (range 22-40)<br><br>70% female | Comparison between drinking a high whey protein breakfast drink (HP), a high carbohydrate drink (HC), or a placebo drink on: subjective mental workload (measured by mental, physical and temporal demand, performance, effort and frustration), sleepiness, mood (negative- measured by tension, fatigue, obliviousness, depression, irritability, inefficiency, and insecurity. Positive- measured by vigor and well-being), heart rate, and biochemical measurements. | Took follow up measurements on 3 test days of work simulation (WS), between 60 and 180 minutes post ingestion of drink. Each test day was separated by one week | Mental workload: ANOVA test showed no difference between groups for either work test (p = .46 and p = .67)<br><br>Sleepiness: Median change in sleepiness observed in HC (-1.5 (IQR -2.0 to -0.13), HP (-0.4, (IQR -1.3–0.28) and control (-0.5 (IQR -1.5–0.79). Pairwise comparisons indicate that there was a significant difference in HC and control drinks (p = 0.021).<br><br>Mood states: Feeling of well-being significantly reduced after control drink compared to HP drink (Wilcoxon signed-rank test p = 0.028<br><br>Heart rate: ANOVA pairwise comparison showed that heart rate Increased more after drinking the control drink than after the HC (p = 0.025) and HP (p = 0.017) drinks<br><br>Biochemical: 2 hours after drinking, plasma Trp:LNAA increased 30% more HC and HP than the control drink. (p < 0.001) | "The breakfast drink with whey protein or carbohydrates significantly attenuated the increase in heart rate during the WS compared with the control drink. In addition, carbohydrates reduced subjective sleepiness during the WS, whereas whey protein increased the feeling of well-being when compared with the control drink." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Thorndike et al. 2016 | Lifestyle Modification--Diet/Nutrition | Randomized Controlled Trial | None reported | Employees of Massachusetts General Hospital who used their platinum plate dining card (direct payroll deduction)<br><br>Social norm feedback n=853<br><br>Social norm feedback plus small financial incentives n=898<br><br>Control n=858 | Control<br>18–30 24%<br>31–40 28%<br>41–50 21%<br>50 and over 26%<br><br>72% female<br><br>Feedback only<br><br>18–30 23%<br>31–40 28%<br>41–50 22%<br>50 and over 24%<br><br>73% female<br><br>Feedback-incentive<br><br>18–30 21%<br>31–40 29%<br>41–50 22%<br>50 and over 26%<br><br>72% female | Compared the effectiveness of providing employees with social norm feedback and a small financial incentive on healthy foods purchases.<br><br>Social norm feedback: received four letters depicting personal and company food purchasing graphs<br><br>Social norm feedback plus small financial incentives: potential to receive $10 credit towards food purchases if purchased healthy foods (labeled "green" foods)<br><br>Control: Not sent any information<br><br>Outcomes: sales data regarding food purchases. | 3, 6 months post baseline | Post-hoc analysis of baseline "green" food purchases separated individuals into quartiles, with number 4 being the healthiest purchases<br><br>At the end of the intervention compared to baseline: larger increase in "green" food purchases in feedback-incentive arm (2.2%, P = 0.03) and borderline in the feedback-only arm (1.8%, P = 0.07) compared to control (0.1%) the two intervention arms were not significantly different from each other.<br><br>Fourth quartile: Significant increases in "green" food purchases in feedback-only (+4.9%, p<.05) and feedback-incentive (+5%, p< .01) groups First quartile: no significant changes in "green" food purchases<br><br>Employees from the healthiest quartile earned a higher number of rewards than employees in the least healthy quartile (1.3 vs. 0.8 rewards, p < 0.001), but the mean value of rewards earned per employee per month was similar ($8.47 vs. $8.40, p = 0.82) | "Our results demonstrate that social norms plus small financial incentives increased employees' healthy food choices over the short-term."<br><br>"Although absolute changes were small, this relatively "light touch" intervention resulted in a significant shift toward healthier food purchases by a large group of employees who had not sought out a healthy eating or wellness program."<br><br>"However, future research will be needed to assess the impact of this relatively low-cost intervention on employees' food choices and weight over the long-term." | |

## ACOEM Evidence Table: Lifestyle Modification – Exercise/Increased Physical Activity

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Bantoft et al. 2016 | Lifestyle Modification – Exercise/ Increased Physical Activity | Randomized controlled trial | No COI declared. | Participants were 45 young adult undergraduate students from the University of Tasmania. | Participants were mostly female (71%, n=31) and the sample had an average age of 22.67 years (SD = 6.27 years). | The present study examined the effect of working while seated, while standing, or while walking on measures of short-term memory, working memory, selective and sustained attention, and information-processing speed.<br><br>Two sit-stand workstations were used in this study. The first was an active workstation with a treadmill attached to the base. The second was a sit-stand workstation that could be adjusted electronically to either a sitting or a standing height.<br><br>The test battery included two screening tests and six cognitive assessments. | Participants completed three sessions each occurring at the same time of day, spaced at 7-day intervals.<br><br>In the first session, participants completed the demographic questionnaire screening tests, followed by the complete cognitive assessment battery while the participant was using the desk in the assigned position for each condition.<br><br>In Sessions 2 and 3, participants completed all tests in the cognitive assessment battery with the exception of the Wechsler Test of Adult Reading.<br><br>Completion of the cognitive test battery took less than 60 minutes. | One-way repeated-measures ANOVAs for all hypotheses returned nonsignificant results with small effect sizes (Hospital Anxiety = .03 and Depression Scale = 0.8; Letter Number Sequencing = .05; Choice Reaction Time = .04; Paced Auditory Serial Addition Task = .001; Digit Span forward = .04; Digit Span backward = .004; Digit Symbol Coding = .03; Stroop Incongruent trial = .02),<br><br>Small effect sizes indicate no change in performance on cognitive tests associated with alterations to work position for up to 1-hr periods. | "The results of the present study utilizing a fully counterbalanced within-subjects design detected no change in cognitive function observed in healthy younger adults who work while sitting, standing, or walking." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Bellicha et al. 2016 | Lifestyle Modification – Exercise/ Increased Physical Activity | Prospective cohort study | None reported | Employees at two distinct buildings of the same multinational company<br><br>Number of employees at worksite during Intervention: n=812 ± 5<br><br>Number of employees at worksite during control period: n= 597 ± 5 | Intervention mean age 43.4 years<br><br>58% female<br><br>Control mean age: 43.5 years<br><br>59% female | Evaluate short and long term effectiveness of a stair climbing health promotion program<br><br>The intervention group received health promotional material regarding stair climbing, and the stair counted was located at the entrance of the building.<br><br>The control building did not received motivational information and the stairs were located behind closed doors and did not have natural lighting.<br><br>Used an unobtrusive counter to count all individuals that climbed the stairs | Short term follow-up immediately after the two intervention phases.<br><br>Medium term follow-up 3 months after intervention phases<br><br>Long term follow-up 7 months after intervention phases | Second intervention phase: stair climbing significantly increased by +18.7 % at the intervention site and decreased by -13.3% at the control site. The difference between sites was significant (+4.6 counts/day/100 employees at the intervention site compared to the control site, (95% CI: 2.3;6.9) $p < 0.001$).<br><br>Stair climbing returned to baseline level during short, medium and long- term follow-ups at the intervention site, but decreased significantly at the control site (-9.6 and -13.8 %, during medium and long-term follow-up, respectively). The difference between sites during long-term follow-up was significant (the intervention effect was +2.9 counts/day/100 employees, (95% CI: 0.5;5.4) $p = 0.019$)<br><br>Process evaluation: first intervention phase was described as **"**difficult**"** by two employees and **"**rather difficult**"** by two others. The point-of-choice for communication suggested by the research team was dedicated to corporate communications and was therefore considered inappropriate for promoting stair climbing.<br><br>Second phase: described as **"**rather easy**"** or **"**rather difficult**"** by 3 and 1 employees, respectively. They found that installation and removal of stickers required time and workforce investment. | "Stair climbing significantly increased at the intervention site by 19 % during the second intervention phase, while it decreased at the control site."<br><br>"The main barriers to adoption and implementation were related to location and visibility of posters. Process evaluation was useful for identifying such barriers throughout the study and for finding appropriate solutions." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Bergouignan et al. 2016 | Lifestyle Modification--Exercise/ Increased Physical Activity | Prospective Cohort Study | Raphaela O'Day is employed as the Associate Director of Behavioral Science at Johnson & Johnson Health and Wellness Solutions and is a shareholder of Johnson & Johnson. Janeta Nikolovski is employed as the Associate Director of Platform Innovation at Johnson & Johnson Consumer Inc. and is a shareholder of Johnson & Johnson. Jack Groppel is employed as the Co-Founder and Thought Leader of the Johnson & Johnson Human Performance Institute and is a shareholder of Johnson & Johnson. Chris Jordan is employed as the Director of Exercise Physiology at Johnson & Johnson Human Performance Institute and is a shareholder of Johnson & Johnson. The other authors declare no conflicts of interest. | Sedentary individuals N=30 | Average age 30 years (+/- 5.6)<br><br>70% female | Compared the effects of 5-minute bouts of moderate-intensity physical activity performed every hour for 6 hours (MICRO) to a 30-min continuous bout of moderate intensity physical activity performed early in the morning (ONE), and to a control (SIT).<br><br>Outcomes: self-reported energy, cognitive function, fatigue and mood levels, urinary concentration of epinephrine, norepinephrine and cortisol, changes in perceived hunger and appetite | 3 weeks | % time sitting- SIT: 93 ± 6 % ONE: 84 ± 10 % (mean difference = 9.6 ± 1.7, 95 % CI [5.5; 13.8], $p < 0.0001$) and MICRO: 85 ± 4 % (mean difference = 8.2 ± 1.7, 95 % CI [4.0; 12.4], $p < 0.0001$)<br><br>Physical activity conditions significantly raised the mean heart rate over the day from average 70.2 ± 9.7 bpm in SIT to 78.3 ± 9.9 and 80.3 ± 11.6 bpm in ONE and MICRO, respectively ($p < 0.0001$ for both).<br><br>Participants reported feeling significantly more vigorous in both ONE (mean difference = −2.1 ± 0.7, 95 % CI[−3.9; −0.3], $p = 0.01$) and MICRO (mean difference = −2.8 ± 0.7, 95 % CI [−4.6; −1.1], $p < 0.0001$), compared to SIT.<br><br>Subjects reported feeling less fatigued, weary, bushed and sluggish after walking 5 min every hour than when remaining seated the whole day ($p < 0.05$ for all) MICRO vs SIT (mean difference = 2.0 ± 0.6, 95 % CI [0.5; 3.4], $p = 0.004$) | "Both physical activity interventions replaced time spent seated by time spent walking at moderate intensity. Both interventions improved self-perceived energy levels over the day and vigor at the end of the day, compared to uninterrupted sitting. The multiple short bouts of activity furthermore improved mood throughout the day and reduced feelings of fatigue in the late afternoon."<br><br>"Based on these findings, occupational health initiatives may want to introduce physically active breaks during the workday routine, as they are likely to increase workers' well-being and energy, without detrimentally impacting worker performance." | |

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| Blankenship et al. 2014 | Lifestyle Modification—Exercise/Increased Physical Activity | Randomized controlled trial | No COI declared. | 10 overweight or obese participants were enrolled from the Amherst, MA area. | Mean age of participants was 51.9 years (SD 15.4 years). The majority of participants were female (80.0%). | The primary outcomes of the study were to compare the effects of adding continuous exercise to a sedentary day (AGW) versus reducing sedentary time by subtracting sitting (FLB, equal energy expenditure or FSB, lower energy expended) on fasting and postmeal glucose and insulin concentrations.<br><br>To compare measures of glycemic variability and postprandial glycemic response across all conditions, linear mixed model regressions with repeated measures were performed with planned contrasts. | Participants completed each of the 3 study conditions (AGW, FLB, and FSB) during an 8 hour day at their workplace in a counter-balanced order with at least 7 days between conditions. | Glycemic variability was lower in FLB compared with AGW ($p < 0.05$), and nocturnal duration of elevated glucose (>7.8 mmol/L) was shorter after FLB (2.5 ± 2.5 min) than AGW (32.7 ± 16.4 min) or FSB (45.6 ± 29.6 min, $p = 0.05$). | "When energy expenditure was matched, breaks from sitting approximated the effects of moderate intensity exercise on postmeal glucose and insulin responses and more effectively constrained glycemic variability."<br><br>"Although these results should be confirmed in more comprehensive trials and in populations with established cardiometabolic disease, the initial interpretation suggests that frequent breaks from sitting of sufficient duration may be more effective to reduce glycemic variability than 1 bout of exercise for sedentary individuals." | |

