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RESEARCH

Global Health Learning Outcomes by Country Location and Duration for International Experiences

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ABSTRACT

Objective. To determine the impact of country income classification and rotation duration on learning outcomes (knowledge, skills, and attitudes) for students participating in an international Advanced Pharmacy Practice Experience (APPE).

Methods. A mixed-methods, longitudinal study evaluated fourth-year student pharmacists participating in an international APPE (N=81) at the University of North Carolina at Chapel Hill, Purdue University, and University of Colorado. A pre-post survey was administered to evaluate self-perceived growth across 13 Consortium of Universities for Global Health (CUGH) competencies using a 5-point Likert scale with additional open-ended questions and focus groups. Quantitative data was analyzed using paired and independent t-tests and multiple linear regression. Qualitative survey and focus group data underwent a two-cycle open coding process using conventional content analysis.

Results. Students going to a low to middle income country (LMIC) had greater growth in all CUGH statements compared to those going to a high-income country. Rotation location in a LMIC and prior travel for non-vacation purposes were statistically significant predictors of growth in the regression model. Qualitative analysis presented three major themes across each income group and no significant themes for duration. Students who went to a LMIC demonstrated increased cultural sensitivity, patient-centered care, and skill development while students who went to a high-income country displayed increased knowledge regarding differences in healthcare system components, pharmacy practice and education, and an appreciation for alternative patient care approaches.

Conclusion. Learning outcomes differed between high and LMIC locations, with both providing valuable educational opportunities that contributed to students' personal and professional development.

Keywords: global health, global health education, experiential education, learning outcomes, assessment

INTRODUCTION

The pharmacist's role in global health is continuing to advance and pharmacy schools are increasingly offering instructional and practice experiences related to global health in their curriculum.¹ This growth has been supported by professional organizations as many have established special interest groups focused on global health education over the last decade.^{2,3} Pharmacists have the opportunity to make a significant contribution to national and international health agendas including the United States' Healthy People 2020 plan and the United Nations' Sustainable Development Goals.^{4,5} As pharmacy education in the United States and other countries continues to emphasize the treatment of non-communicable diseases and preventative medicine, pharmacists can be key contributors towards increasing access to healthcare services as well as reducing morbidity and mortality worldwide.

International Advanced Pharmacy Practice Experience (APPEs) are the most common way schools have incorporated global health education into their curriculum.¹ These experiences vary in duration from a few weeks to months and placement occurs in both high and low to middle income

countries (LMIC).⁶ The most recent ACPE Standards, which incorporate the 2013 CAPE outcomes, emphasize problem solving, self-awareness, patient advocacy, and cultural competence which are among the knowledge, skills, and attitudes that might be gained during international experiences.^{7,8} A growing body of literature has documented students' learning on domestic APPEs in accordance to CAPE outcomes, but little is known regarding international APPEs.⁹ Given the diversity of countries that pharmacy schools send students to, there needs to be better understanding as to how country location can influence learning outcomes and whether these outcomes align with accreditation standards.

Although medicine, dentistry, and nursing have developed global health competency frameworks, there are no pharmacy-specific constructs available.¹⁰⁻¹² The Consortium of Universities for Global Health (CUGH) recently developed a “global citizen” global health competency framework for use across all health professions, however this framework has not been used as an assessment tool for learning outcomes in any health profession.¹³ The CUGH competencies range from articulating barriers to health care in limited resources settings to exhibiting international values and communication skills. To date, most educational research across health professions on global health learning has come from LMICs and there is a paucity of data regarding learning outcomes when students participate in practice experiences in developed countries (high-income countries).^{14,15} While the duration of the experience has a significant impact in undergraduate study abroad programs as it relates to personal and professional development, it is not known if duration influences learning outcomes for health professional students participating in global health experiences.¹⁶

The objective of this research is to evaluate self-perceived learning outcomes, defined as knowledge, skills, and attitudes, for student pharmacists who participated in an international APPE. Using the CUGH global health competency framework, we specifically examined the impact of country location and duration on learning outcomes.

