

# Willingness to treat drug dependence and depression: comparisons of future health professionals

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**Purpose:** Stigma-related feelings, including degree of enthusiasm and willingness to work with alcohol, drug, and mental disorder (ADM) patients, as well as anticipated success in such work, will be required for the United States to be successful in its new initiatives for ADM screening, brief intervention, and effective referral to treatment and rehabilitation services (SBIRT). This study investigates students of medicine and social work with respect to their stigma-related feelings and degree of enthusiasm or willingness to treat patients affected by alcohol dependence, nicotine dependence, or major depression. Inference is strengthened by an anonymous online survey approach, with use of randomized reinforcers to gain at least partial experimental control of nonparticipation biases that otherwise are present in student survey data.

**Material and methods:** All students on required course rosters were asked to participate in a two-part in-class and online assessment; 222 participated, with a gradient of participation induced via randomly drawn reinforcers for online survey participation. Between-group comparisons were made with a multivariate generalized linear model and generalized estimating equations approach that adjusts for covariates.

**Results:** Medical and social work students did not differ from each other with respect to their willingness to treat patients affected by major depression, alcohol dependence, or nicotine dependence, but together were less willing to treat nicotine and alcohol dependence-affected patients as compared to depression-affected patients. Personal history was not associated with the students' willingness to treat, but men were less willing to treat. Drawing strength from the randomized reinforcer experimental design nested within this survey approach, the study evidence suggests potential nonparticipation bias in standard surveys on this topic.

**Conclusion:** These results indicate that future health professionals may prefer to treat depression as opposed to drug dependence conditions. For SBIRT success, curriculum change with educational interventions may be needed to increase willingness to treat patients with neuropsychiatric conditions such as drug dependence. Future research requires attention to a possible problem of nonparticipation bias in surveys of this type.

**Keywords:** alcohol dependence, nicotine dependence, depression, health professionals, stigma

## Introduction

Major obstacles to successful outreach, early intervention, treatment, and rehabilitation for alcohol, tobacco, and other drug use disorders include levels of self-stigma as experienced by users of these drugs, family stigma as experienced by family members of the users, and professional stigma as experienced by counselors or clinicians who provide 'front line' care and are expected to be active participants in initiatives such as the current federal Screening, Brief Intervention, and Referral to Treatment

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(SBIRT) initiative (see <http://sbirt.samhsa.gov/index.htm>). In our experience as faculty members in Schools of Social Work, Medicine, and Public Health, we have observed manifestations of professional stigma as early as the first years of post-baccalaureate (PB) graduate and professional education of our students. Nonetheless, there is some complexity in the assessment of professional stigma, in that a certain amount of deliberate impression management may contaminate our assessments of stigma-related feelings toward care of affected patients. For example, in a face-to-face interview, or even using a confidential questionnaire with identity linkages, our students may deliberately cover their true negative or stigma-laden feelings and appear to be dispassionate or even compassionate.

As background to this investigation, we note that physicians and social workers provide much of the mental health and drug treatment and rehabilitation services in this country. Physicians in general medicine are considered gatekeepers to all of mental health treatment, often with a triage function for psychiatrists providing specialty treatment.<sup>1</sup> Social workers are estimated to comprise between 60%–70% of all mental health professionals and also have gate-keeping and triage roles.<sup>2</sup> The stigma-related feelings of physicians and other professionals are important, in that stigma-related feelings may dampen their propensities to screen for, or respond to, mental health issues.<sup>3–7</sup> In this study, the main aim is to compare medical and social work students' stigma-related feelings in anticipation of providing treatment for patients with three conditions: nicotine dependence, alcohol dependence, and depression. In addition, this study seeks to estimate the degree to which age, sex, discipline, or personal behaviors/conditions might affect these feelings.

