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**JAOA/AACOM**

**Self-efficacy of Osteopathic Medical Students in a Rural-Urban Underserved Pathway Program**

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**Context:** Self-efficacy has been shown to play a role in medical students’ choice of practice location. More physicians are needed in rural and urban underserved communities. Ohio University Heritage College of Osteopathic Medicine has a co-curricular training program in rural and urban underserved practice to address this shortage.

**Objective:** To assess whether participation in the co-curricular program in rural and urban underserved practice affects self-efficacy related to rural and underserved urban practice.

**Methods:** This cross-sectional study explored self-efficacy using Bandura’s 5 sources of self-efficacy (vicarious learning, verbal persuasion, positive emotional arousal, negative emotional arousal, and performance accomplishments). A validated scale on self-efficacy for rural practice was expanded to include self-efficacy for urban underserved practice and e-mailed to all 707 medical students across 4 years of medical school. Composite rural and urban underserved self-efficacy scores were calculated. Scores from participants in the rural and urban underserved training program were compared with those who were not in the program.

**Results:** Data were obtained from 277 students. In the overall sample, students who indicated that they grew up in a rural community reported significantly higher rural self-efficacy scores than those who did not grow up in a rural community ($F_{1,250}=27.56$, $P<.001$). Conversely, students who indicated that they grew up in a nonrural community reported significantly higher urban underserved self-efficacy scores than those who grew up in a rural community ($F_{1,237}=7.50$, $P=.007$). The participants who stated primary care as their career interest ($n=122$) had higher rural self-efficacy scores than the participants who reported a preference for generalist specialties (general surgery, general psychiatry, and general obstetrics and gynecology) or other specialties ($n=155$) ($F_{2,249}=7.16$, $P=.001$). Students who participated in the rural and urban underserved training program ($n=49$) reported higher rural self-efficacy scores (mean [SD], 21.06 [5.06]) than those who were not in the program (19.22 [4.22]) ($t_{65}=2.36; P=.022$; equal variances not assumed). The weakest source of self-efficacy for rural practice in participants was vicarious experience. The weakest source of urban underserved self-efficacy was verbal persuasion.

**Conclusion:** Opportunities exist for strengthening weaker sources of self-efficacy for rural practice, including vicarious experience and verbal persuasion. The findings suggest a need for longitudinal research into self-efficacy and practice type interest in osteopathic medical students.

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**Keywords:** medically underserved area, rural medicine, self-efficacy
The need to increase the number of physicians, particularly primary care physicians, serving in rural and urban underserved communities is well documented. To address this need, an increasing number of medical schools are implementing rural or urban underserved training programs or tracks within their curriculum. Much of the published research on the outcomes of these types of programs has focused on rural-oriented programs. For example, graduates from the Rockford Rural Medical Education program were 14.4 times more likely than students outside the program to choose family medicine and 17 times more likely to be practicing in a rural location.9 Graduates from the Training in Urban Medicine and Public Health program, an urban-focused program, were more likely to select primary care residency programs serving urban underserved populations. Scant research exists on the particular mechanisms within these program models that contribute to the favorable placement and practice outcomes. A 2015 study in rural medical education found a positive relationship between rural medicine career intention and self-efficacy.15

Despite the interest in rural background as a variable in predicting future practice location and self-efficacy, no consensus as to how to define or what comprises rural background has been reached. Researchers in 2010 conducted an extensive literature review into the multiple definitions of rural background and found that there were 5 recurring (self-reported) definitions: (1) having grown up in a rural area, (2) having been born in a rural county, (3) having grown up in a town of less than 10,000 persons/reference to the size of hometown, (4) having graduated from a high school in a town of less than 10,000 persons, and (5) self-declaring the county of residence in a designated rural county. The researchers concluded that the students’ perspective of having grown up in a rural community or having developed a rural identity was as relevant as any of the above measures of rurality. For this reason, in the current study rural and urban underserved were not defined by size or proximity to a large urban center but by student perspective.