METHODS

Final year student pharmacists (n=81) participating in an international APPE rotation at the pharmacy schools of the University of North Carolina at Chapel Hill (UNC), Purdue University, and the University of Colorado completed a retrospective pre-post Qualtrics assessment instrument one week after their rotation assessing their self-perceived ability to meet the CUGH competencies. The assessment instrument was derived from the 13 CUGH global citizen global health competencies by placing the statements into an online survey instrument with a five-point Likert scale from 1=strongly disagree to 5=strongly agree. A composite score was calculated for each student using the Likert responses on the 13 competency statements with a maximum score of 65.

Students were also asked an additional four open-ended questions regarding the knowledge, skills, attitudes, and any other learning gained on the experience and were invited to participate in a focus group interview to further explore responses to the survey. Students received the open ended questions a week prior to the survey and were instructed to reflect upon these questions before submitting their responses. Twenty-two students agreed to participate in focus group interviews with eighteen students from UNC and two each from Purdue University and the University of Colorado. Six virtual focus groups were held using ZOOM 4.1 (Zoom Video Communications, San Jose, CA) in which students were grouped by school then income classification (LMIC vs. high income countries). Research members led their respective student discussions using a jointly developed interview guide. Rotation duration varied by school with four weeks for UNC, six weeks for Colorado, and eight weeks for Purdue. All student participants were asked about demographic information including prior travel history, prior global health coursework, gender, and grade point average (GPA).

Qualitative analysis was conducted with MAXQDA software through a conventional content analysis approach for both the data collected through the open-ended questions as well as the focus group transcripts. A two-cycle open (initial) coding process was utilized where the principal investigator coded all data while research team members were assigned to independently code particular questions.¹⁷ Face to face meetings resolved discrepancies to create a final codebook which was used to re-code the data in the same process as the first coding cycle. During the coding process, each response was evaluated for depth

of reflection using Kember's four category hierarchy of critical reflection from 1=habitual action to 4=critical reflection.¹⁸ Coding for reflective depth followed the same coding process above where the principal investigator coded all data along with team members and rectified discrepancies through face to face meetings. Data was separated by country income classification (high-income vs. LMIC) and school. The technique of code mapping was applied to the final list of learning outcome codes from the survey and focus group responses to identify and group codes into higher level student learning themes across each group.¹⁷

All quantitative data analyses were conducted in SPSS for Windows, Version 23 (IBM, 2011). Continuous data are presented as mean (standard deviation (SD)). Categorical data are presented as frequency (percent). Using recommendations from Carifio and Perla, parametric tests were used to analyze CUGH scores.¹⁹ Cronbach's alpha was used to examine reliability of the instrument. Independent t-tests were used to examine differences between independent groups (e.g. LMIC APPE students vs. high-income APPE students) and paired t-tests were used to examine differences between paired data (e.g. pre-rotation score and post-rotation score). Chi-square tests were used to analyze categorical variables for independent groups. Multiple linear regression was used to predict changes in student responses to the survey pre- and post-rotation, as it was determined that this change was most indicative of effects associated with the global rotation itself. The first regression model included all predictor variables. A more parsimonious model was derived using backward selection with a criteria of $p < .10$, which is the default criteria for retaining predictors during backward selection in many statistical packages.^{20,21} In other words, the parsimonious model was generated iteratively by removing variables with the highest p value in a stepwise fashion until all variables in the model were $p < .10$. Parsimonious models explain the data with a minimum number of predictor variables. Statistical significance was established at $\alpha = 0.05$. The study design is based on a prior analysis by Steeb et al. regarding the assessment of global health learning outcomes for international experiences.²² This study was reviewed and considered exempt by the Institutional Review Board at each participating institution.

RESULTS

Eighty-one students participating in an international APPE completed the survey (100% response rate). Forty-eight students went to LMIC locations which included China, Ethiopia, Guatemala, India, Kenya, Malawi, Moldova, Tanzania, and Zambia while 33 students went to high-income countries including Australia, Canada, Japan, New Zealand, and the United Kingdom. There were no significant differences on key characteristics (e.g. age, gender, GPA) between students that completed an APPE in a high-income country and those that completed an APPE in a LMIC (Table 1).