As noted, stigma can be one of the greatest barriers that keep people from seeking or accessing effective psychiatric treatment.<sup>8,9</sup> People with mental health related conditions are often avoided or thought to be frightening, unpredictable, and strange.<sup>10,11</sup> The structural attitudes in society may also be internalized by those affected by neuropsychiatric conditions, a process termed self-stigma.<sup>12,13</sup> While limited health professional stigma research exists, a few studies have documented its importance. In a survey comparing the attitudes of mental health professionals and individuals in the Swiss general population, Nordt and colleagues found equivalent levels of stigma-related feelings – that is, the professional had stigma-laden feelings equivalent to those in the general population without benefit of professional education.<sup>14</sup> In addition, the study found that both professionals and the general public desired a good bit

of social distance from people affected by schizophrenia as compared to those affected by depression, implying that stigma-laden feelings might be less pronounced for depression.<sup>15,16</sup> The element of stigma most pertinent in this study is the degree to which future health professionals might be willing to treat patients with various conditions. For example, in a study of 440 medical students at one California-based university, Christison and colleagues found that students had more positive anticipatory feelings when they were asked about treating patients who had “straightforward medical” conditions such as meningitis, as compared to the feelings associated with “psychiatric conditions” such as alcohol dependence.<sup>17</sup> A novel feature of the present study is its deliberate attempt to contrast and compare two different subgroups of future health professionals (medical students versus social work students) with respect to their stigma-related feelings as manifest in anticipation of treating patients with several neuropsychiatric conditions, including alcohol and nicotine dependence. Also, some interesting prior research has found that health professionals who were marijuana smokers were less likely to identify patient marijuana use as a problem.<sup>18</sup> The current study will assess levels of personal tobacco smoking and alcohol drinking as well as personal history of depression to investigate whether they influence willingness to treat among health professional students in this sample.

The present study investigates professional stigma, as well as stigma-related feelings in anticipation of patient care, as a potential obstacle to the SBIRT and other related outreach and early intervention initiatives, with a focus upon PB professional school students early in their years of training for practice of a) social work, and b) medicine. The research makes use of a novel assessment approach that yokes anonymous classroom survey questionnaire and saliva test data (for confirmation of self-reported tobacco smoking) with anonymous online survey responses to standardized professional stigma assessments. Looking across classroom samples of social work and medical students, we aim to compare and contrast the levels of stigma-related feelings expressed anonymously by social work and medical students as they forecast their practice experiences with patients or clients whose lives and health are affected by drug use disorders (DUD), and to compare stigma-laden feelings toward DUD-affected individuals with stigma-laden feelings toward individuals with comparator conditions such as major depression.

Another novel feature of this investigation involves use of pre-incentives fixed in value to be the same for all potential participants, plus randomly drawn reinforcers that were designed to vary in value across individual participants so

as to exert an effect on participation levels for the anonymous online surveys. That is, we anticipated that most students would consent to answer the anonymous classroom survey questionnaire and also to provide a saliva specimen for salivary cotinine confirmation of self-reports about tobacco smoking. Nonetheless, we forecast that students with the most negative stigma-laden feelings toward DUD-affected individuals would be less likely to log in and participate in the online survey. For example, students with higher levels of stigma-related feelings may be less likely to participate if they are told in a study description that a survey will focus on their attitudes towards treating patients with DUD. Accordingly, by design, during the initial classroom questionnaire session, we allowed each student to draw a gift card value at random across a gradient from US\$12 to US\$37, and informed them that students who logged in to complete the anonymous online survey would receive a gift certificate equal to the amount just drawn. In addition to an expectation that online survey participation would be enhanced for students whose random draw had yielded higher value gift cards (eg, \$30–\$37) as compared to students drawing the \$12 gift card, we hypothesized that one instrumental effect of the higher value gift card would be to secure participation of students with higher levels of stigma-laden feelings about DUD, who otherwise would decline to participate in the online survey. That is, in the absence of our promise of a higher value reinforcer in the form of the \$30–\$37 gift card, participation would be determined largely by pre-conceived stigma-laden feelings about the disturbances under study (DUD and depression), with greater nonparticipation by the students who hold negative attitudes and higher levels of stigma-valued feelings with respect to these conditions. The report includes a description of our multi-faceted study design, with yoking of anonymous online classroom questionnaire, saliva specimen collection, later online survey, and delivery of the post-log-in reinforcer in the form of a gift certificate – all done in a fashion that allows participants to remain completely anonymous.