Self-efficacy is a psychological construct, generally understood to be a person’s belief as to the degree he or she can or cannot be successful in performing a task. Bandura identified 5 types of interactions or experiences that influence self-efficacy: vicarious learning, verbal persuasion, positive emotional arousal, negative emotional arousal, and performance accomplishments. Bandura stated that persons’ perceptions of their performance were more influential than the actual results of their actions. As a result, they tend to be more motivated to engage in activities within their sphere of perceived success.

Despite a recent surge in interest in the resilience of medical students, a small body of literature exists on self-efficacy in medical students. A few studies have investigated the role of self-efficacy in influencing career choices of medical students. One study showed that, for example, opportunities to experience increasing autonomy through longitudinal integrated clerkships (ie, Bandura’s performance accomplishments) have increased students’ self-efficacy for rural practice. Researchers in another study found a positive relationship between increased self-efficacy and rural practice interest levels in medical students, and they were able to determine that self-efficacy was responsible for 20% of the variance in rural practice interest levels in medical students who participated in their rural training program.

Understanding how self-efficacy develops over time in medical students, particularly in those seeking to work in rural and urban underserved communities, is critical to developing successful training programs in undergraduate medical education geared toward these communities. In the present study, I aimed to (1) understand the sources of self-efficacy in osteopathic medical students and (2) understand if participation in the co-curricular rural-urban pathways program affects self-efficacy related to rural and urban underserved practice.
Methods
A cross-sectional design was used to survey a convenience sample of medical students from Ohio University Heritage College of Osteopathic Medicine. The survey, which was modeled after a validated published instrument,15 consisted of 5 demographic items and 12 items on a 5-point Likert scale, with 1 indicating strongly disagree and 5, strongly agree. Qualtrics survey software was used to develop the online survey. It was e-mailed to all 707 medical students across 4 years of medical school, 60 of whom were participants in the program in April 2016. This program has been in existence for 3 years and is considered a co-curricular program (an extension of the formal academic curriculum), in which participation is optional. Weekly reminder e-mails were sent to students during the 4 weeks that the survey was open. The study was approved by the institutional review board and followed all ethical practices for research with human participants.

The questions for the scale were developed based on Bandura’s 5 sources of self-efficacy: vicarious learning, verbal persuasion, positive emotional arousal, negative emotional arousal, and performance accomplishments.17 Isaac et al15 used items focused on those sources of self-efficacy to calculate a composite rural medicine self-efficacy score. This composite score was calculated from the Likert scale score of each of the questions. Negative scoring was applied to the 2 negatively framed questions (“I get a sinking feeling when I think of working in [rural/urban underserved] setting” and “[Rural/urban underserved] practice is too hard”) before calculating the composite score, which could range from 6 (indicating low self-efficacy) to 30 (indicating high self-efficacy). These questions as a scale demonstrated an internal reliability of 0.78 (Cronbach α) in the study by Isaac et al.15 Construct validity in that study was demonstrated with significant correlation with rural career interest and self-efficacy score (r=0.50, P<.001).15 Primary care was defined in the survey as family medicine, general pediatrics, and general internal medicine.

Urban underserved self-efficacy was addressed by replicating the 6 self-efficacy items and replacing rural with urban underserved. The items on the scale demonstrated moderate internal reliability of 0.65 (Cronbach α on whole scale). The rural self-efficacy scale had higher internal reliability (Cronbach α=0.78) than the urban underserved scale (Cronbach α=0.55). The problematic item on the urban underserved scale was likely “People tell me I should work in urban underserved setting” (if deleted, Cronbach α=0.72).