The mean CUGH score for all participants increased from 43.49 (7.29) before the rotation to 53.38 (6.39) after the rotation ($p < .01$). When analyzed based on the income classification of the rotation country, both groups demonstrated significant growth: 45.12 (8.08) to 50.88 (7.68) for students that rotated to high-income countries ($p < .01$) and 42.38 (6.54) to 55.10 (4.67) for students that rotated to LMICs ($p < .01$) (Table 2). No difference was found between the LMIC and high-income groups on the pre-survey (42.38 (6.54) vs 45.12 (8.08), $p = .11$) with LMIC post-survey results being significantly higher than high-income post-survey results (55.10 (4.67) vs 50.88 (7.68), $p < .01$). Growth from pre-survey to post-survey was also larger for the LMIC group when compared to the growth of the high-income group (12.73 (6.32) vs. 5.76 (5.96), $p < .01$). Cronbach's alpha was .87 on the pre-survey and .91 on the post-survey, indicating high internal consistency for the instrument.

All variables were advanced to the first linear regression model (Table 3). Completing an APPE in a LMIC was the only predictor of change in total CUGH score. When controlling for all other variables in the model, a LMIC APPE was associated with an increase of 7.47 points ($p < .01$). R^2 for the full regression model was .37. After removing variables using backward stepwise procedures with a criteria of $p < .10$, completing an international APPE remained significant, with a 7.55 increase when controlling for all other variables in the model ($p < .01$) (Table 4). Prior travel for non-vacation reasons was also significant in the refined model, indicating that those students demonstrated less overall growth (-3.77 points, $p = .03$) when compared to students who had not previously traveled internationally for non-

vacation reasons. R^2 for the refined regression model was .34. All models met the assumptions of linear regression, including lack of multicollinearity.

Code mapping of the survey and focus group data by country income classification (high-income vs. low-to-middle income) led to identification of three main student learning themes for each income group. Coding inter-rater agreement for survey and focus group responses was 84% (346/412). Codes that appeared in a majority of responses for each income category are shown in Table 5 while representative student quotes of predominant learning outcomes are shown in Appendix 1. Reflection levels showed deeper reflection for students who completed a LMIC APPE compared to a high-income country APPE (2.14 vs. 1.76, $p < .01$).

Qualitative Analysis of Low-to-Middle Income (LMIC) APPE Student Learning

Cultural Sensitivity Progression. Over two-thirds of students who completed a LMIC APPE indicated enhanced cultural awareness from both interactions in their daily living and within their rotation setting. Interacting with healthcare providers and patients helped students learn about cultural influences on disease burden, health beliefs and values, and communication. Half of the students in the LMIC group developed an appreciation for culture beyond that of just an understanding, often noting how valuable it is to factor culture into patient interactions and treatment decisions. Some students appreciated certain cultural attitudes, including community support, patience, and positivity. A few students progressed further to cultural sensitivity, indicating that they would make an effort to incorporate patients' culture during future interactions, with some stating that this would make them a more empathetic and better practitioner.

Patient-Centered Care. The care and management of patients was a prevalent student learning theme throughout most LMIC responses with a focus on barriers to care, patient communication, and interprofessional collaboration. Issues regarding medication shortages, resource limitations, and social determinants of health required students to consider alternative treatment options. As students managed treatment options they indicated enhanced awareness of patient factors that can influence access and quality of care including medication cost, social support, transportation, and environmental influences on

disease. Students indicated that providing care despite barriers enabled an appreciation for patient centered care and interprofessional collaboration to address problems. Students also described a newfound inspiration and respect for healthcare providers at their APPE sites as a result of their commitment to the patient and dedication to advance pharmacy practice in their country.

Skill Development. The majority of skill development was reported by students who went to a LMIC, including communication, problem solving, adaptability, and confidence. Resource limitations as well as cultural and language differences enhanced student's ability to problem solve and adapt. Students indicated improved communication, largely cross-cultural and patient-related, due to working through language and cultural barriers. As students navigated through these barriers, they indicated increased self-awareness and self-efficacy, which resulted in enhanced confidence. Students felt more prepared to take on responsibility, make patient care decisions, and thrive in unfamiliar situations after their rotation.