## Material and methods

In the current project, the study population consisted of students on the rosters of graduate-level required courses in a) medicine, and b) social work at a large midwestern university. The research protocol involved completion of an anonymous multi-part classroom questionnaire survey with saliva specimen collection, followed by a web-based online survey that made use of Longitudinal Study Engine (LSE) software developed by our research group (see <https://www.bric.msu/node/12>). Each participant received a fixed dollar

value (\$10) for completion of the classroom survey questionnaire. In addition, as part of a participation methods experiment nested within the overall survey design, each participant drew, at random, a gift certificate with a pre-assigned value from \$12 to \$37, and were informed that an Amazon.com gift coupon of that value would be delivered by the LSE software upon log-in for completing the LSE online survey. That is, the fixed \$10 value was designed to serve as a reinforcer for completion of the classroom part of the survey and as a pre-incentive for the online survey log-in; the randomly drawn Amazon.com coupon was designed to serve as a reinforcer for the act of logging in for the online survey.

The study design can be understood in relation to several parts. During Part I, a lead researcher read a disclosure statement to potential participants and then left the classroom. In Part II, research assistants allowed each potential participant to make one random draw from a box of coded envelopes so that each random draw would yield one coded envelope containing the pre-coded in-class questionnaire, a pre-coded saliva specimen bottle, and a pre-coded business card that disclosed the gift certificate value and instructions for the online survey. That is, all of the codes were known to the participant but not to anyone else; the same code number linked the anonymous questionnaire with the saliva specimen and also with the online survey results. Thereafter, in Part III, participants completed the questionnaire in the classroom, anonymously, and provided a coded but anonymous saliva specimen, if they consented to participate in that aspect of the study, which was intended to confirm a random sample of self reported tobacco smoking via the NicAlert® (Nymox Pharmaceutical Corporation, Quebec, Canada) semiquantitative salivary cotinine assay. Some potential participants chose not to participate. They were allowed to draw a coded envelope, and then to return the envelope with a blank survey and empty specimen bottle at the end of the recruitment session in a fashion that did not make it possible to discriminate consenting participants from nonparticipants. Consenting participants were given two weeks to complete Part IV of the study, which required them to log in for completion of the coded but anonymous online LSE questionnaire assessment, as described below. This study protocol for anonymous survey research with adult participants was reviewed and approved by the institutional review board for protection of human subjects in research.

The study population consisted of 222 health professional students: 102 medical and 120 master-level social work students. Some participants did not consent to participate and others had missing or invalid responses to key study variables,

thus the final sample for the multi-part survey included 71 medical and 75 social work students. The proportion of designated medical and social work participants with useable data was 70% and 63%, respectively. The gradient of participation level based on the randomly drawn reinforcer value is shown in Panel A of Table 1, with the highest reinforcer amounts (\$30 and \$37) garnering a substantially greater participation level (ie, >85%), as intended. A footnote to Table 1, Panel A, provides some methodological details about the range of reinforcer values in this line of participation methods experiments for surveys of this type; additional methods details about these experiments, and how they are nested within the overall survey approach, are reported elsewhere.<sup>19</sup>

The key response variable in this study was the health professionals' level of stigma-related feelings with respect to patients affected by nicotine dependence, alcohol dependence, or major depression. For this study, stigma was measured via the 11-item Medical Condition Regard Scale [MCRS] for each of these three neuropsychiatric conditions under study, as devised by Christison and colleagues for the study described in this paper's introduction.<sup>17</sup> The MCRS seeks to measure future professionals in relation to anticipatory feelings about treating patients with various medical diagnoses. Evidence of MCRS validity and reliability has been reported (coefficient alpha = 0.87; test-retest reliability = 0.84). In our interpretation, the MCRS is weighted toward a construct of "enthusiasm or willingness to treat patients with a specific condition", and includes additional items on compassion, parity in health plans, and capacities to treat patients effectively, as described below. The MCRS scale was reverse coded from its original form (higher scores = increasing regard). In this context, higher

scores indicate a greater level of stigma-related feelings and lack of enthusiasm or willingness to treat the patient.

