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Research

Medical Students' Knowledge of Adverse Childhood Experiences (ACES)

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Abstract

Background and Objectives

This study was designed to assess the knowledge of adverse childhood experiences (ACEs) in year-one medical students at an HBCU. After assessing this knowledge, we evaluated the effectiveness of an ACEs educational program intervention.

Methods

The study entailed dispersion of a pre-program ACEs knowledge survey, the implementation of a trauma-informed curriculum to augment the hypothesized knowledge deficit, and finally a post-program survey assessing the effect of our intervention.

Results

Results demonstrated a significant knowledge deficit in year-one medical students but also showed that a trauma-informed curriculum could enhance knowledge survey scores by over 50%.

Conclusions

The study adds to the growing body of literature emphasizing the need to include programming in the social determinants of health as a part of every medical school's curricula. It especially highlights the importance of including such curricula in medical training at HBCUs whose graduates often work in underserved areas where the need for trauma-informed care is critical and where such care can be especially impacting.

Introduction

Adverse childhood experiences (ACEs) are negative situations occurring in a child's life that can adversely affect health -- both in childhood and on into adulthood.¹ Experiences such as neglect, abuse, divorce, discrimination, poverty and others have been linked to poor physical health,² mental health,^{3,4} behavioral health,⁵ risky behaviors,⁶ and premature mortality.⁷

When a child experiences multiple ACEs the negative effects become amplified in three ways -- the effects become reinforced, compounded and cyclical. The negatively reinforcing aspect can be seen when ACEs lead to risky behaviors (eg, increased number of sexual partners, unhealthy dietary choices, illicit drug use). This in turn leads to physical disease (eg, STDs, obesity, heart disease), leading to exacerbations in mental health (eg, depression, anxiety), leading to prolonged stress. This dynamic eventually results in chronic diseases of adulthood and early mortality.

The compounding effect of multiple ACEs is such that those experiencing four or more ACEs have been found to have an (up to) twelve times greater risk of premature death.⁵ And finally, the cyclical nature of multiple ACEs, perhaps the most damaging effect, indicates that those who have been subject to these experiences are more likely to perpetrate similar abuses upon their own children.⁸

While the incidence and impacts of ACEs in the general population has been well documented⁵ more recent studies have highlighted an increased incidence and impacts of ACEs in African-American and multiracial children, especially if they are undereducated or live in under-resourced communities.^{9,10} Noting that ACEs can be linked to the disproportionately greater chronic disease burden and the increased likelihood of premature mortality in these communities,^{11,12} it is critical that if we are to improve health in African-American, multiracial and underserved communities, that the screening, education and mitigation of ACEs be pushed to the forefront. The question arises, how best to do this -- how best to screen, educate and mitigate.

The physician-patient interaction seems a logical place to start. However, currently there are several shortcomings with this approach. First, our current US health system has created an environment in which African-American and Hispanics have a lower likelihood of having a primary care physician,¹³ a lower likelihood of accessing physical or mental health services,^{14,15} and have significant financial¹⁶ and cultural¹⁷ barriers to overcome before accessing such services.

Another critical but correctable shortcoming associated with beginning ACEs education and mitigation with the physician-patient interaction in these communities is a lack of healthcare provider knowledge. Studies assessing physicians' knowledge and practices found that few physicians are aware that ACEs are linked to obesity or smoking, few had a firm enough understanding to allow them to confidently screen for or treat ACEs, and few had an adequate understanding of the impact of ACEs on chronic illnesses.^{18,19} Furthermore, physicians surveyed in these studies reported only minimal ACEs education during their medical training and thus tended to underestimate the prevalence of ACEs in their patients.