Qualitative Analysis of High-Income APPE Student Learning

Differences in Healthcare System Components. Students who went to high-income countries often described their learning from a health care system perspective. Students indicated increased knowledge about differences in healthcare delivery, payer and policy models, and technology that positively or negatively impacted patient care. Students mentioned that they had a greater appreciation for universal healthcare systems with some indicating a desire to pursue a similar system in the United States. These comments correlated with students mentioning an appreciation for resource limitations that contribute to healthcare disparities here in the United States. Students more often referred to their experience as “eye-opening” which was usually in reference to the lack of electronic health record systems in countries including Australia and the United Kingdom.

Pharmacy Practice and Education. Students who went to a high-income country location primarily mentioned codes related to pharmacy practice and education. They reflected on differences in roles and responsibilities of the pharmacist and pharmacy technician with many describing increased responsibilities for pharmacy technicians and less autonomy for pharmacists compared to the United States. Pharmacy practice differences were due to many different factors that were observed by students

including laws, pharmaceutical manufacturing and compounding practices, and medication storage and dispensing policies.

Alternative Patient Care Approaches. Many high-income country APPE students indicated learning about a new way to approach patient care. Some students referenced a new approach to the healthcare system structure, while others mentioned a new approach to transitions of care or patient communication. Over one-fourth of students mentioned a newfound appreciation for an alternative approach, often indicating a desire to implement it in their future practice. These approaches were often innovative methods for patient care that the student had not seen in the United States before but could see the value of implementing the approach in their local setting.

Despite each school having different APPE lengths as well as pre-departure training approaches, there were no qualitative trends that were identified that correlated with the duration of the experience.

DISCUSSION

While students who went to LMIC locations had significantly higher CUGH competency growth, qualitative analysis revealed notable learning outcomes associated with the 2016 ACPE Standards across both groups.⁷ Subdomains for *Medication use systems management* (2.2), *Population-based care* (2.4), and *Professionalism* (4.4) were seen in both high and LMIC locations. Growth in the subdomains for *Patient-centered care* (2.1), *Problem solving* (3.1), *Patient advocacy* (3.3), *Interprofessional collaboration* (3.4), *Cultural sensitivity* (3.5), *Communication* (3.6), and *Self-awareness* (4.1) was greatest in the LMIC group, while *Leadership* (4.2) and *Innovation and entrepreneurship* (4.3) demonstrated the greatest growth in the high-income group. While some of these learning outcomes were more apparent for one group over the other, they were present in both. Global health experiences also support nearly all core entrustable professional activity (EPA) domains for graduates with a particular focus on the roles of patient care provider, interprofessional team member, population health promoter, and self-developer.²³ Mapping global health learning outcomes to ACPE Standards 2016, EPAs, and the

CUGH framework can help programs develop pharmacy relevant learning objectives and assessment strategies that can also foster interprofessional collaboration.

There are two potential explanations for the divergence in learning outcomes and themes seen across country locations. First, relative differences in culture, patients, and resources between LMIC and the student's past experiences is much greater, which may lead to greater reflection and perspective transformation. This is supported by Mezirow's theory of transformational learning which states that transformative learning often begins with a disorienting dilemma, which could be caused by the significant cultural and patient care differences students experienced in LMIC countries.²⁴ Students appear to use the skills of communication, problem solving, and adaptability to determine the meaning of the differences they encounter. This process of exploration and critical reflection can stimulate greater cultural awareness as students go from the cognitive to the affective domain of learning with some students wanting to incorporate cultural beliefs and values into their future patient interactions.²⁵ While high-income APPEs can also provide a disorienting experience, the differences appear to be subdued from student comments and more research is needed to determine whether this produces a smaller transformational learning effect. There has been a growing recognition that the principles of global health can be applied to local environments.²⁶ Therefore, there may be opportunities to deliver effective global health experiences in rural and inner-city communities in developed countries where large resource differences could stimulate personal and professional transformation.²⁶ Future research is needed to determine whether APPE learning outcomes may differ between low and high income neighborhoods in the US and other developed countries.