Within this context, covariates of central interest were age, sex, and program type (medical vs social work) as well as personal smoking, alcohol drinking behaviors, and history of depression among the students. These items were measured via single-item questionnaire responses, either during the questionnaire or online survey assessment. These personal characteristics are conceptualized as potential ancillary influences on the level of stigma-related feelings and reluctance to treat a patient with a given diagnosis. Race/ethnicity was not assessed because this variable's values might be used to identify specific participants within each classroom, and we sought to ensure anonymity. No one was excluded from participation on this basis.

In the descriptive analysis step, the task was to estimate the level of stigma-related feelings and how these feelings might be attached to each condition. The main analysis required an application of a generalized linear model and generalized estimating equations (GLM/GEE [see <http://stata.com/capabilities/xtgee.html>]) approach designed for multivariate response profile of the three interdependent MCRS scales, one each for major depression, alcohol dependence, and nicotine dependence. This GLM/GEE approach estimates between-group variation in stigma-related feelings, as measured by the MCRS scales, with covariate adjustments (eg, for age, sex, and program type).<sup>20</sup> Latent structure analysis was used to confirm unidimensionality of each MCRS scale.<sup>21</sup> In this work, the precision of the study estimates is stressed and there is a focus on 95% confidence intervals (CI), with *P*-values presented as an aid to interpretation. Stata software (version 10.0; Stata Corp, College Station, TX) and *Mplus* software (version 5.0; Muthén and Muthén, Los Angeles, CA) were used to complete the analysis plan for GLM/GEE and item response theory/differential item functioning (DIF), respectively.<sup>22,23</sup>

In post-estimation exploratory data analysis steps guided by item response theory, additional latent structure analyses were completed in an effort to probe into possible sex- or gender-related DIF that might account for overall male-female differences reported below. Unidimensionality of the MCRS was confirmed via model fit and residual mean square error of approximation statistics in the comparison of unidimensional versus multidimensional models. Under the assumption of unidimensionality, we probed whether observed male-female differences might be due to DIF because the initial observation of a male-female variation in stigma-related feelings might actually be due to DIF (sometimes called test item bias). The methods

**Table 1** Panel A: Program participation levels for the full two-part survey by level of randomly drawn reinforcer

	Level of reinforcement*				
	\$12	\$18	\$25	\$30	\$37
<b>Program</b>					
Social work	44%	65%	81%	n/a	100%
Medical	n/a	68%	71%	89%	n/a

**Notes:** The medical study was conducted before the social work study, without \$12 and \$37 valued reinforcers. The social work study approach was re-designed with re-balancing of available funds using \$12 and \$37 reinforcers in an effort to achieve 100% participation at the high value, and to induce more variation in the range of participation levels, as shown above. The current plan for our future survey work eliminates the \$30 reinforcer level, creates a \$32 reinforcer level, and retains the \$37 reinforcer level. Via pilot studies described elsewhere (Anthony et al, in preparation), we have learned that an upper asymptote of student participation, close to 96%–100% can be reached via reinforcers in the \$32–\$37 range.

used in this study to test for DIF are based on the research approach used in Educational Testing Service evaluation of standardized academic achievement tests in order to ensure that the standardized achievement testing is not biased for or against males or females. This test involves fitting the unidimensional model within the context of a structural equations model, with the level of stigma-related feelings (as measured by the MCRS items) regressed upon dummy-coded terms for a binary male–female indicator, followed by elaboration of that basic model with a direct path that runs from the dummy-coded male–female indicator to each MCRS item, iteratively (ie, each item response regressed on the male–female indicator one by one, with MCRS-measured stigma level held constant). The results of this DIF analysis are described below.

## Results

A description of the online survey study sample is shown in Panel B of Table 1. After participation, our sample included a larger percentage of females (72%) than males and the majority of the students were younger than 25 years, in a reflection of the age distribution of the rostered student participants. In addition, 44% of students had a history of tobacco smoking behavior, with social work students (53%) more likely to have smoked tobacco at some time in their lives compared to

medical students (34%; exact  $P = 0.02$ ). Medical and social work students did not differ on their alcohol drinking behavior or reported history of depression ( $P > 0.05$ ). Overall, an estimated 22% indicated having at least two drinks per week and an estimated 38% had a history of depression.