Data Analysis
All analyses were completed using SPSS Statistics 22 (IBM). Descriptive statistics (frequency, mean, and SD) were used to summarize the data. Independent t tests with the Levine test of equality of variance were used to investigate differences in rural and urban underserved self-efficacy between the program participants and non-program participants as well as for differences in rural and urban underserved self-efficacy between those from rural and nonrural backgrounds. A 1-way analysis of variance was used to examine the differences in rural and urban underserved self-efficacy scores and preferred specialty. In addition, a post hoc analysis (Tukey Honestly Significant Difference) was used to determine which preferred specialty was responsible for the difference. Cohen d effect size was used to identify the strength of the differences as follows: 0.2 (small), 0.5 (medium), and 0.8 (large).28 A P value less than .05 was considered statistically significant for all analyses.

Results
Data were analyzed from 277 respondents (response rate of 39%) across all 4 years of medical school, 53 of whom were in the rural and urban underserved program (response rate of 88.3%). Demographic details are presented in Table 1. The majority of respondents (187 [62%]) stated that they did not consider the location in which they grew up to be rural. Primary care was the career interest of 122 students.
(40%), whereas 96 respondents (32%) reported interest in “other specialties” and 59 (19%) reported interest in “other generalist specialties.” In response to the question about preferred location for work, 226 respondents (75%) indicated a preference for a nonrural location (large urban center, small city, or suburb) for work, 41 (14%) preferred rural, and 10 (3%) preferred global.

### Rural and Urban Underserved Self-efficacy

The mean (SD) composite score for rural self-efficacy for the 252 respondents comprised the 6 rural self-efficacy statements (19.58 [4.44]). The mean (SD) composite score for urban underserved self-efficacy for the 240 respondents comprised the 6 urban underserved self-efficacy statements (20.23 [3.44]). Of note, the highest mean composite self-efficacy score (23.29) was observed in the third-year students who were participating in the program. A 1-way analysis of variance revealed that no statistically significant differences were found in composite rural self-efficacy ($F_{4,247}=0.78$, $P=.54$) or urban underserved self-efficacy ($F_{4,234}=1.48$, $P=.21$) by year in school.

### Sources of Self-efficacy

The statement with the highest mean score for rural (3.75) and urban underserved (3.78) self-efficacy in the overall sample was “I have the necessary skills to practice in a [rural/urban underserved] setting.” For rural self-efficacy, the statement “I see people like me taking up rural clinical practice” had the lowest mean score (2.90). The parallel statement for urban underserved was not the lowest mean score (3.32). In this study, verbal persuasion, reflected in the statement “People tell me I should work in an urban underserved setting,” had the lowest mean score (2.88) for urban underserved self-efficacy in the entire sample. The parallel statement for rural practice also had a low mean score (2.99). In the subsample of students who participated in the co-curricular program, the second highest mean score in the rural self-efficacy scale was “People tell me I should work in a rural setting” (3.61). Conversely, in the same population, the lowest mean score for urban underserved self-efficacy was “People tell me I should work in an urban underserved setting” (2.64).

### Self-efficacy in Program Participants

The mean (SD) rural self-efficacy composite score for the 49 respondents who were in the co-curricular program (21.06 [5.06]) comprised the 6 rural self-efficacy statements.
self-efficacy statements (Table 2). The mean urban underserved self-efficacy composite score for the 47 respondents (20.62 [4.70]) comprised the 6 urban underserved self-efficacy statements. For respondents who were not in the co-curricular program, the mean (SD) rural self-efficacy composite score was 20.15 (3.06) (n=193) (Table 3). The Levene test for equality of variance indicated unequal variance. The results of the t test indicated that participants in the co-curricular program had significantly higher rural self-efficacy scores than those who did not grow up in a rural community (n=78) reported significantly higher rural self-efficacy scores than those who did not grow up in a rural community (n=174) (F1,250=27.56, \( P<.001 \)). The effect size for this difference was 0.68 (Cohen d). Participants who indicated that they did not grow up in a rural community (n=165) reported significantly higher urban underserved self-efficacy scores than those who grew up in a rural community (n=74) (F1,231=7.50, \( P=.007 \)). The effect size for this difference was 0.37 (Cohen d). The results of the analysis of