Many of the CUGH competencies may be more relevant for LMICs, which may explain why there was greater learning growth among these students. Programs that send students to developing countries may also be more likely to structure and label these rotations as global health experiences and emphasize certain CUGH competencies. This could help explain why LMIC location was the most significant predictor of CUGH competency growth in the regression model. However, significant total growth did occur for CUGH competencies in high-income countries indicating that these could be

structured as global health experiences if it is appropriately contextualized. Students in high-income countries grew the most within the areas of cultural awareness and social determinants of health (3a & 3b) which may be attributed to the large, diverse populations associated with the urban locations of their rotation setting. Programs can help strengthen global health learning across all environments by helping students develop a “glocal” mindset as part of pre-departure training to enhance the students’ ability to apply global health principles, regardless of setting. A glocal mindset reinforces the mantra of “think global, act local” in helping students better translate their global learning to local environments back home.

The learning outcome differences by country location were more patient-focused in LMICs and more system-focused in high-income countries. Although rotations in both the high and LMIC settings involved patient care and engagement with the healthcare system, the majority of the pharmacy practice and healthcare system comments came from students who completed experiences in high-income locations. This may have been due to the relatively unstructured healthcare systems in LMICs, which can make it difficult for students to compare to their experiences in the United States. Programs and preceptors for international APPE rotations should consider how to help students understand the linkages between patient care and healthcare systems regardless of country location. One approach to consider could be the use of systems level thinking to have students look at patient care problems and potential solutions from different perspectives.²⁷ With pharmacy curricula emphasizing the prevention of disease and disease state management, students should recognize the global applicability of their training and the unique challenges that different healthcare systems face in addressing a common goal. Further research needs to assess how international rotation activities best enable certain learning outcomes so these can be disseminated and translated across countries as best practices.

Regarding duration, the study abroad literature shows that longer international experiences have a greater impact than shorter experiences.¹⁶ Although Purdue had the longest rotation duration of the three schools, the regression model failed to show a significant difference in learning growth. There was positive growth on the CUGH competencies regardless of APPE rotation duration. There are several

factors that may have impacted this finding including differences in the curriculum, pre-departure training, and rotation-specific activities. With rotation lengths varying from four to eight weeks, the four-week difference may have been too small to produce a consequential effect. However, study abroad reports also indicate that six-week intensive experiences may be just as effective as longer, less-intensive experiences, suggesting that pre-departure training and rotation design may be more important factors of student learning rather than duration.¹⁶ Additional research is needed to determine if one to two-week experiences, which is a common duration for many medical mission trips, would also produce similar learning outcomes and growth.

There are some limitations to consider. The majority of the students in the focus groups came from one school, which may not allow for differences between the schools to be observed. Although UNC, Purdue, and Colorado were all chosen for this study due to their involvement in global health activities at a public, research-intensive institution, this study was unable to control for factors between the schools including rotation-specific learning activities and pre-departure training that may have impacted learning outcomes. The survey was administered following the international experience to mitigate response shift bias but may have resulted in recall bias and underreporting of some learning outcomes. Further, the pre-post design using self-reported measures could have led some students to overestimate their learning.

CONCLUSION

While international APPE rotations across high and LMICs have different learning outcomes, both provide valuable global health learning with greater growth seen among students participating in LMIC experiences. Pharmacy programs can collaborate with other health professions utilizing the CUGH competency framework to design transformative global health experiences that enable students to serve as patient care providers who are also global health practitioners.

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Table 1. International APPE Rotation Student Demographics

Characteristic	Students Visiting High-income Country (n=33)	Students Visiting Low to Middle Income Country (n=48)	p value^a
Age, years	26.15 (3.53)	25.17 (2.59)	.17
Gender, female	26 (78.79)	36 (75.00)	.69
GPA, points	3.56 (.32)	3.60 (.33)	.69
Countries visited, number	4.15 (3.00)	4.04 (3.07)	.87
Prior international travel, yes	30 (90.91)	41 (85.42)	.46
Non-vacation ^b , yes	15 (50.00)	29 (70.74)	.08
Prior time in low to middle income countries, weeks	2.24 (2.21)	2.83 (3.57)	.36
Prior public or global health course, yes	11 (33.33)	17 (35.42)	.85
Institution			
University of North Carolina at Chapel Hill	14 (42.42)	25 (52.08)	.38
Purdue University	12 (36.36)	18 (37.50)	
Colorado University	7 (21.21)	5 (10.42)	

APPE=Advanced Pharmacy Practice Experience; GPA=grade point average; continuous variables represented as mean (SD); categorical variables represented as frequency (percent).