A third and final issue with addressing ACEs within the physician-patient encounter in underserved communities and communities of color might be physician-patient racial concordance. Although racial concordance has not been studied specifically with regard to ACEs, it has been proven to increase the overall frequency of physician-patient interactions,²⁰ foster more patient participation in medical decision making, provide greater patient satisfaction,²¹ and engender greater overall communication and compliance.²² All this to say that a lack of concordance might be especially significant in ACEs screening, education and mitigation in these communities -- especially when the sensitive nature of ACEs is considered and the possibility of community stigma against counseling is factored in.^{23,24,25}

With the impact of ACEs weighing heavily on the underserved and communities of color, the need to screen, educate and mitigate cannot be overstated. While we acknowledge that all of the above shortcomings cannot be completely eliminated without significant changes to the current US healthcare and financial systems, we believe *some* significant impacts can be made during the physician-patient interaction. The education of racially concordant medical students at HBCUs (who will more likely practice in underserved communities of color upon graduation)²⁴ with regard to ACEs is the focus of this study. Our intent is that, armed with proper ACEs education, these physicians in training can go on make an impact in our most needy communities.

In this study we surveyed year-one medical students at an HBCU regarding their knowledge of ACEs, provided educational programming, then performed a post program knowledge survey to determine the short-term effectiveness of our intervention. We hypothesize that: 1) students matriculating into HBCU medical schools are deficient in their knowledge of ACEs and of their physical, mental, and behavioral health manifestations; 2) a simple educational program could help correct such deficits of knowledge; and 3) that the medical students would then indicate a willingness to incorporate this knowledge into their future practices.

Methods

The study consisted of three components: a pre-program knowledge assessment survey, implementation of an ACEs curriculum (ie, initiating questions, discussion, formal didactic session, post session reflection/discussion) and a post-program knowledge assessment survey. The format of the curriculum was chosen after a review of the literature on best teaching methods such as: student engagement with questioning, discussion groups, repetition of material in an interleaved way, instruction using varied methods of presentation (eg, pictorial, participatory, verbal). Since these methods have been proven to help facilitate learning,^{26,27,28} the ACEs program was constructed and delivered with these principles in mind.

A total of 117 first semester, first-year medical students (M1s) from Meharry Medical College School of Medicine's Class 2024 participated in this study. Sixty-two percent of the participants were female and thirty-eight percent were male. Approximately 82.05% of this cohort were African-American, 9.4% Asian/Pacific Islander, 5.13% Caucasian and 3.42% Hispanic.

Students participated in this program as a part of their Academic Societies Masters Colloquium (ASMC) course as approved by Meharry Medical College School of Medicine's Curriculum

Committee. For this course, students were separated into societies of 11 groups of ten students and one group of seven students, each group led by a faculty master. As a part of the curriculum, societies met weekly in Meharry's Alumni Hall Auditorium.

In accordance with the ASMC course syllabus, attendance by all first-year medical students was required. Students were not given prior lecture material in preparation for this programmed session. Neither were students informed prior to the session that they would be surveyed before and after the lecture. At the onset of the course period, pre-lecture paper surveys were administered to each group of students. This assessment asked five key questions, graded on a Likert Scale, to quantify students' self-reported general understanding of ACEs, their knowledge of the associated physical and mental impacts and their knowledge of appropriate methods of ACEs treatment. The questions were:

1. How much do you understand about adverse childhood experiences (ACEs) or psychological trauma?
2. How much do you understand about the health impacts of ACEs or trauma?
3. How much do you understand about mental health issues associated with ACEs or psychological trauma?
4. How much do you understand about the effect of ACEs or trauma on the brain?
5. How much do you understand about the treatment of ACEs or psychological trauma?

Students were asked to respond to each question by choosing one of the following:

1= None at all, 2= A little, 3= A moderate amount, 4= A lot or 5= A great deal

Following students' completion of the pre-program knowledge evaluation, the ACEs curriculum was implemented. This included a group of "Introduction to ACEs" questions, discussion groups, a formal interactive didactic session, a follow-up Likert Scale knowledge assessment and a follow-up qualitative survey.