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| Buchholz et al. 2012 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective cohort study | No COI disclosed. | 123 overweight or obese participants from a free clinic were enrolled in the study, and 23 (19%) completed all 6 months. | Mean age of returning participants was 46.65 years (SD 10.48 years). The majority of the cohort was female (89.0%). | The primary outcome of interest was the change in body mass index (BMI) among adherents to a monthly 30 minute nutrition and physical activity health promotion intervention after 6 months.<br><br>Paired comparison t tests were used to identify differences in BMI from baseline to 6 months for the entire sample, the full adherers, and partial adherers. A Student t test was used to examine differences between the full adherers and partial adherers on BMI change scores. | Baseline data were collected prior to the intervention, and final data were collected after completion of the 6 month intervention. | There was a modest but significant decrease in BMI from baseline to 6 months for the full adherers ($t = 2.37$, $P = .027$). The BMI change score from baseline to 6 months was higher for the full adherers than for the partial adherers. | "This feasibility study demonstrated that a moderate-intensity nurse counseling intervention was modestly effective in decreasing BMI in those participants who were able to fully adhere to the visits." | |

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| Chaput et al 2015 | Lifestyle -- Behavioral | Prospective Cohort Study | None declared | N=293 | Ages 18-65 (mean 39)<br><br>55% women, 45% men | Workers across levels of standing time at work:<br>rarely/never (n=97)<br>Half the time (n=66)<br>Most of the time (n=57)<br>All the time (n=73) | 6 years | Standing time associated with lower incidence of overweight/obesity (13.8% among those standing all the time versus 21.2% among those standing rarely/never) and of impaired glucose tolerance/type 2 diabetes (10.6% among those standing all the time versus 15.8% among those standing rarely/never).<br><br>Increased standing time compared to decreased standing time also associated with lower incidence of overweight/obesity (17.7% vs 22.3%) and impaired glucose tolerance/type 2 diabetes (9.6% vs 17.1%) .<br><br>However, none of these associations were significant after adjustment for covariates (age, sex, smoking habit, income, caloric intake, physical fitness) | "Greater occupational standing time alone is not sufficient in and of itself to prevent the development of overweight/obesity and impaired glucose tolerance/type 2 diabetes in adults." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Chau et al. 2016 | Lifestyle Modification--Exercise/ Increased Physical Activity | Prospective cohort study | AS has received payment from Eli Lilly, the Pharmacy Guild of Australia, Novo Nordisk, and the Dietitians Association of Australia for seminar presentations at conferences. She is also the author of The Don't Go Hungry Diet (Bantam, Australia, and New Zealand, 2007) and Don't Go Hungry For Life (Bantam, Australia, and New Zealand, 2011) | Customer care employees at a telecommunications company N=31<br><br>Intervention: received the sit-stand desk n=16<br><br>Control: no change n=15 | Total mean age 33.0 years (+/- 10.8)<br><br>45% female | Compared the effects of using sit-stand desks on worker productivity, sitting and physical activity.<br><br>Used an inclinometer and accelerometer to measure sitting and physical activity, as well as self-reported information. Productivity measured by time spent on calls, time spent talking, time spent on hold, time spent wrapping up call, attendance, and sick leave, as well as self-reported information. | 1, 4, 19 weeks | Intervention at 1, 4, 19 weeks significantly reduced sitting time (min/day):<br>1: −64 (95% CI: −125, −2) p=0.049<br>4: −74, (95% CI: −142, −11) p=0.027<br>19: −100 (95% CI: −172, −29) p=0.009<br>control group showed no significant changes differences between groups were non-significant<br><br>Intervention at 1, 4 weeks significantly increased standing time (min/day)<br>1: +73, (95% CI: 22, 123) p=0.008<br>4: + 96 (95% CI: 41, 150) p=0.001<br>Changes were significantly different to those observed in the control group<br>1: mean difference 78 (95% CI: 9, 147) p=0.034<br>4: mean difference 95 (95% CI: 15, 174) p=0.025.<br><br>Weeks 1, 4, and 19: no significant changes from baseline in objectively measured productivity outcomes<br><br>The intervention group expressed significantly stronger agreement at Week 19 than at baseline that they were able to sustain their energy levels throughout the workday (mean 3.2 (SE .11) F=6.44 p=0.02). | "The results of the Opt to Stand study demonstrate that providing sit-stand desks for customer care (call center) workers can increase standing time at work without negatively affecting their productivity, as measured by objective, organization-specific metrics, and self-report."<br><br>"Using sit-stand desks also did not result in differing perceptions about work conditions, energy levels, and positive feelings, although the intervention group did give stronger indication of feeling more sustained energy levels throughout the workday after using sit-stand desks." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Dalagar et al. 2016 | Lifestyle Modification—Exercise/ Increased Physical Activity | Randomized Controlled Trial | No COI declared | 387 office workers were enrolled and randomized to either a treatment group TG (*N* = 193) or a control group CG (*N* = 194). | Mean age of participants was 44 years (SD 10 years). The majority of the cohort was female (74%). | The primary outcome of interest was the change in cardiorespiratory fitness (CRF) expressed as $VO_2$max, and secondary outcomes were body composition, blood pressure and blood lipid profile.<br><br>All measurements at baseline were performed before the randomization and repeated after 1 and 2 years.<br><br>Analyzes of intervention effects for primary and secondary outcomes were done using analysis of covariance (ANCOVA). Per protocol analysis was performed for those participants in the treatment group who had an adherence of minimum 70%. | The training program lasted 1 hour a week for 2 years, the first year was fully supervised and in the second year, monthly supervision of a weekly training session was provided. | The intention to treat analysis showed statistically significant changes between TG and CG. TG ≥ 70 % had a significantly lower absolute $VO_2$max (3.1 ± 0.9 vs 3.4 ± 1.1 l/min) as well as relative $VO_2$max (34.4 ± 9.8 vs 37.9 ± 12.2 ml/min/kg). LDL cholesterol level was significantly higher in those with a high adherence compared with those with an adherence below 70% (3.1 ± 0.9 vs 2.8 ± 0.8 mmol/l), as well as the HDL cholesterol level was significantly lower (1.6 ± 0.5 vs 1.7 vs 0.5 mmol/l).<br><br>In the per protocol analysis, comparing TG ≥ 70 % with CG, had a significantly higher increase in absolute $VO_2$max compared with CG, with an increase of 16.7 ± 22.9%. Relative $VO_2$max increased significantly more in TG ≥ 70 % compared with CG with an increase of 14.4 ± 20.4%.TG ≥ 70 % had a significantly larger reduction in systolic blood pressure compared with CG, with a reduction of 3.6 ± 10.7 vs 0.8 ± 10.1 %. | "The major finding of this study was significantly increased CRF among office workers after 1 year of workplace health promotion including increased levels of physical activity."<br><br>"Clinical relevant improvements were demonstrated in CRF and systolic blood pressure, which is of vital importance and underlines the effectiveness of health promotion implementing physical exercise training interventions at the workplace." | |

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| Dalager et al. 2016 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Office workers from six companies were randomized 1:1 to a training group, TG (N = 194) or a control group, CG (N = 195). | Females accounted for 74 % of the sample and on average the participants were 44 ± 10 years old. | The present study aims to assess 1-year cardiovascular health effects of Intelligent Physical Exercise Training, IPET.<br><br>The training program was based on baseline health check measures of cardiorespiratory fitness (CRF), body composition, blood pressure, blood profile, and musculoskeletal health.<br><br>In short, the exercise training program was performed during working hours, at or nearby the working place, and the training was implemented in Invited cooperation with the employer. The training program lasted 1 h a week for 2 years, the first year was fully supervised and in the second year, monthly supervision of a weekly training session was provided. | The study was a 2 years parallel group, examiner-blinded, randomized controlled trial.<br><br>The primary end-point was 1 year, during the first year the training at the workplace was supervised every week and in addition self-training for 30-min, 6 days a week, was recommended.<br><br>During the second year, the aim was to maintain the increase in CRF and training supervision was given only once a month.<br><br>The present paper reports 1-year intervention effects. The enrolment was sequential in six strata from May 2011 to March 2012, with baseline, 1 year, and 2 years follow-up measures. | Participants had an average weight of 74.2 ± 16.6 kg, a BMI of 25.4 ± 5.1 kg/m2 and a fat percentage of 31.9 ± 7.9 % for females and 21.2 ± 6.0 % for males.<br><br>There were no baseline differences between groups. Cardiorespiratory fitness (CRF) assessed as VO2max in absolute values and relative to body weight was (mean ± SD): 3.0 ± 0.8 l/ min and 35.4 ± 10.9 ml/min/kg for females, 3.9 ± 1.0 l/ min and 37.9 ± 11.79 ml/min/kg for males.<br><br>Intention to treat analysis demonstrated a significant almost 5 % increase in VO2max in TG compared with CG.<br><br>A per protocol analysis of those with an adherence of ≥70 % demonstrated a significant increase in CRF of more than 10 % compared with CG, and a significant reduction in systolic blood pressure (−5.3 ± 13.7 mm Hg) compared with CG.<br><br>There were no baseline differences between TG and CG with regard to the number of days being physically active. Both TG and CG reported 3 days per week as median.<br><br>There was no difference between TG and CG with regard to secondary | "High intensity IPET combined with the recommendations of moderate intensity physical activity demonstrated significant clinical relevant improvements in CRF and systolic blood pressure. This underlines the effectiveness of health promotion by implementing physical exercise training at the workplace"<br><br>"The major finding of this study was significantly increased CRF among office workers after 1 year of workplace health promotion including increased levels of physical activity. The magnitude of increase in CRF obtained by TG compared with CG was almost 5 % in the intention to treat analysis and more than 10 % in the per protocol analysis." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Freak-Poli et al. 2011 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective cohort study | Australian Research Council (ARC) and the Foundation for Chronic Disease Prevention in the Workplace, which is associated with the Global Corporate Challenge partially funded this study. The study design; analysis and interpretation of data; the writing of the manuscript; and the decision to submit the manuscript for publication were solely at the discretion of the researchers, independent of GCC or The Foundation's involvement. | 762 eligible participants were recruited from ten workplaces who were undertaking the 2008 Global Corporate Challenge (GCC) in Melbourne, Australia. Eighty percent (n = 539) of these participants returned to complete the waist circumference (WC) measurement at four-months. | Mean age of returning participants was 40.67 years (SD 10 years). The majority of the cohort was female (55.7%). | The primary outcome of interest was change in waist circumference measurements.<br><br>Univariate analyses were calculated using baseline and 4-month waist circumference. | Baseline data were collected directly prior to the GCC 2008 event and four months later, immediately after completion of the event. | Within the baseline high-risk WC group, variables associated with WC improvement identified through univariate analyses included having greater physical functioning at baseline and meeting the goal of at least 10,000 steps per day on average during the health program (1.11 cm greater loss in those meeting the 10,000 steps per day goal, p=0.49)<br><br>Univariate analysis also indicated that baseline variables associated with reducing WC from high risk to low-risk after four-months included meeting physical activity guidelines. | "Unique baseline predictors were identified for improving WC to meet guidelines at four-months and these included … higher physical functioning and lower BMI."<br><br>"These results indicate that employees who started with better health, potentially due to lifestyle or recent behavioral changes, were more likely to respond positively to the program." | |