^aDifferences between groups examined by independent t-test for continuous variables and chi-square test for categorical variables

^bNon-Vacation travel includes study abroad, mission trips, volunteering, family reasons, and other.

Table 2. Change in Response (“Growth”) Prior to and Following Rotation for Students that Completed Rotations at High-income and Low-to-middle income Countries

CUGH Global Citizen Global Health Competency	High-income Pre-Rotation Survey Score (n=33) M (SD)	High-income Post-Rotation Survey Score (n=33) M (SD)	<i>p</i> value ^a	Low to Middle Income Pre-Rotation Survey Score (n=48) M (SD)	Low to Middle Income Post-Rotation Survey Score (n=48) M (SD)	<i>p</i> value ^a
1a. Describe the major causes of morbidity and mortality around the world, and how the risk for disease varies with regions	3.09 (1.07)	3.58 (0.90)	.05	2.85 (.82)	4.23 (0.52)	<.01
1b. Describe major public health efforts to reduce disparities in global health (such as Millennium Development Goals and Global Fund to Fight AIDS, TB, and Malaria).	2.45 (.97)	2.91 (0.98)	.06	2.33 (.88)	3.71 (0.85)	<.01
2c. Describe how travel and trade contribute to the spread of communicable and chronic diseases	3.36 (1.06)	3.82 (1.01)	.08	3.27 (.86)	4.06 (0.60)	<.01
3a. Describe how cultural context influences perceptions of health and disease.	3.39 (1.11)	4.03 (0.73)	<.01	3.33 (1.02)	4.4 (0.49)	<.01
3b. List major social and economic determinants of health and their effects on the access to and quality of health services and on differences in morbidity and mortality between and within countries	3.27 (1.15)	3.94 (0.93)	.01	3.25 (.89)	4.27 (0.57)	<.01
3c. Describe the relationship between access to and quality of water, sanitation, food, and air on individual and population health.	3.56 (.90)	3.94 (0.86)	.08	3.63 (.87)	4.33 (0.52)	<.01
5d. Exhibit interprofessional values and communication skills that demonstrate respect for, and awareness of, the unique cultures, values, roles/responsibilities and expertise represented by other professionals and groups that work in global health.	3.88 (.78)	4.30 (0.68)	.02	3.56 (.85)	4.40 (0.49)	<.01
5e. Acknowledge one's limitations in skills, knowledge, and abilities.	4.27 (.63)	4.36 (.49)	.51	3.79 (.71)	4.46 (0.50)	<.01

6a. Demonstrate an understanding of and an ability to resolve common ethical issues and challenges that arise when working within diverse economic, political, and cultural contexts as well as when working with vulnerable populations and in low-resource settings to address global health issues.	3.42 (.94)	3.85 (0.83)	.06	2.98 (.89)	4.23 (0.66)	<.01
7b. Articulate barriers to health and health care in low-resource settings locally and internationally.	3.58 (.83)	3.88 (0.93)	.17	3.29 (.90)	4.38 (0.49)	<.01
8c. Demonstrate a basic understanding of the relationships between health, human rights, and global inequities.	3.79 (.93)	4.12 (0.74)	.11	3.58 (.77)	4.29 (0.50)	<.01
8e. Demonstrate a commitment to social responsibility.	4.03 (.81)	4.24 (0.75)	.27	3.69 (.72)	4.38 (0.61)	<.01
10a. Describe the roles and relationships of the major entities influencing global health and development.	3.03 (1.13)	3.91 (0.84)	<.01	2.81 (.82)	3.98 (0.64)	<.01
Total CUGH	45.12 (8.08)	50.88 (7.68)	<.01	42.38 (6.54)	55.10 (4.67)	<.01

M=mean; SD=standard deviation; CUGH=Consortium of Universities for Global Health

^ap value represents mean difference between the pre-score and post-score for the LMIC and the pre-score and post-score for the high-income group

Table 3. Regression Model Predicting Change in Student Responses on the CUGH Statements