The range of possible MCRS values is from 11 to 55, and the observed distributions were Gaussian with combined medical and social work sample-based estimated means as follows, indicating greater willingness in anticipation of treating patients with major depression (major depression MCRS mean = 24), and less willingness with respect to treating patients with alcohol dependence (alcohol dependence MCRS mean = 30) or nicotine dependence (nicotine dependence MCRS mean = 31). Consistent with our expectation that nonparticipation bias might be an important factor in standard stigma surveys of this type, MCRS scores were found to depend upon the size of the online survey log-in reinforcer. For example, as compared to the overall major depression mean of 24, the estimated major depression mean was 27 for students who logged in after the random draw of a \$30–\$37 reinforcer. Corresponding alcohol dependence and nicotine dependence means for this subgroup of students also were well above the overall sample mean values, at 35 and 35, respectively (data not shown; a separate paper provides methodological details and regression-based confirmation of these results).<sup>19</sup>

In Table 2, covariate adjusted estimates from the GLM/GEE models help to characterize variations in the levels of stigma-laden feelings for each of the main subgroups of the sample. Initial models showed that it was possible to borrow information from all three MCRS scores (major depression, alcohol dependence, and nicotine dependence) in order to describe the relationships with a single common slope. For example, with or without covariate control of the reinforcer value, male students had generally higher MCRS scores for all three neuropsychiatric conditions under study. Under the covariate-adjusted GLM/GEE model, the estimated male-female difference in MCRS scores was 3.8 units on the original scale (95% confidence interval [CI]: 1.7, 5.8;  $P < 0.001$ ; Table 2), with males showing less enthusiasm and willingness in anticipation of treating patients with major depression, alcohol dependence, or nicotine dependence. This estimated difference is roughly the same magnitude as the estimated difference seen in the contrast of students who drew the larger reinforcer value as compared to those who drew the smallest reinforcer values in the participation methods experiment that was nested within this study.

As for program type and the medical versus social work student contrast, there was little variation in MCRS scores.

**Table 1** Panel B: Sample description based upon online survey data from medical and social work student participants on university rosters for required courses

	Medical school students (n = 71)	Social work students (n = 76)
	% (n)	% (n)
<b>Sex/gender</b>		
Men	42 (30)	15 (11)
Women	58 (41)	86 (65)
<b>Age (years)</b>		
20–21	3 (2)	1 (1)
22–23	31 (22)	40 (30)
24–25	39 (27)	21 (16)
Over 25	27 (19)	38 (29)
<b>Depression history</b>		
Yes	34 (24)	43 (32)
No	66 (47)	57 (43)
<b>Tobacco smoking</b>		
Current smoker	3 (2)	23 (17)
Past smoker	31 (22)	31 (23)
Never smoked	66 (47)	47 (35)
<b>Alcohol use</b>		
2 or more drinks/week	21 (15)	23 (17)
2–4 drinks/month	41 (29)	29 (22)
Monthly or less	21 (15)	32 (24)
Never	16 (11)	16 (12)

**Table 2** Estimates from pooled GLM/GEE multivariate regression analysis assessing levels of MCRS-rated stigma-feelings, with covariate adjustment for age and variables listed below\*

	Coefficient ( $\beta$ )**	95% CI**	Coefficient ( $\beta$ )	95% CI	P-value
Sex: Male (Female is reference)	3.4	1.3, 5.6	3.8	1.7, 5.8	<0.001
Program: Medical student (Social work program is reference)	0.3	-1.6, 2.1	-0.7	-2.4, 1.0	0.405

**Notes:** \*Covariate adjustment for the randomly drawn reinforcer values did not yield appreciable change in these estimated relationships; \*\*Unadjusted estimates

Again, with the GLM/GEE model used to borrow information across the major depression, alcohol dependence, and nicotine dependence scale scores for a common slope estimate, the medical-social work difference was fundamentally null at  $-0.7$  (95% CI:  $-2.4, 1.0$ ;  $P = 0.405$ ; Table 2).

