

Supplemental Digital Appendix 1

Detailed Study Protocol for the Medical Student Cognitive Habits and Growth Evaluation (CHANGE) Study

Study description

The Medical Student Cognitive Habits and Growth Evaluation (CHANGE) Study is a multi-measure national longitudinal study of a cohort of medical students. It was designed to examine changes in medical students' well-being, experiences, and attitudes between their first year of medical school and the end of their last year of medical school.

In 2010, the study enrolled a large sample of medical students during the fall of their first year of medical school and followed them through their fourth year of medical school (data not yet available). To assess individual-level characteristics (e.g., implicit and explicit attitudes, empathy, mastery), students were surveyed at baseline (i.e., in 2010, during the fall of their first year of medical school) and at follow-up (i.e., in 2014, during the winter and spring of their fourth year of medical school). In addition, the study included a survey of an independent sample of medical students enrolled in the same medical schools during the winter and spring of the independent sample's fourth year (i.e., in 2013, when the focal cohort was in their third year of medical school) to independently assess school-level characteristics (e.g., exposure to relevant training, informal school norms, campus climate).

Sampling and recruitment

The Medical Student CHANGE Study employed a stratified multistage sampling design. In the first stage, medical schools were stratified by geographical region and public/private status into 11 strata, and a probability sample of schools was selected. Roughly the same proportion (43%) of schools was sampled from each stratum resulting in the targeted sample size of 50 schools. Within each stratum, the specific schools selected were sampled using a proportional to (first-year class) size sampling methodology.¹

In the second stage, we recruited first-year students from 49 of the selected schools (1 military school was excluded; for a participant recruitment flowchart, see Supplemental Digital Appendix 2). There were no publicly available complete and accurate lists of incoming medical students to sample from. Thus, we ascertained participants using a combination of three strategies:

- (1) The Association of American Medical Colleges (AAMC) administers the Matriculating Student Questionnaire (MSQ) in late spring/early summer to all students who will be entering medical school that year. In the 2010 MSQ, the AAMC included a question allowing respondents to provide an e-mail address if they were interested in learning about the Medical Student CHANGE Study.

¹ Särndal C-E, Swensson B, Wretman JH. *Model Assisted Survey Sampling*. New York: Springer-Verlag; 1992.

- (2) A list of first-year medical students (incomplete) purchased from an AMA licensed vendor.
- (3) Students contacted us as a result of a referral (snowball) sampling strategy. When students completed the survey they were asked to let other students in their first-year class know about the study. Students who learned of the study through classmate referral contacted us. After we confirmed eligibility and non-duplication, they were sent information about the study.

Students who agreed to participate in the study completed an extensive online survey questionnaire and Implicit Association Tests, described below. The University of Minnesota and Mayo Clinic Institutional Review Boards approved the study. All students who completed the survey received a \$50 incentive for participation.