### Table 2.
Self-efficacy in Rural and Urban Underserved Practice in Students Who Participated in the Rural-Urban Pathways Program (n=53)*

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean (SD)</th>
<th>Strongly Disagree/Agree</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rural Self-efficacy (n=49)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural practice is too hard.</td>
<td>3.51 (1.02)</td>
<td>24 (49.0)</td>
<td>19 (38.8)</td>
</tr>
<tr>
<td>I have the necessary skills to practice in rural setting.</td>
<td>3.65 (0.99)</td>
<td>6 (12.3)</td>
<td>11 (22.4)</td>
</tr>
<tr>
<td>I get a sinking feeling when I think of working in rural setting.</td>
<td>3.71 (1.34)</td>
<td>30 (61.2)</td>
<td>7 (14.3)</td>
</tr>
<tr>
<td>I have a strong positive feeling when I think of working in a rural setting.</td>
<td>3.51 (1.31)</td>
<td>14 (28.5)</td>
<td>8 (16.3)</td>
</tr>
<tr>
<td>People tell me I should work in a rural setting.</td>
<td>3.61 (1.00)</td>
<td>5 (10.2)</td>
<td>16 (32.7)</td>
</tr>
<tr>
<td>I see people like me taking up rural clinical practice.</td>
<td>3.06 (1.27)</td>
<td>16 (32.6)</td>
<td>11 (22.4)</td>
</tr>
<tr>
<td><strong>Urban Underserved Self-efficacy (n=47)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban underserved practice is too hard.</td>
<td>3.57 (1.19)</td>
<td>25 (53.2)</td>
<td>14 (29.8)</td>
</tr>
<tr>
<td>I have the necessary skills to practice in an urban underserved setting.</td>
<td>3.74 (1.12)</td>
<td>8 (17.1)</td>
<td>7 (14.9)</td>
</tr>
<tr>
<td>I get a sinking feeling when I think of working in an urban underserved setting.</td>
<td>3.68 (1.43)</td>
<td>28 (59.6)</td>
<td>6 (12.8)</td>
</tr>
<tr>
<td>I have a strong positive feeling when I think of working in an urban underserved setting.</td>
<td>3.64 (1.36)</td>
<td>13 (27.7)</td>
<td>6 (12.8)</td>
</tr>
<tr>
<td>People tell me I should work in an urban underserved setting.</td>
<td>2.64 (1.25)</td>
<td>20 (42.6)</td>
<td>17 (36.2)</td>
</tr>
<tr>
<td>I see people like me taking up urban underserved clinical practice.</td>
<td>3.38 (1.25)</td>
<td>13 (27.1)</td>
<td>13 (27.1)</td>
</tr>
</tbody>
</table>

* Valid percentages were used to account for missing data.
* Mean (SD) composite score for rural self-efficacy was 21.06 (5.06) and for urban underserved self-efficacy was 20.62 (4.70).
* n=48.
variance and post hoc analysis (Tukey) indicated that the participants who stated primary care as their career choice reported higher rural self-efficacy scores ($F_{2,249}=7.159$, $P=.001$) than the participants who reported a preference for other specialties (ie, general surgery, general psychiatry, general obstetrics and gynecology). No significant difference was found in urban underserved self-efficacy ($F_{2,249}=7.159$, $P=.001$) by specialty.

**Discussion**

Previous research has found that participation in a rural or urban underserved training program in medical school can positively affect self-efficacy for rural and urban underserved practice. Similarly, in the current study, students who participated in the rural and urban underserved training program had higher rural self-efficacy scores than those who were not in the program. In the overall sample, no differences were found between students’ self-efficacy toward rural and urban underserved practice.

Other studies have suggested that career interest and self-efficacy expectations influence career choice. Research has shown a positive relationship between increased self-efficacy and rural practice interest levels in medical students. Similarly, the findings in the current study suggest a possible relationship between career interest and self-efficacy. The participants who stated primary care as their career interest reported higher rural self-efficacy scores than the participants who indicated a preference for a generalist specialty.