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| Hemmingsson et al. 2011 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective cohort study | The study was supported by a grant from Cycleurope Inc., a bicycle retailer. Cycleurope also provided logistical support (bicycles, helmets and bicycle service). Cycleurope had no role in the design or conduct of the study; the collection, management, analysis, and data interpretation; or the preparation, review, or approval of the manuscript. | 98 women with abdominal obesity were enrolled from the Stockholm Bicycle Trial. | Mean age of participants was 47.3 years (SD 7.6 years). The entirety of participants were female (100.0%). | The primary outcome of interest in this study was the change in overall insulin resistance (IR) in women with abdominal obesity who were randomized to counseling programs to promote either bicycling or walking to and from work.<br><br>Indicators of overall IR were fasting serum insulin and homeostatic model assessment (HOMA-IR), calculated as fasting plasma glucose (mol/l) × fasting serum insulin (pmol/l)/22.5.<br><br>Multiple regression was used to test independent associations between exposure and outcome variables. | Activity diaries were filled in and calculated at baseline, and after 2, 4, and 6 months. | Increased bicycling by 10 km/wk was associated with reductions in fasting serum insulin (β = -10.9, *P* = .042), independently of age, treatment allocation, baseline IR, Δ walking, and Δ % body fat, but not HOMA-IR at follow-up (β = –2.0, *P* = .13).<br><br>There was no association between walking and IR at follow-up (*P* = .33 for fasting serum insulin; *P* = .44 for HOMA-IR), adjusted for age, treatment allocation, baseline IR, Δ bicycling, and Δ % body fat. | "To summarize, we found that bicycling to and from work was independently associated with fasting insulin whereas no such effect was found for walking."<br><br>"Bicycling may therefore be more effective than walking in reducing hyperinsulinemia in abdominally obese women." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Honda et al. 2016 | Lifestyle Modification--Exercise/ Increased Physical Activity | Prospective cohort study | None reported | N=430 Japanese employees of an enterprise group who met inclusion and exclusion criteria | Median age 48 years<br><br>85.7% male | Comparing the effects of prolonged bouts of sedentary behavior with the development of metabolic syndrome<br><br>Measurements: physical activity and sedentary behavior<br><br>Outcomes: blood pressure, lipid and glucose profile, BMI, waist circumference<br><br>Metabolic syndrome was defined based on the Joint Interim Statement 2009 definition (used outcomes to assess) | 3-4 years | 76 men and 7 women developed metabolic syndrome.<br>No associations between total sedentary time and metabolic syndrome were found in any models.<br><br>Significant associations were observed between prolonged sedentary time (≥ 30-min bouts) and increased risk of metabolic syndrome HR: 2.85 (95% CI: 1.31 – 6.18) p=0.008.<br><br>Participants with two affected components relating to metabolic syndrome: most sedentary had 3.5-fold significantly greater risk of developing metabolic syndrome compared with the least sedentary group (p<.05). | "In this longitudinal study of adult office workers, we found that longer time spent in prolonged sedentary bouts (≥ 30- min bouts), but not in shorter ones, was significantly associated with higher risk of metabolic syndrome."<br><br>"These results highlight the importance of sedentary bouts, which should be taken into account in the recommendations for the primary prevention of metabolic syndrome. Public health recommendations regarding the prevention of metabolic diseases may need to include avoiding prolonged uninterrupted periods." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| John et al. 2011 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective cohort study | No COI declared. | 12 overweight or obese sedentary office workers were enrolled from the University of Tennessee faculty and staff. | Mean age of participants was 46.2 years (SD 9.2 years). The majority of participants were female (58.3%). | The primary outcome of interest in this study was an increase in physical activity (PA) through the use of a treadmill-workstation (TMWS). Secondary outcomes examined TMWS influences on anthropometric, body composition, cardiovascular, and metabolic variables.<br><br>To examine the relationship between the changes in PA between baseline and 9 months on the outcome variables, Spearman's Rank Correlation coefficients were computed between these variables. | Baseline measurements were taken before the TMWS installation and repeated again 3 and 9 months after installation. | Between baseline and 9 months, significant increases were seen in the median standing (146–203 min·day$^{-1}$) and stepping time (52–90 min·day$^{-1}$) and total steps/day (4351–7080 steps/day; $P < .05$).<br><br>The median time spent sitting/lying decreased (1238–1150 min·day$^{-1}$; $P < .05$).<br><br>Using the TMWS significantly reduced waist (by 5.5 cm) and hip circumference (by 4.8 cm), low-density lipoproteins (LDL) (by 16 mg·dL$^{-1}$), and total cholesterol (by 15 min·day$^{-1}$) during the study ($P < .05$). | "Our study demonstrated that use of a TMWS increased the amount of time spent standing and walking on workdays, over a 9 month period, in overweight and obese office workers."<br><br>"This change in the office environment reduced waist and hip circumference and lowered resting HR, triglyceride, and glycosylated hemoglobin." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Kerr et al. 2016 | Lifestyle Modification--Exercise/Increased Physical Activity | Randomized Controlled Trial | None reported | N=30 employees and non-employees who spent at least 8 hours sitting over five days, who were between the ages of 50-70.<br><br>Reduction in total sitting time ( n=15)<br><br>Increase in sit-to-stand transitions (n=15) | Average age 60.4 years (+/- 5.9)<br><br>27% male | Comparing the effects of intervention arms on the associate behavior. Used thigh mounted inclinometer, written health educational materials, and meetings with a health educator<br><br>Reduction in sitting group decrease total daily sitting time by 2 hours (standing approximately 10 minutes per hour).<br><br>Increased sit to stand transitions group added 30 more transitions per day.<br><br>Primary outcome: measures of behavior using the inclinometer-sitting time, standing time, stepping time, and number of sit-to-stand transitions. | 3 weeks | There was a significant time x condition interaction for sitting time (β=57.0 (SE 12.5): p < .0001), standing time (β=-40.9 (SE 9.4): p < .0001), and number of sit-to-stand transitions (β=0.10 (SE 0.04): p = .006)<br><br>Presented as graphs: Those randomized to reduce their sitting time had a significant 130-minute decrease in sitting time but no change in sit-to-stand transitions.<br><br>Those randomized to increase sit- to-stand transitions had a significant increase in sit-to-stand transitions by about 13 transitions per day, but no change in total sitting time.<br><br>There was no significant interaction for stepping time; all participants increased their physical activity level by 10 minutes/day. | "This is the first pilot study in older adult workers and non-workers to attempt to interrupt sitting behaviors in two different ways. One strategy was to reduce sitting time by 2 hours per day; the other was to increase daily sit-to-stand transitions by 30. Both groups changed the targeted behavior exclusively without changing the other behavior. Participants were compliant and satisfied with the intervention and measurement procedures." | |