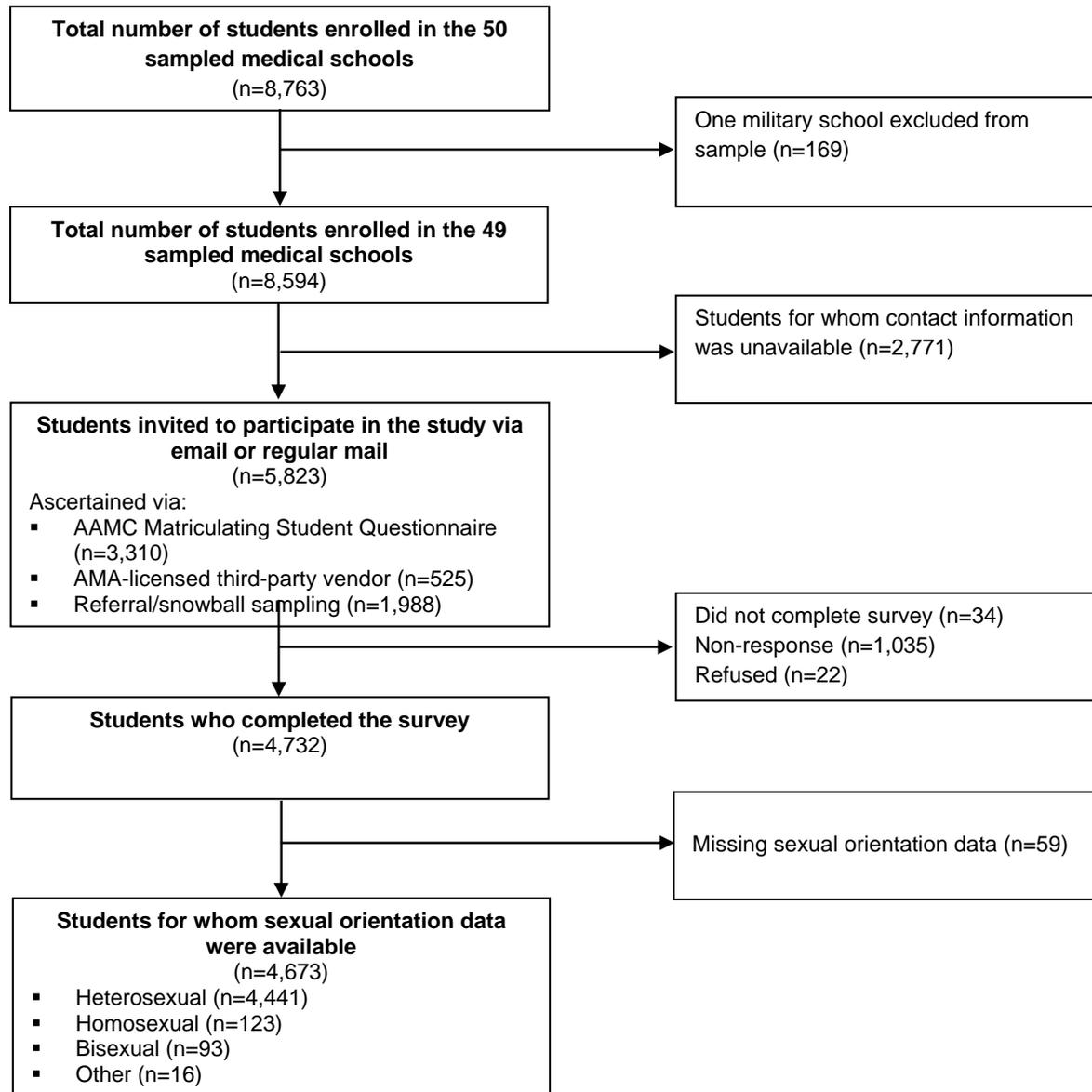
Data collection

In order to be eligible for the study, respondents had to be enrolled in their first year at one of the sampled medical schools. Students who met these criteria were sent an initial survey mailing by e-mail or regular mail (or both when both addresses were available) that included a cover letter briefly describing the study, information about the study incentive, and specific instructions for signing into a Web page containing the informed consent form. Students who consented were redirected to an online questionnaire that they advanced through by answering sets of questions placed on consecutive pages. Time spent on each page and total time to questionnaire completion was recorded. Participants who attempted to proceed to a subsequent page without answering all the questions received a pop-up notification, at which point they could choose to either return to the omitted questions or click on a button confirming their decision to skip. This protected participants' right to skip questions while reducing time-saving incentives for doing so.

After students completed the questionnaire, they took two Implicit Associations Tests (IATs). All participants received the race IAT, while half the sample was randomized to the weight IAT and the other half to the sexual orientation IAT. Upon completing the two IATs, participants were directed to a separate secure server where they provided their name and address in order to receive the \$50 incentive. This step both allowed us to identify and eliminate duplicates, as well as re-confirm that respondents sampled through referral met the study eligibility criteria by cross-referencing the information with online school directories. Last, responses were examined for indications of systematic response bias (e.g., clicking the same response option to move rapidly through the questionnaire).

Supplemental Digital Appendix 2

The Medical Student CHANGE Study Participant Recruitment Flowchart^a



Abbreviations: CHANGE indicates Cognitive Habits and Growth Evaluation; AAMC, Association of American Medical Colleges; AMA, American Medical Association.

^aFor the detailed study protocol, see Supplemental Digital Appendix 1.

Supplemental Digital Appendix 3

Medical Student CHANGE Study Sample Demographic Characteristics Compared to National Matriculant Data for U.S. MD-granting Medical Schools, 2010

Characteristic	Medical Student CHANGE Study sample (49 schools): No./total (%)	All matriculants ^{a,b} (131 schools): No./total (%)
Gender		
Male	2,369/4,732 (50.0)	9,909/18,665 (53.1)
Female	2,363/4,732 (49.9)	8,756/18,665 (46.9)
Race/ethnicity		
Black or African American, non-Hispanic	239/4,732 (5.1)	1,174/18,665 (6.3)
Alaska Native, American Indian, or Pacific Islander, non-Hispanic	15/4,732 (0.3)	76/18,665 (0.4)
Asian, non-Hispanic	1,009/4,732 (21.3)	3,812/18,665 (20.4)
White, non-Hispanic	2,847/4,732 (60.2)	10,655/18,665 (57.1)
Hispanic/Latino	287/4,732 (6.1)	1,539/18,665 (8.2)
Unknown/other, non- Hispanic	115/4,732 (2.4)	614/18,665 (3.3)
Multiracial, non- Hispanic ^c	220/4,732 (4.6)	514/18,665 (2.8)

Abbreviations: CHANGE indicates Cognitive Habits and Growth Evaluation.

^aSource: Castillo-Page L. Table 10: U.S. Medical School Applicants, First-Time Applicants, Acceptants, and Matriculants by Gender and Race and Ethnicity, 2009-2011. Diversity in Medical Education: Facts and Figures 2012. Washington, DC: Association of American Medical Colleges; 2012.

https://members.aamc.org/eweb/upload/Diversity%20in%20Medical%20Education_Facts%20and%20Figures%202012.pdf. Accessed January 13, 2015.

^bThe Association of American Medical Colleges denominator includes foreign students (n=281), for whom race/ethnicity data are unavailable; percentages may not sum to 100.

^cMultiracial includes all individuals who indicated more than one race.