The program's initial questions primed student curiosity and engagement. The questions were:

- 1) What is trauma, examples of traumas, how common is it?
- 2) What are the physical health effects associated with trauma? Why do these occur?
- 3) What are the mental effects associated with trauma?
- 4) What are some of the behavioral effects associated with trauma? Why do these occur?
- 5) Explain the concept of adverse child experiences (ACEs)
- 6) What is living with ACEs like? How does it affect one's outlook?
- 7) Why do we want to help people overcome trauma? How can we help people overcome?

The discussion groups that followed allowed each group to focus on one of the ACE-related question(s) above. Society masters directed the group discussions using learning objectives provided to them prior to the beginning of the program. These objectives included the pervasiveness of ACEs, the behavioral and mental health effects of ACEs, the effects of ACEs

on brain development, how trauma affects behavior and impulse control, the effects on physical health, the importance of physician awareness and the treatment of ACEs.

During the discussion portion of the program, students were also given a chance to calculate their own ACE scores along with a blank space to write down their scores and their reflections if they felt so inclined (see Appendix II).

After student dialog within their academic societies, a spokesperson from each group reported a synopsis to the whole class. As the moderator brought up each of the learning objectives and posed questions, student group spokespersons respond with their ideas, thoughts, experiences and opinions.

Following the full class discussions, a didactic session (now with heightened student interest due to the preceding student investment in group discussions) reiterated aspects of the topic believed to be most relevant. The didactic session was delivered by the primary investigator, inculcated important points, and was substantiated with appropriate literature and references.

At the conclusion of the didactic session the ACEs post-session survey was distributed, filled out and collected. There were two parts to the final assessment. The first part included the same questions asked in the pre-program survey in order to determine the effectiveness of the program in enhancing student knowledge of ACEs (see Appendix I). The second part of the post-program survey was an additional set of qualitative queries -- the results of which are beyond the scope of this paper and will be the subject of subsequent analysis and publication.

Results

Of the 117 first-year medical students that took part in the ACEs ASMC Session, 117 completed the pre-program knowledge assessment survey (response rate, 100%) and 106 completed the post-lecture knowledge assessment survey (response rate, 90.6%). Each assessment question showed an increase in student knowledge after the ACEs educational program intervention. The overall average pre-program ACEs knowledge reported on the Likert Scale was 2.64, the average post-program knowledge climbed to 4.02. The average difference between pre- and post-program scores was 1.38, representing a 52% increase in knowledge gained by participation in the educational program.

We found that first-year medical students felt they had the least knowledge regarding the treatment of ACEs (2.3) and the effects of ACEs on the brain (2.4) prior to the program. Likewise, students' scores indicate that both of these components had the lowest post-session results (3.9) but still demonstrated a considerable improvement. At the end of the educational program, the highest scores were seen in student understanding of ACEs (4.1), health impact of ACEs (4.1) and the mental health issues associated with ACEs (4.1). We found that the greatest improvement in knowledge was in the two sections that scored the lowest in the pre-lecture evaluation, with student knowledge of treatment of ACEs increasing by 1.6 and student understanding about the effect of ACEs on the brain showing an increase of 1.5. In comparison to student learners' general knowledge of ACEs and the health impacts of ACEs both increased by 1.3 and understanding of mental health issues associated with ACEs improved by 1.2 (see Figure 1).

Medical student qualitative responses, gathered after the session, showed that the learning objectives were effectively communicated. This can be seen in the feedback where students reiterated essential lecture takeaways during the class discussion. As stated, this qualitative data will be combined with qualitative data collected in subsequent years before being analyzed and published.

Discussion

As mentioned above, African-American, multi-racial, impoverished and underserved communities are burdened with an increased incidence of adverse childhood experiences. These experiences are linked with an increased likelihood of physical, mental and behavioral maladies later in adulthood, thus making it urgent to address ACEs if we are to overcome the long-term health effects and health disparities found in these communities -- and, importantly, if we are to unlock the full human potential lying dormant in these communities.