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| Kilanowski et al. 2013 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective comparative study | No COI declared. | 59 mothers were enrolled into the study (intervention group n = 34; comparison group n = 25). 82 children were enrolled in the study. | 49% of adult participants were 28-37 years old. The entirety of the adult participants were female (100%). The mean age of child participants was 6.8 years (SD 3.3). The majority of the children were girls (51%). | One of the primary outcomes of interest in this study was the change in body mass index (BMI) among children whose mothers took part in group nutritional classes that included a component on increasing physical activity (intervention group) when compared to children whose mothers did not take part in the group classes (comparison group).<br><br>Children's BMI adjusted by age and sex was compared between the intervention and comparison groups using an analysis of covariance model controlling for covariates. | Data were obtained at baseline in the beginning of the summer, and again at the close of the summer, about 3 months later. | The children in the intervention group had a significant trend moving from the obese to the normal category (P = .0156).<br><br>The children's post–BMI in the treatment group (M = 65.6) was significantly lower (1-sided *P* = .0472) than the baseline BMI (M = 70.6).<br><br>The adjusted analysis of covariance model was significant (F (5, 27) = 55.42; *P* < .0001).<br><br>Ninety-one percent (95% confidence interval of η2 = .80-.93) of the total variance in children's post– BMI was accounted for.<br><br>The mean of the children's post BMI was significantly lower (*P* = .0382) in the treatment group (mean = 69.0) than in the comparison group (mean = 78.2). | "Intervention children had decreased body mass index percentiles." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Kim et al. 2013 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective cohort study | No COI declared. | 376 overweight or obese Japanese office workers were enrolled and 316 participants completed the intervention. | Mean age of participants was 46.7 years (SD 6.8 years). The entirety of participants were male (100.0%). | The primary outcomes of interest in this study were changes in metabolic syndrome (MetS) and its components in association with bouts of brisk walking ≥ 10 minutes.<br><br>Paired t tests were used to compare differences in quantitative variables before and after the intervention. Changes in the prevalence of MetS and its components were analyzed using McNemar's test. | Data was collected using a pre-post study design, with data collected at baseline and after 1 year. | The prevalence of MetS and its components decreased significantly after the intervention (all, $P < 0.05$).<br><br>The mean daily step and brisk walking step counts increased significantly from baseline to the end of the intervention (all, $P < 0.001$)<br><br>The brisk walking step count tended to be higher in subjects with improvements in MetS during the intervention compared with subjects without improvements ($P = 0.009$). | "Our results suggest that a 1 year lifestyle based physical activity intervention is associated with MetS improvement in overweight male employees with ≥ 1 MetS component."<br><br>"Our results also indicate that bouts of brisk walking of ≥ 10 minutes may have several advantages in terms of the degree of improvements in MetS." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample Size: | Age/Sex: | Comparison: | Follow-up | Results: | Conclusion: | Comments: |
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| Mainsbridge et al. 2016 | Lifestyle Modification | Prospective Cohort Study | No COI declared | 43 participants received the intervention | Average age: 43.81 years<br><br>Female: 72.1%<br><br>Male: 27.9% | Investigating the effectiveness of a workplace intervention designed to interrupt prolonged occupational sitting time (POST) and its impact on the self- reported health of a cohort of desk-based employees.<br><br>The study had participants interacting with a computer-based software intervention, first half based on passive prompting of POST interruption, the second half making the intervention voluntary. This was done to determine the sustainability of the intervention to change workplace health behavior. | Subjects participated for 26 weeks. | "ANOVA results revealed a significant interaction between group and test occasion, ($p<0.05$), such that the experimental group increased their total health from pre-test to post-test (13 weeks), and to second post- test (26 weeks) with a medium effect size of d= 0.37." | "These findings present promise for approaches to enhancing the health of desk-based employees to prone to extended periods of sitting while at work. The passive prompt period proved effective in changing the health behaviors of the participants while at work, with standing and performing non-purposeful movement developing into routine behavior and directly impacting on health. Despite the prompt not appearing involuntarily during the second 13- week period participants reported that their perceptions of health were maintained, thus it could be presumed that the participants continued to interrupt their POST and be active at work." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Mytton et al. 2016 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective Cohort | No COI declared. | 809 participants were enrolled from the Commuting and Health in Cambridge Study. | Median age of participants was 43.4 years. The majority of participants were female (69.6%). | The primary outcome of interest in this study was the change in body mass index (BMI) associated with walking or cycling to work.<br><br>Analyses used linear regression adjusted for the covariates hypothesized to act as confounders to test the associations between changes in weekly cycling and walking, and commute time and change in BMI. | The follow-up assessment was completed one year after the baseline questionnaire. | Those who maintained cycling to work had a significantly lower BMI at follow-up, after adjustment for covariates (−1.14 kg/m$^2$, 95% CI: −2.00, −0.32), than those who did not cycle to work.<br><br>When stratifying those who maintained cycling to work by weight status, a stronger association was observed among those who were overweight or obese at baseline (−1.02 kg/m$^2$, 95% CI: −2.08, 0.02).<br><br>There was some evidence of a possible dose-response relationship between walking and BMI (1–149 min: −0.51 kg/m$^2$, 95% CI: −1.68, 0.65; 150 min: −0.95 kg/m$^2$, 95% CI: −2.36, 0.47), although the differences were not significant. | "We found that maintenance of cycling to work was associated with a lower BMI at one year follow-up, after adjustment for covariates. "<br><br>"This association was stronger for those who had a longer distance to commute or who were overweight or obese at baseline, but there was no evidence of a 'dose-response' effect."<br><br>"We found that increasing walking was associated with a reduction in BMI, but only when we restricted our analysis to those who had not moved home or work." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Oh et al. 2012 | Lifestyle Modification—Exercise/Increased Physical Activity | Randomized controlled trial | No COI declared. | 78 participants were enrolled from the general population. | Mean age of participants was 24.9 years (SD 8.15 years). The majority of participants were female (57.7%). | The primary outcome of interest in this study was the change in ad libitum chocolate consumption among participants after short bouts of moderate intensity exercise (Treatment Group) or passive conditions (Control Group) and 3 mental tasks.<br><br>A two-way ANOVA was then used to determine the main and interaction effects of treatment and control on total chocolate consumption.<br><br>Changes in affect from pre- to post-exercise were determined with mediation analysis to examine if changes in affect mediated any effects of exercise on chocolate consumption. | Chocolate consumption was measured at baseline, during exercise, after exercise, and after completion of 3 mental tasks. | There was a significant main effect of exercise ($F = 7.12$, $p < .01$). Those in the exercise conditions ate a mean of 15.6g (SD 19.6g) of chocolate compared with 28.8g (SD 23.5g) in the passive conditions ($t = -2.69$, 95% CI: 3.4, 22.9, ES = 0.61). | "In conclusion, the present study suggests, for the first time, that a brief bout of physical activity can reduce ad libitum eating of chocolate among regular chocolate consumers while performing mental tasks in a simulated workplace, and that the effects are similar for both low and high demanding tasks." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Patel et al. 2016 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Participants were 281 adult employees (body mass index ≥27 kg/m2). | Participants had a mean age of 39.7 years (SD, 11.6) and 78% were women. | The present study aims to test the effectiveness of 3 methods to frame financial incentives to increase physical activity among overweight and obese adults.<br><br>Participants had a goal of 7000 steps per day and were randomly assigned to a control group with daily feedback or 1 of 3 financial incentive programs with daily feedback: a gain incentive ($1.40 given each day the goal was achieved), lottery incentive (daily eligibility [expected value approximately $1.40] if goal was achieved), or loss incentive ($42 allocated monthly up front and $1.40 removed each day the goal was not achieved). | The intervention was 13-weeks and participants were followed for another 13 weeks with daily performance feedback but no incentives.<br><br>Primary outcome was the mean proportion of participant-days that the 7000-step goal was achieved during the intervention. Secondary outcomes included the mean proportion of participant-days achieving the goal during follow-up and the mean daily steps during intervention and follow-up. | Participants had a mean BMI of 33.2 kg/m2 (SD, 5.6).<br><br>The mean proportion of participant-days that the 7000-step goal was achieved at the weekly level peaked at about 0.48 in the loss-incentive group, 0.42 in the lottery-incentive group, and 0.41 in the gain incentive group, but it was never greater than 0.33 in the control group (Figure 2). These levels decreased slightly toward the end of the intervention for all groups.<br><br>Only the loss-incentive group had a significantly greater mean proportion of participant-days achieving the goal than the control group (adjusted difference, 0.16 [95% CI, 0.06 to 0.26]; P = 0.001).<br><br>The loss-incentive group had greater mean daily steps than the control group, but they were not significantly differ ent (adjusted difference, 861 steps [CI, 24 to 1746 steps]; P = 0.056).<br><br>The loss-incentive group had the greatest mean proportion of participant-days achieving the goal (0.30 [CI, 0.24 to 0.37]), but it was not significantly different from the control group (adjusted difference, 0.07 [CI, –0.02 to 0.14]; P = 0.110). | “In this randomized, controlled trial using financial incentives to increase physical activity, we found that the design of the incentive significantly influenced outcomes. The gain incentive, in which an employee received a fixed amount each day he or she met goal, was no more effective than control. In comparison, a loss incentive, in which rewards were allocated upfront and taken away each day the goal was not achieved, resulted in a 50% relative increase in the mean proportion of time participants achieved physical activity goals.” | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Sarma et al. 2014 | Lifestyle Modification—Exercise/Increased Physical Activity | Prospective Cohort | No COI declared | 8783 respondents, consisting of 51,499 person-year observations were enrolled from the longitudinal National Population Health Survey (NPHS) in Canada. | The mean age for males beginning the survey in 1994/95 was 34.08 years. The mean age for females beginning the survey in 1994/95 was 34.50 years. Nationally representative proportional data was collected on both males and females. | The primary outcomes of interest in this study were the effects of leisure time physical activity (LTPA) and work-related physical activity (WRPA) on body mass index (BMI). | Respondents were followed for 8 cycles, or 16 years, of the NPHS. | An additional unit increase in energy expenditure is associated with a decrease in BMI in the range of 0.04–0.05 points among males. Compared to physically inactive males, those males who are physically active or moderately active reduce their BMI in the range of 0.11–0.14 points.<br><br>An additional unit increase in energy expenditure is associated with a decrease in BMI among females by about 0.08–0.09 points. Females who are physically active or moderately active reduce their BMI by about 0.20 points compared to physically inactive females<br><br>Compared to those who are inactive at work, being able to stand or walk at work is associated with a decrease in BMI in the range of 0.16–0.19 points for males and a decrease in BMI in the range of 0.24–0.28 points for females. | "The findings of our study clearly suggest that LTPA exerts a negative effect on BMI of Canadian adults. "<br><br>"This paper provides robust empirical evidence on the effects of LTPA and WRPA on BMI after accounting for time-invariant unobserved heterogeneity and the dynamics of obesity while controlling for a wide range of socio-economic factors."<br><br>"We find that WRPA is negatively related to BMI in Canada. From a policy perspective, promotion of physical activity in workplaces, such as providing access to and availability of physical activity facilities and encouraging employees to remain physically active through various wellness programs may mitigate some of the unintended consequences of a sedentary workplace." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Shafieinia et al. 2016 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Participants were 95 female office workers of the Tehran University that divided randomly in two case and control groups | Participants were entirely female (100%, n=95) and the case sample had an average age of 40.94 ±6.77 years and the control sample had an average age of 39.04 ±7.22 years. | The present study aims to assess the effectiveness of an intervention based on TPB to improve attitude, perceived behavioral control, Subjective norms, behavioral intention and PA behavior among female office workers. | Using the theory of planned behavior questionnaire and the International physical activity questionnaire, the participants were evaluated before the training and three months after that.<br><br>The training was provided in the form of four 90-minute training sessions and some electronic messages sent through office automation system once every two weeks. | Based on the body mass index (BMI), 40% of the participants were overweight and 15% were considered obese.<br><br>Except for the subjective norms, other constructs have shown a significant increase in the case group after the educational intervention (Attitude p = 0.003, Perceived behavioral control p = 0.000, Intention p = 0.000, Physical activity = 0.004).<br><br>The average moderate intensity activity of the case group has increased slightly, which was not significant (p= 0.108). However, the walking activity (p=0.000) and the consumed energy (p= 0.001) of the case group had a significant increase compared to those of the control group.<br><br>Before the intervention, only 22% of the members of the case group walked for 150 minutes or more per week, which increased to around 46% after the educational intervention. | "The present study has provided some of the data toward understanding determinants of physical activity behavior in female office workers. Specifically, the results suggest that interventions designed t o promote physical activity in this population should focus on the development of PBC as well as positive attitude toward PA." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Thorp et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | 23 overweight / obese office workers completed the experimental study. | Participants were majority male (73.9%) and the average age was 48.2 ± 7.9 years. | Participants undertook two, 5-day experimental conditions in an equal, randomised order.<br><br>Participants wore a 'metabolic armband' to estimate daily workplace EE (KJ/8 hours) while working in a: 1) seated work posture (SIT condition); or, 2) alternating between a standing and seated work posture every 30-min using a sit-stand workstation (STAND-SIT condition). | To determine whether alternating bouts of sitting and standing at work influences daily workplace energy expenditure (EE) participants completed two, 5-day experimental conditions (Monday-Friday), separated by a minimum 7-day washout period. | Standing to work acutely increased EE by 0.7 [0.3, 1.0] KJ/min (13%), relative to sitting (p=0.002). Compared to indirect calorimetry, the metabolic armband provided a valid estimate of EE while standing to work (mean bias: 0.1 [-0.3, 0.4] KJ/min) but modestly overestimated EE while sitting (p=0.005).<br><br>Daily workplace EE was greatest during the STAND-SIT condition (mean condition difference [95% CI]: 76 [8, 144] KJ/8-hour workday, p=0.03). | "Intermittent standing at work can modestly increase daily workplace EE compared to seated work in overweight/obese office workers." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Thorp et al. 2014 | Lifestyle Modification—Exercise/Increased Physical Activity | Randomized controlled trial | No COI declared. | 23 overweight or obese office workers were enrolled from the Sit or Stand @ Work Study. | Mean age of participants was 48.2 years (SD 7.9 years). The majority of participants were male (73.9%). | The primary outcomes of interest in this study were changes in serum insulin, plasma glucose, and triglycerides between the control condition (seated work posture) and the intervention condition (interchanging between a seated and standing work posture every 30 minutes using a height adjustable workstation).<br><br>Linear mixed models with a single random effect were used to evaluate the differential effects of the experimental conditions on glucose, triglycerides, and the ratio between insulin and glucose. | Fasting and postprandial blood samples after a mixed test drink were collected hourly for 4 hours on days 1 and 5 of each experimental condition. | After adjustment for time, the incremental area under the analyte time curve differed significantly between conditions for plasma glucose ($P = 0.007$) but not for serum insulin or plasma triglycerides.<br><br>The adjusted mean glucose incremental area under the analyte time curve was lowered by 11.1% after the intervention condition (6.38 $mM \cdot h^{-1}$ (95% CI, 5.04–7.71)) relative to the control condition (7.18 $mM \cdot h^{-1}$ (95% CI, 5.85–8.52)). | "Our results show that the introduction of 30-minute bouts of standing (using an electric, height adjustable desk) can significantly attenuate the postprandial glucose response related to uninterrupted sitting during a typical workday."<br><br>"In conclusion, introducing intermittent standing bouts across the workday results in modest beneficial effects on postprandial glucose responses in overweight/obese office workers at increased risk of diabetes and cardiovascular disease." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Thorp et al. 2014 | Lifestyle Modification—Exercise/Increased Physical Activity | Randomized controlled trial | No COI declared. | 23 overweight or obese office workers were enrolled from the Sit or Stand @ Work Study. | Mean age of participants was 48.2 years (SD 7.9 years). The majority of participants were male (73.9%). | The primary outcomes of interest in this study were changes in physical activity as a subscale of fatigue as measured by the Individual Strength (CIS20-R) Questionnaire and the MAF Scale and musculoskeletal discomfort.<br><br>McNemar's test for dependent proportions was used to determine significant changes (expressed as a %) in the prevalence of musculoskeletal symptoms and fatigue between experimental conditions | On day 5 of each experimental condition, participants completed a set of self-administered questionnaires to recall behavior from the past 5 workdays. | Participants' total fatigue score was significantly higher during the SIT condition (mean 67.8 (95% CI 58.8 to 76.7)) compared with the STAND-SIT condition (52.7 (43.8 to 61.5); p<0.001).<br><br>Lower back musculoskeletal discomfort was significantly reduced during the STAND-SIT condition compared with the SIT condition (31.8% reduction; p=0.03). | "Transitioning from a seated to a standing work posture every 30 minutes across the workday, relative to seated work, led to a significant reduction in fatigue levels and lower back discomfort in overweight/obese office workers, while maintaining work productivity." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Torbeyns et al. 2016 | Lifestyle Modification--Exercise/Increased Physical Activity | Prospective cohort study | None reported | Employees who were sedentary for their job 70% of the time, and who participated in moderate to vigorous physical activity for a maximum for 2.5 hours/week<br><br>N=23 | Mean age: 35.7 years ± 10.3<br><br>70% female | Assessed the differences in cognitive performance and typing between biking and sitting at a desk. Electrophysiological measurements were taken to evaluate neuronal processes.<br><br>Outcomes: scores on transcription test "TypingMaster Pro", short term memory scores using the Rey auditory verbal learning test, selective attention and response inhibition using the Stroop test, sustained attention using the Rosvold continuous performance test | 2 weeks (one week in between testing while sitting and cycling) | ANOVA repeated measures indicate:<br><br>Wilcoxon signed rank tests indicate differences between cycling and sitting:<br><br>Typing performance: no significant differences ($F(1,22) = 0.556$, $p = 0.464$)<br><br>Rey auditory verbal learning test: no significant differences in immediately repeated words ($F(1,22) = 0.644$, $p = 0.431$), Recalled words ($F(1,22) = 0.511$, $p = 0.482$), or correctly and incorrectly recognized words ($F(1,22) = 1.131$, $p = 0.299$) ; ($F(1,22) = 0,000$, $p = 1.000$)<br><br>Stroop test: Reaction time was significantly shorter in the cycling condition than in the sitting condition (639.6 ± 107.9ms vs. 663.1 ± 118.9ms) ($F(4,88) = 7.941$, $p = 0.01$)<br><br>Rosvold continuous performance test: Reaction time was shorter during cycling relative to sitting (377.9 ± 132.8 ms vs. 404.3 ± 174.6 ms; $F(1,22) = 50.496$, $p < 0.001$) | "In the current study, typing performance did not significantly differ between the sitting and the cycling condition. This shows that, after two familiarisation sessions, people became accustomed to the combination of cycling at low intensity and performing a fine motor skill like typing."<br><br>"This study shows that cycling at 30%Wmax on a bike desk does not influence typing performance and short-term memory. Moreover, it has a positive effect on response speed across tasks requiring variable amounts of attention and inhibition. These findings suggest that implementing bike desks in office settings could not only contribute to reducing health risks associated with excessive sitting, but could also contribute to an improved cognitive performance, therefore work performance." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Tudor-Locke et al. 2014 | Lifestyle Modification—Exercise/Increased Physical Activity | Randomized controlled trial | Dr. Tudor-Locke and her husband (Mr. Gerald Locke) are co-inventors, and thus intellectual property holders, of a workstation alternative device not discussed in the manuscript. The lessons learned and described fully in the article did lead to the conception of the invention. | 41 overweight or obese office workers were enrolled into 2 cohorts (Cohort 1: N=21, Cohort 2: N=20) from the WorkStation Pilot Study. | Mean age of participants was 40.2 years (SD 10.1 years). The majority of participants were female (98.0%). | The primary outcomes of interest in this study were employee interest as indicated by recruitment response, attendance at orientation and baseline sessions, and adherence to scheduled treadmill desk sessions.<br><br>Adherence data are presented as process data in a descriptive format with no inferential statistics applied to evaluate potential differences between recruitment cohorts. | Outcome measures were taken at baseline, week 3, month 3, and month 6 (cohort 1 only) following implementation of the intervention. | Treadmill desk session duration was stable (43–44 min/session on average) across the first 3 months of study for cohort 1.<br><br>Over study months 4–6 both recruitment cohorts experienced decreases in duration used, although cohort 2 logged less time (34–37 min/session) and a steeper average decrease.<br><br>For cohort 1, adherence averaged 53% at intervention inception and increased to 66% during the third month of their intervention.<br><br>During the same calendar time that both cohorts were participating, their adherence ranged between 38%–46%. | "We documented that sedentary office workers averaged ~43 minutes of light intensity treadmill walking daily in response to a scheduled, facilitated, and shared-access workplace intervention."<br><br>"Implementation of workstation alternatives that combine computer based work with light intensity physical activity represents a potential solution to health problems associated with excessive sedentary behavior…" | |