The GLM/GEE model also made it possible for us to quantify the gradient of stigma-laden feelings across the major depression, alcohol dependence, and nicotine dependence conditions, with covariate adjustment for sex, medical-social work program type, student age, and reinforcer value. With the alcohol dependence score set as a reference, the resulting model-based covariate-adjusted mean for major depression was 5.7 units lower (95% CI:  $-6.8, -4.5$ ;  $P < 0.001$ ; data not shown in a table), and the resulting model-based covariate-adjusted mean for nicotine dependence was 1.2 units greater than the corresponding alcohol dependence mean (95% CI:  $0.1, 2.4$ ;  $P = 0.030$ ; data not shown in a table). These model-based results have the advantage of covariate adjustment, and they confirm what was seen in the original contrast of means. Namely, students display the least enthusiasm in anticipation of treating patients with nicotine dependence, and substantially greater enthusiasm with respect to major depression patients, with stigma-laden feelings about alcohol dependence closer to those associated with nicotine dependence.

Other covariates of interest, including personal 'ever' smoking, alcohol drinking, and history of depression, were not found to be associated with variation in stigma levels ( $P > 0.20$ ), and did not function as confounding variables with respect to the main relationships under study. It is for this reason that these covariates were not carried forward for the GLM/GEE estimates shown in Table 2. It may be of interest that for a small sub-sample of students in each study ( $n = 20-30$ ), the NicAlert<sup>®</sup> assay was used to challenge the self-report assertion of no recent smoking; all saliva specimens confirmed the negative self-report. We did not test specimens from students who reported recent tobacco smoking.

In order to probe into the observed male-female differences in stigma-related feelings, via post-estimation exploratory

analyses, the possibility of DIF was examined. Since unidimensionality of the MCRS scale had been confirmed, our analyses probed into the possibility that there might be a male-female bias in responses to individual MCRS items. In this approach, with the level of stigma-related feelings held constant, females were found to be more likely to anticipate greater satisfaction when working with major depression patients as compared to males, and were more optimistic about their capacities to help these patients ( $P < 0.05$ ). In addition, also with overall stigma-related feelings held constant, females held more favorable views about work and about health care parity with respect to alcohol dependence patients.

A note about potential participation biases is in order. As forecast in this paper's introduction, there was some evidence of nonparticipation bias, which was overcome (partially) by the use of the randomized reinforcer approach. Namely, there was a substantially greater participation level for students who logged in for completion of the anonymous online survey after a random draw of a gift certificate for more than \$25 (to be received upon completion of the log-in). Moreover, the students who logged in after drawing a higher value reinforcer certificate were found to have systematically higher levels of stigma-related feelings as compared to students who logged in after having drawn the \$12-\$18 reinforcer values at the time of the initial recruitment session. In our analyses, we dealt with this variation via a modeling approach. The alternative approach of weighting the survey data to address these differential participation levels affected the study's point estimates, but did not change the conclusions of the less complex unweighted models with covariate adjustments.

## Discussion

The main findings of this study may be summarized succinctly. First, future health professionals in the medical and social work student populations under study did not differ in relation to their stigma-related feelings, including enthusiasm and willingness to treat patients with alcohol dependence, nicotine dependence, or depression. Nonetheless, each group shared responses consistent with preferences to treat

patients with major depression compared to patients affected by either nicotine dependence or alcohol dependence. This finding is interesting, given that the most preventable cause of morbidity and mortality in the world is tobacco smoking.<sup>24</sup> Also of note, males were found to manifest higher levels of stigma-related feelings with respect to patient-victims of these conditions. The observed male-female differences are consistent with other stigma research.<sup>25</sup> Nonetheless, as noted above, some degree of the observed male-female differences might be traced to DIF (ie, differential functioning of specific items in the measurement of stigma-feelings for female versus male health professionals even when the underlying levels of stigma-related feelings are held constant via the latent structure analysis model). Also of note were the personal smoking behaviors and personal history of depression among students. Current smoking was much more likely among social work students, who reported levels consistent with national population estimates. Smoking among medical students was much lower, which may be a reflection of their medical education. While medical and social work students did not differ on their history of depression, nearly 40% of all students had ever felt depressed. This finding is consistent with high levels observed in other research.<sup>26</sup>

Before detailed discussion of these results, several of the more important study limitations merit attention. Of central concern is that this study was conducted at only one Midwestern United States university and its results may not generalize to other study populations. Future replications may include multiple geographically diverse sites, which could increase generalizability and sample size. The medical student sample consisted of mostly students in the early years of medical training (years 1–2). Including students across all years of medical education may be important in future research. Parallel research with medical and other health professional students in Peru is underway; similar studies of health professional students in Brazil and other countries are in the planning stages.