As discussed, despite the need to mitigate the effects of ACEs, today's clinicians feel ill-prepared to address these experiences. Medical professionals lack adequate knowledge, have expressed discomfort with asking about ACEs, and feel inadequately trained to address these issues.^{29,30}

Our study was designed to explore the level of ACEs knowledge in year-one HBCU medical students, to provide ACEs training, to evaluate the short-term effectiveness of our intervention and to inspire future practitioners to incorporate such training into their practices.

Our pre-program knowledge assessment survey corroborates previous work cited demonstrating a lack of ACEs knowledge in healthcare providers. Our findings add to the existing body of literature by being the first to document suboptimal knowledge in year-one medical students at an HBCU (search terms: ACEs and Historic Black Colleges and Universities). Our work demonstrates that matriculating students had little to moderate knowledge of ACEs, of their effects and of the available treatment options (Figure 1).

Our post-program knowledge assessment data shows that our educational intervention had a significant short-term impact on student knowledge acquisition, increasing overall ACEs knowledge by over 50%. The effectiveness of our intervention demonstrates that it is possible to adequately introduce students to ACEs, its ties to neuroscience and brain development, the long-term adverse health effects and appropriate treatments -- all within the framework of an existing medical school curriculum pre-clerkship course. Our findings support, and indeed advocate for ACEs educational programming in HBCU medical schools. Programming in this setting is especially important since studies have shown that African-American physicians (as stated, Meharry's first-year class identified as 82% African-American) are more likely to practice in underserved communities where the incidence of ACEs is higher^{31,32,33} -- and where racial concordance imparts a greater likelihood of patient identification, compliance and satisfaction.^{31,34}

In agreement, the Association of American Medical Colleges and the Liaison Committee on Medical Education have both recommended that medical curricula include instruction in the social determinants of health, including ACEs,^{35,36} and that this training should continue across the continuum of medical education^{37,38} from pre-medical instruction continuing through ongoing professional development.