## ACOEM Evidence Table: Lifestyle Modification – Multiple

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Borah et al. 2015 | Lifestyle Modification | Prospective Cohort Study | No COI declared. | The final study sample resulted in 3199 subjects.<br><br>Adult employees and dependents (age ≥18 years) of Mayo Clinic Rochester, Minnesota, who were continuously enrolled in the clinic's wellness center from January 2007 through December 2010 constituted the study sample. | The respondents were on average 44.35 ± 10.62 years of age, and female workers comprised 72.15% of the group | The purpose of this study was to assess the impact of wellness center attendance on weight loss.<br><br>Attendance was categorized as follows: 1 to 60, 61 to 180, 181 to 360, and more than 360 visits.<br><br>Weight loss was defined as moving to a lower body mass index category. The following four weight categories were assessed: normal (BMI <25), overweight (BMI≤25to<30), obese (BMI≤30to<35), and obesity grade II or higher (BMI≥35). | The first year (2007) of this 4-year study was the baseline period, which was used to extract patient baseline demographic and clinical characteristics including BMI and comorbid conditions.<br><br>Study outcomes were assessed during the 3-year follow-up period, 2008 to 2010. | At the baseline, 34% of our sample are overweight, 17% are obese, and 12% are obesity grade II or higher. During follow-up, 284 people or 9% of the sample's BMI category dropped one or more notch. Two hundred forty six of them dropped one, 34 dropped two, and 4 dropped three.<br><br>As noted from Table 2, compared with the visit category of 0 to 60 visits, the visit category of 181 to 360 visits was associated with 46% more likely to drop in the baseline BMI category (odds ratio=1.46; P=0.05), whereas the group with the most visits was 72% more likely to drop in the baseline BMI category (odds ratio=1.72; P=0.01).<br><br>Unadjusted and adjusted mean overall health care costs by wellness engagement level did not differ substantially. Both declined monotonically as the wellness engagement level increased. Compared with $13,267 mean overall costs for subjects who visited the wellness center between 1 and 60 times during the follow-up, those with the visit categories of 61 to180, 181 to 360, and more than 360 visits had adjusted mean overall costs of $9538, $9332, and $8,293, respectively. | "Workplace wellness center attendance was associated with both significantly lower health care costs and BMI improvement, generally commensurate with attendance frequency category. Although center use is unlikely the only mediator of either weight control or health care costs, workplaces that are able to offer comprehensive wellness facilities may be capable of achieving similar gains, even blind to individuals' activity pursuits at the facility. Additional research is warranted both to explore attributes of frequent users that may better predict health care costs and BMI control, as well the motivating factors that may be translatable from frequent users to be adopted by infrequent users." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Brace et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | At baseline, there were 2,819 employees at the study sites, with 1,301 in control sites and 1,518 in treatment sites. The site size ranged from 232 to 933 employees.<br><br>Overall, 479 employees enrolled in FYL at the treatment sites. | The average age of employees was 46 years and 94% were male. | Sites were matched based on the number of employees and randomly assigned to treatment or control group.<br><br>The FYL intervention was based on the DPP Lifestyle Intervention (The DPP Research Group, 2002). The key features of the original DPP were the following: (a) weight loss and physical activity goal-based behavioral intervention, (b) case manager/lifestyle coach intervention delivery, (c) intensive and ongoing intervention, (d) individual tailoring, (e) materials/strategies for an ethnically diverse population, and (f) interventionist network support. | Participants completed paper surveys at three time points: baseline, posttest (6 months after baseline), and follow-up (12 months after baseline). | The majority of participants were either overweight (BMI = 25-29.9) or obese (BMI ≥ 30; 32.9% overweight, 59.4% obese).<br><br>FYL participants maintained their body weight when compared to employees at control sites who experienced a 2.6- pound weight gain at 6 months, and the findings remained consistent at 12- month follow-up. At 12 months, 55% of FYL participants lost weight compared with 35% in the control group.<br><br>FYL participant dose scores ranged from 0 to 44 (M = 10.91, SD = 10.66), and 75% had a dose score of 15 or less. A chi-square test examined the relationship between dose and total weight loss, and a significant relationship was found, $\chi 2(3, N = 158) = 9.178$, $p = .027$. Participants who received the highest intervention dose were more likely to lose weight than those who received lower intervention dose.<br><br>Fewer than half (43%) of the participants reported continuing FYL after the first 6 months. Even fewer participated in the final data collection activities at 12 months (31%). | "The program was successful in reaching employees who were overweight or obese and was effective for preventing weight gain in this population. Participants who had the highest levels of participation and engagement lost the most weight. However, participation and engagement were relatively low. Despite these low levels, participants were generally satisfied with the program and FYL was well received." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Butler et al. 2015 | Lifestyle Modification | Prospective cohort study | No COI declared. | Participants included 121 university employees enrolled in a worksite wellness program was offered to employees at Washington University in St. Louis, MO. | The sample was 85% female and the average age was 46 (11) years. | The aim of the study to explore exercise self-efficacy among university employees and the effects of a worksite wellness program on physical activity, cardiorespiratory fitness, and CVD risk factors<br><br>The worksite wellness program included cardiovascular health assessments, personal health reports, 8 weeks of pedometer-based walking and tracking activities, and weekly wellness sessions.<br><br>Outcome measures included pedometer step counts as an estimate of daily physical activity, exercise self-efficacy, CVD risk factor assessment, and a post-program survey. | Baseline assessments were completed before the 8-week pedometer-based intervention began and follow-up assessments were performed immediately after completion of the 8-week intervention. Step counts were quantified at baseline, week 4, and week 8. Exercise self-efficacy and CVD risk factors were assessed at baseline and follow-up. | At baseline, 67% of the 121 enrollees were categorized as sedentary or low active based on daily step counts <7500,20 69% were overweight or obese (ie, BMI ≥ 25.0 kg/m2).<br><br>Daily step count increased from 6566 ± 258 (LSM ± SE) at baseline to 8605 ± 356 at week 4 and 9107 ± 388 at week 8. The increase in step count over time ($P < .0001$) was greater from baseline to week 4 ($P < .0001$) than from week 4 to week 8 ($P = .02$).<br><br>Although obese participants took significantly fewer steps than normal weight and overweight participants at baseline ($P = .003$ and $P = .006$, respectively), the increase in steps over time was evident among all BMI categories, without interaction ($P = .58$).<br><br>The proportion of participants achieving 10,000 steps/day increased from 6% at baseline to 25% at week 4 and 36% at week 8. The odds of a participant being in a lower physical activity category at baseline was more than three times as likely as at week 4 (OR 3.3, 95% CI 2.7–4.7, $P < .0001$) and nearly five times as likely as at week 8 (OR 5.0, 95% CI 3.3–7.4, $P < .0001$). | "A multi-faceted, pedometer-based worksite wellness program was successful at increasing physical activity and cardiorespiratory fitness within 8 weeks. Notably, individuals in all BMI categories demonstrated increases in daily step count over time. Our program promoted modest improvements in several CVD risk factors, as reported in previous worksite studies."<br><br>"A worksite wellness program was effective for increasing physical activity, cardiorespiratory fitness, and CVD risk factors among university employees. Exercise barriers and outcome expectations were identified and have implications for future worksite wellness programming." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Cash et al. 2013 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Thirty-four worksites were randomized (one worksite dropped after randomization).<br><br>The original dataset of employees in randomized companies (n=1,386) had an average of 140 employees | In total, 539 men were included in the analysis with an average age of 44.4 (4.5) years.<br><br>600 women were included in the analysis with an average age of 43.7 (4.0) years. | Worksites were randomized to either intervention or control arms and paired according to similarity in baseline response rates.<br><br>The study sought to examine BMI and physical activity over 2 years as predictors of change in obesity-specific QoL and potential gender differences in these associations within the context of a worksite-based intervention study, the Promoting Activity and Changes in Eating (PACE) study. | Self-reported activity and Obesity and Weight-Loss Quality Of Life (OWLQOL) were analyzed for individual-level associations accounting for random worksite effects at baseline and after two year follow up. | The within-group mean Approximately 58.4% (n=665) of employees were either overweight (32.7%) or obese (25.7%) at baseline.<br><br>Adjusting for age, race, income, education, smoking and intervention arm, a 1.9 unit decrease in BMI (i.e., a change in BMI as large as the interquartile range (IQR) of its distribution) was associated with a 1.7 unit increase in mean OWLQOL (95% CI: 1.2, 2.2) in males and a 3.6 unit increase (95% CI: 3.2, 4.0) in females.<br><br>A 23 unit increase in Godin score (free-time physical activity) was associated with a 0.9 unit increase in mean OWLQOL (95% CI: 0.5, 1.4) in males and a 1.6 unit increase (95% CI: 1.0, 2.3) in females.<br><br>Associations between physical activity and OWLQOL were attenuated when controlling for change in BMI in both men and women, but notably remained significant for women, with a 23 unit increase in Godin score being associated with a 1.5 unit increase (95% CI: 0.9, 2.2) in mean OWLQOL. | "Our results suggest that decreases in BMI and increases in physical activity are associated with improved obesity-specific quality of life, with the impact being more pronounced in women."<br><br>"This is the first study to demonstrate that increasing physical activity may improve obesity-specific QoL to a greater extent in women, particularly among overweight women, independent of BMI. Results may inform the design of interventions tailored to women targeting well-being through messages of increasing physical activity." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Christensen et al. 2011 | Lifestyle Modification | Randomized controlled trials | No COI declared. | 98 female, overweight health care workers were cluster-randomized to an intervention group or a reference group. | Participants in the study were on average 45.5 (9.5) years of age and 100% of the sample were female. | The intervention consisted of an individually dietary plan with an energy deficit of 1200 kcal/day (15 min/hour), strengthening exercises (15 min/hour) and cognitive behavioral training (30 min/hour) during working hours 1 hour/week. Leisure time aerobic fitness was planned for 2 hour/week. The reference group was offered monthly oral presentations.<br><br>Body weight, BMI, body fat percentage (bioimpedance), waist circumference, were measured before and after the intervention period. | The intervention lasted 0-3 months) and measurements were assessed before and after the intervention period.<br><br>The present study evaluates the effects of the first 3-months of a cluster randomized controlled lifestyle intervention among health care workers. The intervention addresses body weight, general health variables, physical capacity and musculoskeletal pain. | The participants in the study were on average 77.4 (16.8) kg body weight, 36.8 (8.2)% in fat percentage, 28.1 (5.8) in BMI and 94.6 (15.0) cm in waist circumference. A BMI ≥ 25 was found for 64.5% of the employees, and a critically high waist circumference (> 88 cm) was recorded for 61.1%.<br><br>In an intention-to-treat analysis from pre to post tests, the intervention group significantly reduced body weight with 3.6 kg ($p < 0.001$), BMI from 30.5 to 29.2 ($p < 0.001$), body fat percentage from 40.9 to 39.3 ($p < 0.001$), waist circumference from 99.7 to 95.5 cm ($p < 0.001$) and blood pressure from 134/85 to 127/80 mmHg ($p < 0.001$), with significant difference between the intervention and control group ($p < 0.001$) on all measures. | "The significantly reduced body weight, body fat, waist circumference and blood pressure as well as increased aerobic fitness in the intervention group show the great potential of workplace health promotion among this high-risk workgroup. Long-term effects of the intervention remain to be investigated" | |

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| Christensen et al. 2012 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Ninety-eight overweight female health care workers were randomized into an intervention or a reference group. | The entirety of the sample (100%) was female.<br><br>The participants in the study were on average 45.5 (9.5) years of age. | The intervention consisted of diet, physical exercise and cognitive behavioral training during working hours 1 hour/week. The reference group was offered monthly oral presentations. | Several anthropometric measures, blood pressure, cardiorespiratory fitness, maximal muscle strength, and musculoskeletal pain were measured before and after the 12-months intervention period. | As a mean for all participants BMI was 30.6, aerobic fitness 26.3 mL O2/kg/min, waist circumference 100.3 and blood pressure 131.8/83.7 at baseline.<br><br>In the intervention group, body weight decreased from 84.2 to 78.4 kg ($p < 0.001$), corresponding to a decrease in BMI from 30.7 to 28.5 ($p < 0.001$) and reduced fat percentage from 41.2 to 38.4% ($p < 0.001$). There were no statistical reductions in the control group, resulting in significant differences between the two groups over time.<br><br>In both the intervention and the reference group, subjects in test 1 and 3 were classified as above or below the recommended level for BMI (>24.9), waist circumference (>88 cm) and blood pressure (>139/89) in order to define the high risk fraction of the groups. The high risk group based on BMI, waist circumference and blood pressure showed a substantial decrease in the intervention group, in percentages from 90.7, 77.8 and 44.2 in test 1 to 64.8, 66.7 and 27.9 in test 3, respectively. | "The 12-months workplace intervention among female overweight health care workers consisting of diet, physical exercise and cognitive behavioral training resulted in an average weight loss of about 6 kg, BMI of more than 2 units and body fat with almost 3 percent in an intention to treat analysis. This study shows that an integrated lifestyle intervention is effective for attaining prolonged weight loss among overweight and obese female workers. Furthermore, the positive results support that workplaces are efficient arenas for weight loss programs among overweight persons." | |