### Table 3.

<table>
<thead>
<tr>
<th>Items</th>
<th>Mean (SD)</th>
<th>Strongly Disagree/Disagree</th>
<th>Neutral</th>
<th>Strongly Agree/Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Rural Self-efficacy (n=203)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural practice is too hard.</td>
<td>3.34 (0.93)</td>
<td>76 (37.4)</td>
<td>98 (48.3)</td>
<td>29 (14.3)</td>
</tr>
<tr>
<td>I have the necessary skills to practice in rural setting.</td>
<td>3.78 (0.79)</td>
<td>13 (6.4)</td>
<td>51 (25.1)</td>
<td>139 (68.5)</td>
</tr>
<tr>
<td>I get a sinking feeling when I think of working in rural setting.</td>
<td>3.37 (1.28)</td>
<td>107 (52.7)</td>
<td>43 (21.2)</td>
<td>53 (26.1)</td>
</tr>
<tr>
<td>I have a strong positive feeling when I think of working in a rural setting.</td>
<td>3.03 (1.10)</td>
<td>62 (30.6)</td>
<td>72 (35.5)</td>
<td>69 (34.0)</td>
</tr>
<tr>
<td>People tell me I should work in a rural setting.</td>
<td>2.84 (0.98)</td>
<td>61 (30.0)</td>
<td>102 (50.2)</td>
<td>40 (19.7)</td>
</tr>
<tr>
<td>I see people like me taking up rural clinical practice.</td>
<td>2.86 (1.06)</td>
<td>70 (34.5)</td>
<td>81 (39.9)</td>
<td>52 (25.6)</td>
</tr>
<tr>
<td><em>Urban Underserved Self-efficacy (n=193)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban underserved practice is too hard.</td>
<td>3.31 (1.03)</td>
<td>83 (43.0)</td>
<td>63 (38.8)</td>
<td>47 (24.4)</td>
</tr>
<tr>
<td>I have the necessary skills to practice in an urban underserved setting.</td>
<td>3.79 (0.84)</td>
<td>16 (8.3)</td>
<td>37 (19.2)</td>
<td>140 (72.6)</td>
</tr>
<tr>
<td>I get a sinking feeling when I think of working in an urban underserved setting.</td>
<td>3.51 (1.11)</td>
<td>112 (58.3)</td>
<td>40 (20.8)</td>
<td>40 (20.8)</td>
</tr>
<tr>
<td>I have a strong positive feeling when I think of working in an urban underserved setting.</td>
<td>3.29 (0.94)</td>
<td>38 (19.7)</td>
<td>72 (37.3)</td>
<td>83 (43.0)</td>
</tr>
<tr>
<td>People tell me I should work in an urban underserved setting.</td>
<td>2.94 (0.90)</td>
<td>52 (27.0)</td>
<td>104 (53.9)</td>
<td>37 (19.1)</td>
</tr>
<tr>
<td>I see people like me taking up urban underserved clinical practice.</td>
<td>3.30 (0.95)</td>
<td>35 (18.1)</td>
<td>75 (39.3)</td>
<td>83 (43.0)</td>
</tr>
</tbody>
</table>

*a Valid percentages were used to account for missing data.

*b Mean (SD) composite score for rural self-efficacy was 19.22 (4.22) and for urban underserved self-efficacy was 20.15 (3.06).
(including general surgery, general psychiatry, and general obstetrics and gynecology) or other specialties. In the overall sample, no significant differences were found in students’ self-efficacy toward rural or urban underserved practice, but those who participated in the co-curricular program did have higher self-efficacy for rural practice. Students who participated in the rural and urban underserved training program had higher rural self-efficacy scores that those who were not in the program. There are implications of this study at both the programmatic as well as the institutional level.