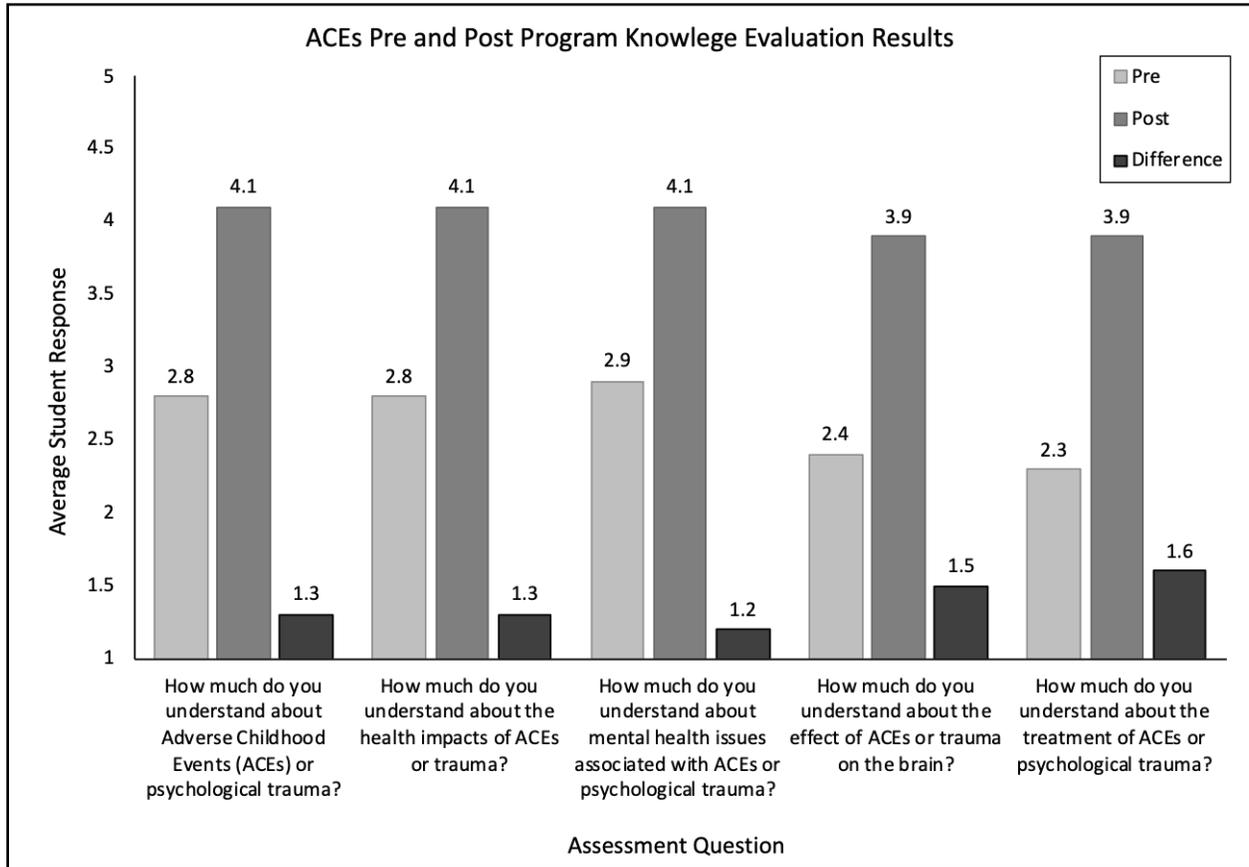


Figure 1. Bar graph comparing average student response to pre-lecture (pre) and post-lecture (post) program knowledge evaluation surveys, along with the calculated averaged difference between the two assessment averages for each question. A total of 117 students completed the pre-lecture survey and 106 students completed post-lecture survey (p-value= <0.01). Response options: 1=None at all 2=A little 3=A moderate amount 4=A lot 5=A great deal

Limitations in this study

One limitation of the study is its short-term nature. Although we showed that one of our goals, the acquisition of knowledge, improved in the short term, we have yet to demonstrate that the knowledge is retained in the longer term and that the knowledge is put to practical use in the clinical setting. This should be the subject of subsequent research.

Another limitation was more of an oversight. When exposing a cohort of predominantly black first-year students to ACEs without retraumatizing them, we could have done a better job of

preparing students for the session and informing them that the information we were about to discuss was sensitive in nature. Re-traumatization may have affected the decreased post-program knowledge assessment survey compliance. The demographics of HBCU students reflects the fact that the majority of them can be expected to have an increased number of ACEs and, therefore, it is paramount that in exposing these students to our ACES programing a level of caution be applied. To address this, our next ACEs sessions will better emphasize the sensitivity of the content, convey to students that we understand the difficulty in learning about ACEs and make counseling available as needed during the session. In addition, future programing might include deeper discussions of resilience and a wider exploration of trauma-informed care so that students may better understand and approach the sequelae of their own past traumatic experiences.

Conclusion

From our discussion above, it is clear that ACEs education should be emphasized with physicians-in-training in HBCU medical schools where a significant proportion of physicians of color are trained.³⁹ As stated, such physicians are more likely to practice in low-income areas and treat African-Americans and minority patients⁴⁰ in whom higher ACE scores are the rule. While the financial and cultural barriers to healthcare are likely to continue to impact underserved communities, our research shows that ACEs training can be easily implemented at HBCU Medical Schools and that significant gains in knowledge can be demonstrated. The hope is that this knowledge will eventually manifest by significantly addressing: 1) physician-patient interactions; 2) health in underserved communities and communities of color; and 3) some of our nation's gaping healthcare disparities.