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| Christensen et al. 2013 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Among these employees, 144 consented to participate in the project. Among these, a subgroup consisting of all the overweight female healthcare workers was analyzed as a target group (N=98). | For the whole population the mean age of intervention group participants was 44.8 ± 9.5 years and 98.7% of participants were female.<br><br>For the whole population the mean age of control group participants was 46.4 ± 9.5 years and 94.1% of participants were female.<br><br>For the subgroup population the mean age of intervention group participants was 45.7 ± 8.7 years and 100% of participants were female.<br><br>For the subgroup population the mean age of control group participants was 46.0 ± 8.6 years and 100% of participants were female. | The intervention consisted of calorie-limited diet, physical exercise, and cognitive behavioral training during working hours 1 hour per week.<br><br>The reference group was offered presentations about healthy lifestyle. | The study consisted of 12 months of intervention.<br><br>Absenteeism and presenteeism (productivity, workability, and sickness absence) were recorded at baseline and after 3 and 12 months of intervention. | In terms of average changes from baseline to 3 months in the whole population for the intervention and reference groups a significant effect of intervention was found for productivity. Nevertheless, the positive effect on productivity did not remain after 12 months of intervention. This finding indicates that interventions aiming for reducing excessive body weight among health care workers will not per se provide long-term improvements in productivity.<br><br>No significant intervention effects in productivity were found in the subpopulation in the target population for the intervention and reference groups.<br><br>In terms of average changes in the whole population from baseline to 12 months in the intervention and reference groups no significant changes in any outcome measures were found. Similarly, no intervention effects were found for the target group. | "The main finding of this study was that this intervention, despite being successful in improving several health outcomes, did not impose any lasting effects on presenteeism and absenteeism. A significantly improved productivity was found in the intervention group after 3 months of intervention, but did not remain after 12 months of intervention.<br><br>This study suggests that a worksite intervention aiming for and successfully reducing excessive body weight among employees in a care unit may provide a short-term improvement in productivity, but no long-term effects on productivity, sickness absence, or workability. It needs to be investigated whether these findings can be generalized to other companies, job groups, and countries." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| de Souza et al. 2014 | Lifestyle Modification | Prospective Cohort | No COI declared. | Fifty-one male and female employees were recruited to promote healthy eating and physical activity amongst their peers. | Their ages ranged from 29 to 59 years and 42 (79%) were female. | For the qualitative evaluation, semistructured interviews were conducted with 20 peer helpers using stratified random sampling.<br><br>A semistructured interview guide was developed using an iterative process. Questions focused on the peer helpers' experiences in the program, including their participation in the training and feedback sessions; use of peer helping behaviors related to persuading, connecting, and informing; personal behavior change; and their observations of changes in norms and organizational outcomes. | The Go! intervention was a 12-month multicomponent obesity prevention program conducted at a hospital worksite. This qualitative evaluation of the peer helper component of a multifaceted campaign was completed following the intervention.<br><br>The duration of most interviews was 45 minutes to 1 hour and interviews were audio-recorded and transcribed. | Five main themes were revealed through the analysis. These included discussion of the roles taken on by the peer helpers and their expectations for those roles, personal behavior changes experienced by peer helpers, changes in the hospital's social and physical environment, the sustainability of changes, and perceptions and feedback on their peer helper experiences.<br><br>We found evidence for synergies between the peer helper component and other components of the campaign and present recommendations and questions related to best practices for peer helper interventions at worksites. | "Training on the use of peer helpers and the incorporation of peer helper components into interventions is needed." | |

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| Fernandez et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | This group-randomized trial (n=3799) was conducted at 10 worksites in the northeastern United States. | At baseline, participants in the intervention group were majority male (68.1%) and the average age was 47.7 ± 7.47 years.<br><br>At baseline, participants in the control group were majority male (55.6%) and the average age was 47.4 ± 7.84 years. | Worksites were paired and allocated into intervention and control conditions. To develop intervention strategies tailored to each worksite and to build social support and employees' capacity to address environmental contributors to weight gain, we formed employee advisory boards (EABs) including 5 to 10 employees from different levels of the company. Interventions sought to increase employee awareness and build capacity and to reduce energy intake and increase energy expenditure.<br><br>Within- and between-groups changes in mean BMIs and in the percentage of overweight or obese employees were examined in a volunteer sample. | Baseline and postintervention data were collected from February to October 2006 and January to June 2009 (two years follow up), respectively. | The within-group mean BMI decreased significantly at the intervention worksites after 2 years of the intervention (by 0.51 kg/m2; P=.03) and decreased nonsignificantly at the control worksites by 0.20 kg/m2; P=.6.<br><br>The adjusted analysis revealed the same trends in within worksite mean BMI changes (decreases of 0.54kg/m2; P=.02, and 0.12kg/m2; P=.73, at the intervention and control worksites, respectively) and a larger difference in differences result in the expected direction (a decrease of 0.42 kg/m2; P=.33).<br><br>In the adjusted model, within-worksite changes in the percentage of overweight or obese employees were of a different magnitude but remained in the same direction (decreases of 3.7%; P=.07, and increases of 4.9%; P=.1, at the intervention and control worksites, respectively), resulting in a net difference of 8.6% favoring the intervention in the DID analysis (P=.02). | "Our findings support a worksite population strategy that might eventually reduce the prevalence of overweight and obesity by minimizing environmental exposures to calorically dense foods and increasing exposures to opportunities for energy expenditure within worksite settings."<br><br>"Our results suggest that, after 2 intervention years, there was a favorable trend toward a larger decline in average BMIs at the intervention worksites than at the control sites." | |

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| Hjarnoe et al. 2013 | Lifestyle Modification | Prospective cohort study | No COI declared. | A total of 606 male seafarers were invited to take part in the study.<br><br>343 participants completed the first questionnaire and 257 completed the health profile at T1.<br><br>209 participants completed the follow up questionnaire and 153 completed the health profile at T2. | The mean age of the sample at T1 was 42 years (SD 10.5).<br><br>Since 95% of respondents were male (which reflected the gender distribution among the employees), it was decided to restrict all further analysis to this male subsample. | A single-group pre-post design was conducted in 2008–2009 in order to identify changes in lifestyle related behaviors and health risk factors among seafarers.<br><br>The questionnaire covered seafarers' perceived health, well-being, and health-related behaviors. Anthropometric and cardiovascular fitness measurements were recorded by a registered nurse and/or by a physiotherapist during the course of individual sessions on board and on land.<br><br>A BMI-of 30 and above was used as an index of general obesity. | Five different interventions were implemented in 2008/ 2009.<br><br>Baseline and follow-up data (approximately one year after) were collected with a self-administrated standardized questionnaire and individual health profiling assessing parameters such as physical health and physical fitness.<br><br>In addition, qualitative interviews with participants and non-participants were conducted in order to gain in-depth information on experiences with the intervention processes. | At baseline health profile T1 64 (25%) of participants met criteria for obesity (≥ BMI 30) compared to 42 (28%) participants at Follow-up health profile T2.<br><br>The percentage of those with high waist circumference had decreased by 5% from 71% at T1 to 66% at T2. This was, however, only a non-significant trend.<br><br>For metabolic syndrome on the other hand there was a significant decrease from 57% to 48% of affected seafarers between T1 and T2 (p=0.029). In none of these cases was there any significant association between participating in the exercise guidance or the extra health profile interventions and the respective outcomes. The decrease in daily sugar intake and prevalence of seafarers with metabolic syndrome might be associated with the cooking course intervention which aimed at providing healthier daily meals on board. | "The findings suggest that a multi-component health promotion intervention program has the potential to achieve change in seafarers' health behavior and health parameters. In the future, studies with more rigorous designs, separately testing the contribution of different types of interventions are needed." | |

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| Hwang et al. 2012 | Lifestyle Modification | Prospective cohort study | No COI declared. | Participants were 248 bus drivers from 2 transportation companies. | Mean age of participants was 56.2 ± 5.8 years and 241 participants (97.2%) were men. | The tailored health promotion program consisted of exercise, diet, temperance, and smoking cessation education.<br><br>Participants were surveyed on health behaviors (physical activity, diet, smoking habit, and alcohol consumption), health status (body mass index, systolic blood pressure, triglycerides, total cholesterol, high-density lipoprotein, and low-density lipoprotein), and job stress | The tailored health promotion program was developed to reduce cardiovascular disease risk factors and was administered for 6 months.<br><br>After measuring the BMI, systolic BP, TG, TC, HDL, and LDL before and after the program, the results were analyzed using a paired t test. | Preintervention the participants BMI was an average of 24.1 (2.7) and after intervention the BMI remained the same (24.1 (2.7)). There was no significant change in BMI before and after the health promotion program (P = .753).<br><br>There were significant differences in physical activities before and after the health promotion program (P = .000) and significant differences in the dietary habits before and after the health promotion program (P = .003).<br><br>Whether or not there was any difference in health status, changes before and after the health promotion program between the top 25% and the lowest 25% stress groups were determined. The analysis showed that there was no significant difference by stress group in BMI (p=.866), blood pressure, TG, TC, HDL, and LDL. | "The health promotion program to reduce chronic disease in the workplace is aimed at increasing physical activity so as to decrease a variety of risk factors and induce behavioral changes through improvement in dietary habits and smoking cessation.19 Accordingly, a tailored health promotion program was developed and implemented to prevent cardiovascular disease among middle-aged and advanced-age bus drivers to protect workers' health. As a result of the health promotion program, there were improvements in health behavior, such as physical activity, diet, and smoking and alcohol consumption frequency, and health status indicators, such as BMI and HDL." | |

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| Jepson et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Participants included 29 inactive women working full-time sedentary jobs. | The sample was entirely female (100%). | The aim of this study was to determine whether dietary patterns would change following an intervention intended to reduce sedentary behavior in inactive women.<br><br>Inactive women working full-time sedentary jobs were randomized into one of two 8-week interventions occurring during the work week [short breaks (1-2 min every half hour, n=12) or long breaks (15 min twice daily, n=17)]. | Assessments occurred at baseline, and weeks 4 and 8. Dietary information was collected via 3-day food records. | Analyses of all participants revealed no change in AHEI scores over time (baseline: 54.0+/-15.1, week 4: 51.5+/-11.3, week 8: 47.3+/-12.2, p>0.05). Caloric consumption was not significantly different at week 4 (p>0.05), but was decreased at week 8 (baseline: 1809.7+/-488.0, week 4: 1682.3+/-622.8, week 8: 1625.4+/-554.2 kcals/day, p=0.04). | "Following an 8-week sedentary intervention in the workplace, inactive women did not alter their dietary quality, but decreased caloric intake." | |

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| Lippke et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Eligible employees (N=384) taking part in both Time 1 (T1) and Time 2 (T2) were shiftworkers in more or less physically demanding positions were recruited during a routine medical examination | The sample mostly included men (n=306, 79.7%)<br><br>Participants were between 20 and 64 years of age, with a mean (men) age of 43.7 years (SD 7.6). | The main research aim of this study was to test the efficacy of a stage-matched intervention in comparison with an active control condition (one-size-fits-all-treatment/standard care intervention) to improve physical activity and dietary behavior in employees.<br><br>Effects on single health behaviors, psychological predictors of behavior change (intention, planning, and social support), BMI, and lifestyle (multiple behavior index combining physical activity and nutrition) were examined. | After providing informed consent, participants completed the baseline T1 questionnaire on behavioral, psychological, and sociodemographic variables. At T2, 1 month later, follow-up questionnaires were returned. | The intervention outperformed the control condition for lifestyle changes containing physical activity and nutrition ($\chi$ =3.5; P=.04, for N=384).<br><br>An interaction of time × workplace or time × workplace × treatment could only be revealed for BMI. On average, study participants reduced their BMI from 27.75 at T1 (86.05 kg) to 27.48 at T2 (85.23 kg). This effect was about the same in the stage-matched group with a sedentary workplace (BMI =27.49; BMI =27.18) or with a physically demanding workplace (BMI =27.98; BMI =27.77).<br><br>For the active control condition, those employees working in a sedentary workplace maintained their BMI over time (BMI =27.54; BMI =27.38). Those working in a physically demanding workplace started with a much higher BMI (BMI =29.82) and were able to reduce their weight more than all other groups (BMI =29.03).<br><br>The performance of a healthy lifestyle T2 was predicted by sex, age, workplace demands, and BMI (all at T1). However, none of these 4 variables were a significant (P≥.07) predictor for a healthy lifestyle behavior at T2. | "To conclude, for the practice of occupational health promotion, parsimonious computer-based interventions on multiple health behaviors open avenues for reaching more employees, especially those who are "on the road" as part of their job and may not have access to company-owned, on-site support programs (eg, face-to-face counseling). Upscaling individual-level, multiple behavior workplace health promotion programs is a key to preventing and managing chronic diseases. This is especially imperative among the workforce due to the high proportions of the total cost of productivity loss due to sick leave and disability pensions attributable to obesity and obesity-related diseases." | |