Also of note, roughly 62% of social work and 70% of medical students participated in both the in-class and online portions of the survey. While a portion of students did not participate, a comparison of those who completed classroom questionnaire survey items, and those who completed the same items in the online survey, only yielded differences that were not statistically robust ( $P > 0.05$ ). Furthermore, the lead investigators were instructors in the departments where the research was being conducted. While this may have unintentionally affected the participation levels, the lead researchers left the room before study materials were

distributed by research assistants. Potential participants were notified that anonymity was protected throughout the study, so there was no way for the lead researchers to connect an individual student to study participation or study responses in the questionnaire, saliva, or online survey formats.

Future research can be improved by extending the dimensions of stigma now addressed in the primary assessment tool of this study. The MCERS scale is heavily weighted toward items that tap the future health professional's enthusiasm and willingness to treat a patient. The MCERS does not measure dimensions of stigma such as dangerousness and social distance, as sometimes have been included in other investigations of stigma.<sup>14,25,27,28</sup> In addition, the measurement of some covariates via single-item questions, in order to keep the assessment brief, may be improved via multi-item scales designed to optimize reliability of assessment if not validity. One example was a single-item question regarding tobacco smoking. Future research may use multiple questions to query different types of tobacco use such as smokeless tobacco. With respect to our conceptual model, guided by prior research, we anticipated that personal tobacco smoking, alcohol drinking, and history of depression would be associated with variation in stigma scores.<sup>5,18</sup> We did not find that this was the case in this sample. Other important covariates may have been neglected, and in future research we hope for more enriched conceptual models. Future studies also may be able to shed more light on the importance of confounding variables in relation to the associations under study. We found no evidence of moderate-strong confounding in our investigation of covariates in this study. We also note that in this study other general medical conditions were not included for comparison; this is a study defect that can be remedied in future research.

## Conclusion

Notwithstanding limitations such as have been outlined in our discussion section, and notwithstanding a need to extend this research agenda into more detailed probing of the relationships under study, these study findings are of interest because few studies compare future medical students, social work students, and other student health professionals with respect to their levels of stigma related feelings, enthusiasm, and willingness to treat conditions they almost certainly will face in practice settings. The observed excess levels of stigma-related feelings are especially important in relation to treatment of individuals with the neuropsychiatric conditions under study, especially alcohol dependence and major depression, which are two of the most disabling conditions

worldwide.<sup>29</sup> As such, the study could have implications for the education of the future health professional workforce. Research indicates that there are often inadequate numbers of mental health professionals, complicated by a lack of knowledge and motivation from general health care workers to treat neuropsychiatric conditions.<sup>30–32</sup> Stigma-laden feelings held by future health professionals may interact or interfere in the treatment process. In consequence, patients with these conditions may not receive effective services and might be knowingly or unknowingly discouraged from seeking services.

In future research, it should become possible to assess stigma-related feelings in a longitudinal fashion to understand whether these are modifiable feelings (eg, by education or other interventions) or whether they should be understood as fixed and immutable traits, not readily modified. We are optimistic that brief educational or training interventions can be used to change stigma-laden feelings of the type under study here. Training of medical and other professionals and students on these topics has shown some initial success.<sup>33,34</sup>

Whereas this research has had its focus on future health professionals, the general study approach can be adapted for surveys of practicing professionals. As noted above, in Peru and Brazil, we have completed or are planning surveys of this type in the early stages of an international health research program. The long-term goal of this research will include development and experimentation to compare and contrast alternative brief online interventions that may be effective in shaping stigma-laden feelings held by physicians and other health professionals during professional school and in their early practice years.

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