If health disparities are to be fully addressed in underserved communities and the nation, ACEs education must be provided for physicians of color attending HBCUs.^{41,42}

Looking Forward

Future follow-up of this study should include this cohort of Meharry students as they progress to their clinical years. Follow-up studies should evaluate both knowledge retention and practical application of that knowledge in the clinical setting. Future studies may also examine this cohort as they graduate and become medical residents and, finally, practicing physicians, so that the "real world" impact of ACEs education and trauma-informed care may be examined. If our Meharry ACEs programing is found to have longer-term practical application and benefits, it should significantly contribute to achieving elements of the Institute for Healthcare Improvement's 2007 Triple Aim: improving patient experience, reducing overall costs, and improving the health of populations.⁴³

A final thought is one of contribution and collaboration. Since the inclusion of ACEs in medical school curricula is well-received by student learners⁴⁴ and since three of the four HBCU medical schools have no formal ACEs training in their first two years, the possibility of implementing a "Meharry Type" ACEs curricula at other HBCUs should be considered. This is especially important in light of a growing recognition of the role that social determinants of health play in overall health outcomes.^{45,46,47}

Declarations

Approval for human subjects research was granted by Meharry Medical College IRB on 04/16/20, #FWA00003675.

This manuscript has not been published in another journal and is not under consideration by another journal. The final manuscript has been seen and approved by all authors. The authors declare that they have no relevant or material financial interests that relate to the research described in this paper. The authors have no conflict of interest.

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Appendices

I. Pre- and post-lecture knowledge assessment survey

	Medical Student Pre-Program Knowledge Evaluation	Ranking: 1=Not at all, 2=A little, 3=A moderate amount, 4=A lot, 5=A great deal				
Question 1	How much do you understand about Adverse Childhood Events (ACEs) or psychological Trauma?	1	2	3	4	5
Question 2	How much do you understand about the health impacts of ACEs or trauma?	1	2	3	4	5
Question 3	How much do you understand about the mental health issues associated with ACEs or psychological trauma?	1	2	3	4	5
Question 4	How much do you understand about the effect of ACEs or trauma on the brain?	1	2	3	4	5
Question 5	How much do you understand about the treatment of ACEs or psychological trauma?	1	2	3	4	5

	Medical Student Post-Program Knowledge Evaluation	Ranking: 1=Not at all, 2=A little, 3=A moderate amount, 4=A lot, 5=A great deal				
Question 1	How much do you understand about Adverse Childhood Events (ACEs) or psychological Trauma?	1	2	3	4	5
Question 2	How much do you understand about the health impacts of ACEs or trauma?	1	2	3	4	5
Question 3	How much do you understand about the mental health issues associated with ACEs or psychological trauma?	1	2	3	4	5
Question 4	How much do you understand about the effect of ACEs or trauma on the brain?	1	2	3	4	5
Question 5	How much do you understand about the treatment of ACEs or psychological trauma?	1	2	3	4	5

II. ACEs self-assessment score sheet

ANONYMOUS SURVEY - MEHARRY FAMILY MEDICINE

Adverse Childhood Experiences (ACEs) are stressors that may have happened to you during childhood (before age 18). They can have long-term health effects like high blood pressure, stomach ulcers, depression, anxiety, being overweight or getting diabetes. Having 4 or more of these experiences can be especially damaging to your health.

Circle All That Apply -14 Stressful Experiences

5 Personal Experiences	6 Household Experiences	3 Neighborhood Experiences
Physical Abuse	You Saw Your Mother Treated Violently	Poverty
Sexual Abuse	There Was Drug Or Alcohol Abuse in Your Home	Discrimination

Emotional Abuse	A Household Member Had Mental Illness	Neighborhood Violence.
Physical Neglect	A Household Member Was In Jail	
Emotional Neglect	Separation Or Divorce Of A Parent	
	Death Of A Parent	

Would you want to talk to your doctor about how these experiences may affect your health? (If so, please bring it up during your visit. Your doctor will NOT have a copy of this anonymous survey)

- Yes
- Not At This Time, But I'll Think About It
- No

If not, why not?

- I Don't believe these experiences effect my health
- I Don't believe in talking about these things
- I only talk about these things with friends or family
- I Don't believe talking about these things would help
- I'm not comfortable talking about these things
- I Don't have time
- List any thing else that would keep you from talking about these experiences with your doctor

My race is - (circle one) - White, African American, Hispanic, Asian, Multiracial

Number of people in my household is _____

Total household income is (roughly) _____

I had / had not heard of ACEs before - (circle one)