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| Low et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Women (40-65 years old, n = 57) who self- identified as having increased cardiovascular risk and ready for change were randomly assigned to weekly motivational counseling (n=28) or control (n=29). | Mean age of participants was 52 ± 6.3 years and 100% of participants were female. | This unblinded randomized trial tested the effectiveness of the addition of weekly motivational communications concerning the availability of health promotion classes and an on-site gymnasium on CVD risk.<br><br>Intervention participants were randomly assigned to weekly motivational counseling or control. All participants were offered classes (weight/diet, stress, exercise, and smoking cessation) and gym access. | Classes, gymnasium availability, organized walks, and the intervention (ie, weekly communication) continued for 6 months. Data were collected on class attendance. At the end of the program, the risk data collected at baseline were collected again. A followup survey was also conducted 1 year after program completion. | Baseline weight ranged from 109 to 358 pounds, with 77% categorized as overweight or obese.<br><br>Body weight was ranked by 42% of the participants as the factor of highest concern.<br><br>Weight loss was greater in the intervention group (mean = 7.2 ± 14.0 lb) compared with the control group (3.8 ± 10.3 lb), although this was not statistically significant.<br><br>Only race/ethnicity was associated with weight change, with whites losing 8.6 ± 12.5 lb, and women of color gaining 1.9 ± 8.6 lb ( P = .006), and race/ethnicity remained significantly associated with weight change with the intervention group included in the analysis ( P = .004). Among those ranking weight as their highest concern, the intervention group lost 13.5 ± 4.9 lb compared with 2.7 ± 13.0 in the control group (P = .101).<br><br>Compared with control, the intervention group resulted in greater exercise days per week (1.4 vs 1.2) but this was not a statistically or clinically important difference. | "The consistent and positive findings of this preliminary study are promising for risk reduction at the worksite in general and the use of individualized motivational messages in particular. Despite high levels of variability among the study sample, those who had weekly encouragement showed improvements, particularly in weight management and stress reduction. Numbers were small and results were therefore only suggestive." | |

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| Lv et al 2014 | Lifestyle modification-Multiple | Prospective Cohort | No COI declared | 2016 individuals aged 18-64 years who had lived in the local district for at least a year | Intervention areas, mean age: 43.9+/-12.6 years at baseline; 44.1+/-12.2 years at follow- up. Comparison area, mean age: 41.7+/-11.5 years at baseline; 43.7+/-12.3 years at follow- up. Males were in the minority in the intervention: 49.5, 46.6 and comparison areas: 47.4, 44.6 at baseline and follow- up respectively | The primary outcome of interest was MET- min/wk after a 2 year intervention period. Community mobilization, structural change, health education and social marketing were employed as primary intervention strategies. | Follow-up survey was conducted at the end of the 2 year intervention period. | The score for physical activity- related knowledge and belief declined slightly in the intervention areas (from 5.38 to 5.04) but not in the comparison area. However, the metabolic equivalent of physical activity increased from 1204 to 1386 (p=0.023) in the intervention areas compared with 918 to 924 in the comparison area (p=0.201) after the intervention period. | "A mean difference of 182 MET-min/wk in intervention areas might be translated to an increase of 6.5 min of moderate PA per person per day". "Though small, moderate and achievable change by the population as a whole might greatly reduce the number of people with conspicuous problems". | |

MET-min/wk: Metabolic equivalent of physical activity minutes per week

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| Miller et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Forty participants were randomized to the experimental group, and 32 had sufficient number of weekly weights recorded for the current analyses. | Participants in the study were on average 52.3 (9.0) years of age and 84.4% of the sample were female. | The experimental group received the 16-week Group Lifestyle Balance intervention adapted from the DPP. The intervention was goal-based, with a goal of losing 7% of initial body weight, consuming ≤25% of energy from dietary fat, and achieving ≥50 min/week of moderate to vigorous physical activity. | Our aim was to evaluate the time point and threshold for achieving 5% weight loss after completion of a 16-week worksite, lifestyle intervention for diabetes prevention.<br><br>Percent weight loss was assessed weekly during the intervention and at 4- and 7-month follow-up. | Baseline BMI for the sample was 35.1 (5.8).<br><br>Percent weight loss at intervention week 5 was significantly associated with percent weight loss at 4 and 7 months (all P<0.001). Only 11.1% and 12.5% of participants who failed to achieve a 2.5% weight-loss threshold during month 1 achieved ≥5% weight loss at months 4 and 7, respectively.<br><br>The predictive power, as seen by the sum of sensitivity and specificity or the sum of PPV and NPV, increased from week 2 to week 4 and then stabilized. The areas under the ROC curve showed a similar pattern and were highest for weeks 4 or 5 and were in the range of ≥0.70. The PPVs (62 to 69) were moderate, while the NPVs (80 to 100) were high for decision rules based on week 4 and week 5 thresholds.<br><br>The odds ratio of not achieving a ≥5% weight loss at month 4 based on failure to achieve an initial weight loss of 2.5% at week 5 was 14.6 (95% CI 1.4 to 138.2; P¼0.009), and a similar odds ratio for month 7 failure was 8.0 (95% CI 1.3 to 48.2; P¼0.023). | "The study findings illustrate that the first month of intervention is highly correlated with and predictive of weight loss after 4 months of treatment and 3 months of follow-up. Failure to achieve a weight-loss threshold of 2.5% at the beginning of week 5 was predictive of failure to achieve clinically significant weight loss. Thus, participants who fail to achieve 2.5% weight loss by week 5 of the intervention are at risk and may benefit from additional intervention while the intervention is actively underway. Furthermore, the areas under the ROC curves were fairly high (0.71 to 0.76), indicating the ability of the threshold to correctly classify participants who did or did not achieve ≥5% weight loss." | |

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| Ohta et al. 2014 | Lifestyle Modification | Prospective cohort study | No COI declared. | A total of 19 workers participated in the intervention. | The participants in the study were on average 55.6 (7.7) years of age and 52.6% of the sample were female. | A lifestyle modification programme consisting of aerobic exercise and diet counselling was conducted for 12 weeks in a health promotion centre. This programme was designed to prevent lifestyle related diseases and held two or three times per year.<br><br>The aims of this study were to investigate the associations between work ability and CV risk factors, and to estimate the effects of community-implemented lifestyle modifications on work ability and CV risk factors, particularly oxidative stress.<br><br>Continuous body mass index (BMI) was calculated by dividing weight (kg) by the square of height (m2). | The measurements of interest were performed before and after the 12 week intervention. | BMI, systolic blood pressure and total cholesterol showed weak negative associations with Work Ability Index (WAI) score, but these associations did not reach significance (all absolute r values were greater than 0.4). There were no significant correlations between WAI score and oxidative stress markers.<br><br>Significant negative correlations were observed between WAI score and waist circumference (r=- 0.50, P<0.05).<br><br>Among the WAI items, the Urinary 8-iso-prostaglandin F2α (PGF2α), levels showed a significant negative correlation with psychological resources (r=-0.51, P <0.05). Waist circumference and BMI were negatively correlated with absence (waist circumference: r=-0.49, P< 0.05; BMI: r=-0.55, P<0.05)<br>and psychological resources (waist circumference: r=-0.71, P<0.01; BMI: r<-0.67, P<0.01).<br><br>BW (-1.06 ± 1.21, p=0.001), percentage of fat (1.74 ± 1.67, p= 0.0004), BMI (0.41<br>±0.48, p=0.001), and waist circumference (-1.54 ±3.00, p=0.06), improved following lifestyle modifications during the 12 weeks. | "PGF2α, a biomarker of oxidative stress, was negatively correlated with psychological resources, as measured by the Work Ability Index (WAI). Overall WAI score was unchanged following the programme, while CV risk factors and antioxidative activity improved. A reduction in PGF2a levels was correlated with an improvement in subjective work ability relative to job demands, as assessed by a WAI item. Taken together, the results suggest that lifestyle modification programmes enhance the personal resources component of work ability and are associated with a reduction in oxidative stress."<br><br>"We demonstrated the capacity of a lifestyle modification programme to augment personal resources by reducing CV risk factors such as oxidative stress. In addition, since the community-implemented lifestyle modification programme minimally affected work ability, 'worksite' health promotion programmes might more effectively enhance personal resources." | |

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| Ovbiosa-Akinbosoye et al. 2011 | Lifestyle Modification | Prospective cohort study | No COI declared. | Data came from Health Risk Assessments completed by 89,746 overweight and obese persons. | Participants were almost evenly distributed by gender with 50.8% women; and the average age was approximately 48 years. | The aim of the study was to examine factors associated with long-term weight loss and maintenance for participants of a comprehensive workplace wellness program.<br><br>The comprehensive wellness program included weight management, blood pressure management, cholesterol management, physical activity, nutrition, and stress management.<br><br>Weight categories were determined by BMI computed from self-reported weight and height. Overweight was determined by BMI between 25 kg/m2 and 29.9 kg/m2 and obesity by BMI greater than or equal to 30 kg/m2. | Data was collected between 2005 and 2010 to examine the association between demographics, improved nutrition, improved exercise and reduced stress and odds of weight loss and weight maintenance, as well as changes in bodyweight at 1 year follow-up. | Of these participants, 54.5% were obese and 45.5% were overweight at baseline.<br><br>At 1-year follow-up, weight loss (≥3% of initial bodyweight) was achieved by 25% of participants, and clinically significant weight loss (≥5% of initial bodyweight) was achieved by 15.3% of participants. Moreover, participants who lost weight increased their weekly physical activity by an average of 1200 MET-minutes.<br><br>Results suggest that factors significantly associated with increased odds of weight loss or weight maintenance are being male, older age, improved exercise and nutrition, and program maturity. For example, men are 1.553 times more likely to lose weight than women (p=0.000), and those aged 57 years and older are 1.122 times more likely (p=0.000) to lose weight than those aged 18 to 28 years; and fifth-year program participants were 1.322 times more likely to lose weight and 1.260 times more likely (p= p=0.016) to maintain weight compared to first-year participants. | "In summary, participation in a comprehensive workplace wellness program was associated with average mean loss of 6.8% of initial bodyweight in overweight and obese participants. This result indicates that comprehensive workplace wellness programs can be effective in achieving clinically significant weight loss. Self-reported improvements in nutrition and reductions in psychosocial stress were found to be positively associated with weight loss at 1 year. Study efforts are currently devoted to further understanding the levels of physical activity that would be required to observe positive associations with weight loss in a population such as the one examined in this study." | |

| Author/Year: | Category: | Study Type: | Conflict of Interest: | Sample size: | Age/Sex: | Comparison: | Follow-up: | Results: | Conclusion: | Comments: |
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| Ramli et al. 2013 | Lifestyle Modification | Prospective cohort study | No COI declared. | At the end of six months, only 24 subjects had completed the health programme and were included in the data analysis. | Mean age of participants was 31.6 ± 8.2 years and 20 participants (83.3%) were female. | This study involved a non-randomised interventional pilot carried out among public sector office workers.<br><br>A total of 28 employees participated in a six-month-long obesity health programme, which consisted of two weekly unsupervised exercise sessions and monthly dietary/health education sessions. | The study was conducted for a period of one year, from June 2011 to June 2012.<br><br>The physical fitness and body fat percentages of participants were assessed at the baseline and after six months. | The participants had a BMI of 27.6 kg/m2 (SD 3.2). The Wilcoxon test showed significant differences in body fat percentage (t = 47, z = –2.58, P = 0.010), gross maximum oxygen uptake (VO2max, P = 0.014), partial curl up repetition (P = 0.001) and sit and reach distance (P = 0.005).<br><br>However, no significant effects were observed on body mass (P = 0.193), selfperceived level of physical activity (P = 0.145) or behaviour toward exercise (P = 0.393) | "The results of this study suggest that the six- month health programme involved can effectively reduce the body fat percentages of subjects who complete the programme. However, the positive findings of the study were based on a pilot study involving a small sample size, and so their application to clinical practice needs to be interpreted with caution." | |

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| Ribeiro et al. 2014 | Lifestyle Modification | Randomized controlled trial | No COI declared. | 195 women age 40–50 yr who were employees from a university hospital and physically inactive at their leisure time were randomly assigned to one of four study groups. | The sample was entirely female (100%). Within each study group, the average age was 45 (3) years. | Participants were randomly assigned to one of four groups: minimal treatment comparator (MTC), pedometer-based individual counseling (PedIC), pedometer-based group counseling (PedGC), and aerobic training (AT).<br><br>The outcomes were total number of steps (primary outcome), those performed at moderate intensity (≥110 steps per minute), and weight and waist circumference (secondary outcomes). | Evaluations were performed at baseline, at the end of a 3-month intervention, and 3 months after that. | Only groups using pedometers (PedIC and PedGC) increased the total number of steps after 3 months (P = 0.05); however, the increase observed in PedGC group (1475 steps per day) was even higher than that in PedIC (512 steps per day, P = 0.05) with larger effect size (1.4).<br><br>The number of steps performed at moderate intensity also increased only in the PedGC group (845 steps per day, P = 0.05). No PA benefit was observed at 6 months.<br><br>Women submitted to AT did not modify PA daily life activity but reduced anthropometric parameters after 3 and 6 months (P = 0.05). | "Our results showed that the pedometer-based intervention delivered with group counseling had the greatest impact on increasing the number of steps in middle-age women, whereas the AT program had a greater impact to reduce weight and waist circumference without affecting the number of steps in daily life. In addition, we also observed that more intensive interventions (with a higher number of sessions) presented the smallest study adherence mainly because of the difficulty coordinating the study participation with the participant's work schedule." | |