Sources of Self-efficacy
The rural and urban underserved self-efficacy of students were analyzed by a composite score of 6 statements that reflected the sources of self-efficacy; however, the mean scores of the individual statements revealed something about the sources of self-efficacy in these students. For example, the statements with the highest mean score for rural and urban underserved self-efficacy in the overall sample was “I have the necessary skills to practice in a [rural/urban underserved] setting.” This statement reflects Bandura’s performance accomplishments and suggests that students are developing self-efficacy for both rural and urban underserved practice from the program’s skills-based training.

Conversely, the statements with the lowest means were equally revealing. One source of self-efficacy is vicarious learning, watching peers or people similar to oneself succeed at a particular task. For rural self-efficacy, the statement “I see people like me taking up rural clinical practice,” which reflects vicarious learning, had the lowest mean, suggesting that students may feel that they are not being adequately exposed to role models who are in rural practice. Vicarious learning was the weakest source of self-efficacy for rural practice in these students. The parallel statement for urban underserved did not have the lowest mean, which suggests that students are developing self-efficacy for urban underserved practice through vicarious learning. While much of the preclinical years involve observation, shadowing, and other vicarious experiences, to my knowledge, this construct as a specific component of self-efficacy has not been well studied in medical education.

What students are told by respected individuals (verbal persuasion) also contributes to their self-efficacy. In this study, verbal persuasion, reflected in the statement “People tell me I should work in an urban underserved setting,” was the weakest source for urban underserved self-efficacy. The parallel statement for rural practice also had a low mean. This finding could suggest that students are hearing conflicting, and perhaps discouraging, statements about going into rural and underserved practice. The program participants had a higher mean on this item. Clearly, the participants in the rural and underserved urban program are getting a positive message about going into rural practice. However, they may not be getting that same positive message about urban underserved practice, as this was the weakest source of urban underserved self-efficacy for the program participants. Like other components of Bandura’s construct of self-efficacy, this specific aspect has not been well studied in medical education, to my knowledge.

Self-efficacy in Program Participants
Composite self-efficacy scores for participants in the co-curricular program were compared with their peers. Students who participated in the program reported higher levels of self-efficacy related to rural practice than their counterparts. Whether this difference is a factor of the type of student who enrolls in the program is unknown and warrants further research. To this end, this survey will be distributed annually to the entire student body. No differences were found in self-efficacy as it related to urban underserved practice between the 2 groups.

Limitations
This study has several limitations. Because it was a cross-sectional study, I cannot infer any causal relationships. Higher levels of rural self-efficacy in program participants can be a function of the type of student who enrolls in this program. The problematic nature of defining a rural or urban background and the decision
to rely on participants’ own perspectives of rurality could be seen as a limitation of this study. Each of the various ways of measuring rurality has its critique. No consensus had been made on how to address this limitation in future iterations of this study.

The voluntary self-report nature of the survey introduces a risk of bias. Smaller response rates in years 3 and 4 compared with years 1 and 2 could also bias the study. Attitudes may change as students gain experience in clinical rotations. Demographic variables could be confounding variables. Sex and race were intentionally omitted from the survey to protect the identity of the small number of students in the program. The program has expanded enrollment, and future iterations of the survey will include additional demographic variables, which will allow for additional analyses. Longitudinal research could yield more meaningful comparisons and patterns.

Conclusion

The study examined a revised tool for understanding rural vs urban underserved self-efficacy in medical students who participated in a co-curricular rural and urban underserved training program. Even as a cross-sectional snapshot, the study revealed opportunities for strengthening weaker sources of self-efficacy for rural practice training, including verbal persuasion and vicarious learning. Likewise, the results reveal the need to further strengthen vicarious learning opportunities in urban underserved practice training. Ultimately, if medical education is to address the shortage of primary care physicians in underserved settings in both rural and urban locations, understanding the development of self-efficacy is critical to designing programs that aim to train physicians for practice in these settings.

Author Contributions

Dr Casapulla provided substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafted the article or revised it critically for important intellectual content; gave final approval of the version of the article to be published; and agrees to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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