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| Sugiyama et al. 2011 | Lifestyle Modification | Prospective Cohort Study | No COI declared. | The total number of workers in the four worksites was 2,322, and of these, 1,468 (63%) and 1,773 (76%) responded to the pre- and postintervention surveys, respectively. | The preintervention respondents were 42.0 ± 11.5 years of age, and male workers comprised 66.1% of the group | The purpose of this study was to examine the associations of visual messages presented on A2-size posters and A4-size flyers with simple textual information.<br><br>After the intervention, we evaluated knowledge acquisition by means of quiz-type questions about Japanese health behavior guidelines and surveyed participants to determine whether they remembered the posters and flyers and whether they had positive attitudes toward health behavior. | Knowledge and attitude were surveyed using a questionnaire two weeks before the intervention.<br><br>The visual message intervention was implemented for 4 months between late August and late December 2010.<br><br>Follow-up questionnaire survey was administered in early January 2011, after the intervention period. | Correct responders to the vegetable intake knowledge question increased in the four worksites from 36–48% in the preintervention survey to 38–73% in the postintervention survey (Table 2). For the physical activity question, correct responses rose from preintervention rates of 7–14% to 7–59%. Positive attitude toward vegetable/fruit intake significantly increased from 71–76% to 78–83% at worksites A and B. Positive attitude toward physical activity did not increase.<br><br>Media recall results were 35–73% for posters, 20–43% for flyers and 19% for intranet. The workers who recalled the posters and flyers had more correct answers on knowledge questions than those who did not recall the posters or flyers ($p<0.01$).<br><br>In multivariate analyses using Model 1, seeing the visual messages on the poster and flyer was associated with change from incorrect to correct responses about physical activity (odds ratio (OR)=1.56, 95% confidence intervals (CI)=1.02–2.39; OR=2.03, 95%CI=1.37–3.02, respectively). | "The findings of this study were that highly specific, unfamiliar knowledge can be acquired by workers through posters and flyers."<br><br>"Interventions with a combination of media and simple visual messages should be considered for health promotion among general populations at worksites." | |

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| Thomley et al. 2011 | Lifestyle Modification | Prospective cohort study | No COI declared. | Of the 50 who consented to participate, 37 attended at least 90% of the classes. Ten individuals attended 100% of the classes. | Mean age of participants was 49.5 ± 11.0 years (range, 24-76 years), and 13 participants (26%) were men. | Participants met Monday through Saturday for six weeks to do a sequence of yoga postures in a classroom setting. The yoga practiced was in the style of power vinyasa flow.<br><br>Main outcome measures were biometric measures (height, weight, blood pressure, flexibility, body fat) and quality-of-life measures (physical, emotional, and spiritual well-being). | Participants met six days per week (Monday through Saturday) at 5:10 AM. Sessions lasted for at least one hour, and the program was six weeks long.<br><br>Mean ± standard deviation of each studied variable was calculated from baseline to postintervention | Statistically significant improvements were observed in weight (-4.84 ± 5.24 kg; P =.001), diastolic blood pressure (-2.66 ± 8.31 mm/Hg; P=.03), body fat percentage (-1.94 ± 2.68; P =.001), and overall quality of life (linear analog self-assessment [LASA] score 3.73 ± 8.11; P = .03). | "This pilot study shows the feasibility of incorporating a yoga based program into the overall wellness strategy for a group of employees. These initial findings also suggest that the program could improve weight, blood pressure, flexibility, and several subjective indicators of quality of life." | |

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| Van Berkel et al. 2014 | Lifestyle Modification | Randomized controlled trial | No COI declared. | In total, 257 participants completed the baseline questionnaire and were randomized to the intervention (n = 129) or control group (n = 128). | Participants in the study were on average 46 years of age and 67% of the sample were female. | The aim of this study was to evaluate the effectiveness of a worksite mindfulness-based multi-component intervention on vigorous physical activity in leisure time, sedentary behavior at work, fruit intake and determinants of these behaviors. The Mindful VIP intervention comprised 8 weeks of in company mindfulness training with homework exercises, followed by 8 sessions of e–coaching. The weekly mindfulness training sessions took 90 minutes and were held in a room at the worksite in a group setting of 4 to 17 participants.<br><br>The control group received information on existing lifestyle behavior- related facilities that | The total duration of the intervention was six months.<br><br>Outcome measures were assessed at baseline and after 6 and 12 months using questionnaires. | The majority of both groups had a healthy body weight (BMI < 25 kg/m2, 64.6% and 58.7%, respectively).<br><br>No significant effects ($p > 0.05$) of the intervention were observed for the other lifestyle behaviors and behavioral determinants after 6 and 12 months.<br><br>The sensitivity analyses showed effect modification for gender in sedentary behavior at work at 6-month follow-up (women in the control group sat 246 minutes per week less than women in the intervention group), although the main analyses did not. | "This study did not show effects of a worksite mindfulness based intervention on vigorous physical activity, fruit intake and behavioral determinants after 6 and 12 months among a group of relatively highly educated workers. Thereby, the results do not support the implementation of the mindfulness intervention as evaluated in this study among this group." | |

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| Vasquez et al. 2015 | Lifestyle Modification | Prospective cohort study | No COI declared. | 285 Lose to Win 2009 Challenge participants, belonging to 72 different teams (1 per workplace) completed the intervention. | Mean age of participants was 36.9 ± 8.2 years and 160 participants (56.1%) were female. | Participants underwent a structured program comprising 21 physical activity ("boot camp") sessions, 3 nutrition education sessions, and 3 fitness assessments over a period of 12 weeks.<br><br>Participants, had their anthropometric (weight, body mass index [BMI], and body fat percentage) and fitness (fitness index score based on UKK 2-km walk test) measurements taken pre-intervention and post-intervention. | Participants completed the intervention over a period of 12 weeks and were assessed at baseline to end of intervention (12 Weeks Post-baseline). | Most participants were in the overweight category (25.0-29.9; 52.9%) followed by the obese category (≥30; 45.6%). Using the Asian BMI classification, most participants were in the high-risk category (≥27.5; 73.7%). More than half of the participants (55.7%) had a body fat percentage in the 30% to 39.9% range.<br><br>Average decreases, from baseline to end of intervention, in weight, BMI, and body fat percentage were 3.58 kg, 1.32 kg/m2, and 2.14%, respectively and a significant improvement in fitness index score (by 34.1 units).<br><br>The average percentage change in weight/BMI and body fat percentage was −4.37% and −6.03%, respectively.<br><br>There was a significant improvement from baseline to the end of the intervention in physical activity (range = 2-8): 3.97 (1.41) to 5.46 (1.50).<br><br>Attending 16 or more boot camp sessions was associated with a significantly higher loss of body weight, BMI, and body fat percentage and gain in fitness index score relative to attending either 0 or 1 to 5 or 6 to 10 or 11 to 15 sessions. | "The LTW 2009 Challenge was effective in producing beneficial changes in key anthropometric and fitness measures in the short term. A key strength of our study is that it extends international research into workplace-based weight loss interventions locally, being among the first studies in Singapore documenting the experience in conducting a weight loss intervention in the workplace setting. It is worthwhile examining whether such an intensive program (with direct costs of about S$400 per participant or US$311) can be expanded to reach more individuals and even become a national program worth maintaining over the long term."<br><br>"Greater participation in physical activity and nutrition education sessions was associated with more beneficial anthropometric and fitness changes. The intervention was well received and effective in producing short-term weight loss. Further research needs to be done to ascertain its long-term effectiveness and generalizability." | |

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| Verweij et al. 2012 | Lifestyle Modification | Prospective Cohort | No COI declared. | To measure the degree of implementation, interviews were conducted after the intervention period among all OPs (n = 7) and employers (n=7) allocated to the intervention group. | Occupational physicians were on average 47 years old (range: 35 to 54 years), and 28.5% of OPs were men. | The purpose of this study was to assess barriers and facilitators to implementation of an occupational health guideline aimed at preventing weight gain.<br><br>Barriers and facilitators to implementation were assessed among 14 occupational physicians (OPs) and employers and analyzed following a systematic approach using Atlas.ti. | The semistructured interviews were held after the 18-month trial period between September 2010 and January 2011. One focus group interview among three OPs was conducted at the Netherlands Society of Occupational Medicine over a 1 hour period. | Barriers and facilitators mentioned by OPs and employers were related to the sociopolitical context, organization, OP, and guideline. Recommendations include the formation of a linkage group, collaboration with other experts, formation of peer support groups, and communicating benefits of investments, expectations, and ethical considerations. Results of this study recommend incorporating these barriers and facilitators in the guideline, including strategies about how to overcome barriers and stimulate facilitators. | "There is a broad societal base and organizational support among OPs and employers for implementation of the guideline, but resources, structures, and support for continuation should receive more attention in the guideline and training. Results from the present study can be used to increase the chance of successful implementation of the guideline into occupational health practices throughout the Netherlands, and thereby may contribute to the prevention of weight gain." | |

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| Weinhold et al. 2015 | Lifestyle Modification | Randomized controlled trial | No COI declared. | Participants with prediabetes were recruited from a university worksite and randomized to an intervention (n = 35) or usual care (n = 34). | The intervention group was 80% female and the average age was 51.6 (9.5).<br><br>The control group was 79.4% female and the average age was 51.0 (8.1). | Participants each were randomized at baseline to either a 16-week group-based lifestyle intervention or usual care from their health care providers (control condition).<br><br>Participants randomized to the intervention group received the manualized 16-week group-based intervention adapted from the DPP Outcomes Study Lifestyle Balance Program (17,18). The behavioral goals for the program were consistent with those of the DPP: achieve at least 7% weight loss, engage in at least 150 minutes per week of moderate to vigorous PA, and consume 25% or less of total energy from fat. | Postintervention data were collected after the 16-week intervention, followed by a 3-month maintenance period. Final data were collected 7 months after enrollment. Follow-up of participants was completed in May 2014 at trial end. | We found a significant between-group difference in mean (SE) percentage weight change from baseline to postintervention (−5.5% [0.6], intervention; −0.4% [0.5], control; P < .001).<br><br>Postintervention, the intervention group achieved significantly greater reductions in waist circumference, fasting glucose, and systolic and diastolic blood pressure than did the control group (all P < .025). Total cholesterol declined significantly ( P = .01) in the intervention group.<br><br>Changes from baseline to 3-month follow-up remained significantly greater for the intervention than the control group for percentage weight change, body weight, waist circumference, and systolic and diastolic blood pressure (all P < .05).<br><br>In the intervention group, 32.4% met the goal of achieving 7% or more weight loss postintervention, which was significantly more than in the control group (2.9%; P = .003). The proportion of participants in each group who lost more than 5% of their weight differed postintervention and at 3-month follow-up. | “The 16-week group-based lifestyle intervention delivered at a university worksite facilitated reductions in body weight among employees with prediabetes. These results support the efficacy of the intervention for promoting risk reduction and provide evidence for its utility at the worksite.” | |

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| Zinn et al 2012 | Lifestyle Modification - Behavioral Health | Prospective Comparative | No COI declared | 1st intervention: 54 employees in 2 geographically separate sites. 2nd intervention: 105 employees in 2 separate sites. All participants were older than 18 years with a body mass index >25kg/$m^2$ | Mean age of participants in SC+M group: 45±11 and 42±11 years for completers and non-completers respectively. SC group: 47±11 and 37±10 years for completers and non-completers respectively.<br><br>Males were in the majority in the SC+M group: 70% and 71%; but in the minority in the SC group: 39% and 47% for completers and non-completers respectively. | The primary outcome of interest was weight loss in kilograms at the end of the 12 month intervention.<br><br>Other outcomes of interest were changes in waist circumference, serum glucose, lipid profile and blood pressure | Follow-up was done at 12 months for the 1st intervention. While for the 2nd intervention, follow-up was done at 12 weeks, and again at 12 months. | Relative to usual care (1st intervention), both worksites had decreases in weight during small changes {2nd intervention (Auckland worksite:−4.2%±7.4; Whangarei group:−4.9%±8.8)}.<br><br>Among the larger sample of participants of the small-changes interventions, weight fell at 12 weeks by 3.8%±3.3 in SC+M and 3.9%±3.4 in SC; and by 3.5%±5.6 in the SC+M and 3.5%±5.8 in SC groups at 12 months. One in every 3 participants lost 5% or more weight.<br><br>Other findings include a moderate reduction in LDLc for the SC group but a small increase in HDLc for the SC+M group at 12 months; a small decrease in SC+M group but a small increase in SC group for serum glucose at 12 months; small systolic and diastolic BP increases in SC+M but small to moderate decreases in systolic and diastolic BP in SC group at 12 months. | "The small-changes intervention was successful in bringing about sustained weight loss compared with the usual-care intervention".<br><br>"The intervention has been successful in bringing about the maintenance of lost weight, albeit small amounts, with consequent improvements in some health outcomes, irrespective of the inclusion of a maintenance component" | |

SC+M= small changes + maintenance; SC= small changes only; LDLc= low density lipoprotein cholesterol; HDLc= high density lipoprotein cholesterol; BP= blood pressure