Variable	Unstandardized Coefficient (B)	Standard Error (SE)	Standardized Beta (β)	p value
<i>Intercept</i>	-5.26	12.40		.67
Rotation income level [LMIC]	7.47	1.45	.53	<.01
Age, years	.25	.25	.11	.33
Gender [Female]	-.55	1.69	-.03	.74
GPA	1.29	2.49	.06	.61
Countries visited, number	.53	.31	.23	.09
Prior international travel [Yes]	-2.38	2.50	-.11	.34
Prior travel for non-vacation ^a [Yes]	-3.75	1.89	-.27	.05
Prior time in low income countries, weeks	.09	.26	.04	.74
Prior public health course [Yes]	.50	1.49	.03	.74
Institution [University of North Carolina at Chapel Hill]				
Purdue University	3.20	1.81	.22	.08
Colorado University	-.88	2.25	-.05	.70

R²=.37

^aNon-Vacation travel includes study abroad, mission trips, volunteering, family reasons, and other.

LMIC=Low-to-Middle Income Country; GPA=grade point average; CUGH=Consortium of Universities for Global Health; [Bracket] represents reference group for categorical variables.

Table 4. Refined Regression Model Predicting Change in Student Responses on the CUGH Statements^a

Variable	Unstandardized Coefficient (B)	Standard Error (SE)	Standardized Beta (β)	p value
<i>Intercept</i>	4.62	1.56		<.01
Rotation income level [LMIC]	7.55	1.35	.53	<.01
Countries visited, number	.44	.26	.19	.09
Prior travel for non-vacation ^b [Yes]	-3.77	1.66	-.27	.03
Purdue University [University of North Carolina at Chapel Hill]	2.79	1.43	.19	.05

R²=.34

^aModel derived using backward selection with a criteria of p<.10

^bNon-Vacation travel includes study abroad, mission trips, volunteering, family reasons, and other.

LMIC=Low-to-Middle Income Country; GPA=grade point average; CUGH=Consortium of Universities for Global Health; [Bracket] represents reference group for categorical variables.

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Table 5. Prevalent Learning Outcome Codes by Country Location

	Low-to-Middle Income APPE Country	High-Income APPE Country
Knowledge	<ul style="list-style-type: none"> • Cultural awareness (general, healthcare related) • Disease state management • Barriers to care (resource limitations, supply chain management) • Infectious disease (malaria, tuberculosis, HIV) • Social determinants of health 	<ul style="list-style-type: none"> • Cultural awareness (general, healthcare related) • Health care system (payer and policy, technology) • Pharmacy practice • Role of the pharmacist • Non-communicable diseases
Skills	<ul style="list-style-type: none"> • Adaptability • Communication (patient, healthcare personnel, language, cross-cultural) • Patient care (counseling, clinical skills) • Interprofessional collaboration • Problem solving • Self-awareness • Empathy 	<ul style="list-style-type: none"> • Communication (cross-cultural, healthcare personnel) • Navigation
Attitudes	<ul style="list-style-type: none"> • Future applicability • Point of view (patient care) • Appreciation (cultural, US health care, limited resources, teamwork) • Global health perspective • Confidence 	<ul style="list-style-type: none"> • Eye-opening • Point of view (general, alternative approach, patient care) • Appreciation (alternative approach)

APPE=Advanced Pharmacy Practice Experience

Appendix 1. Representative Quotations of Global Health Learning Outcomes by Country Location

Learning Outcome	Representative Student Quote
Low-to-Middle Income Countries Cultural Sensitivity Progression	<p><i>“One of the things I think I’ve already started to take forward into my rotations and that I’ll continue to take forward in my career is cultural competency and I don’t think that just means, for me, diversity as far as racial groups or even like different parts of the [United States], but being able to work with different patients to be able to help them achieve their best health. . . every patient is different and being able to help them to find what works for them is my goal as a practitioner.”</i> – Focus Group Participant 7, Moldova</p>
Patient-centered care	<p><i>“Our conduct as healthcare professionals can affect the team. . . It is important not just to do the bare minimum but go further and instill the sense of responsibility into everyone else as a leader. At the end of the day, the patient care depends on each member and his/her role, and there are important distinctions in each member’s function, which is why teamwork is critical.”</i> – Survey Participant 12, Kenya</p>
Skill development	<p><i>“[The rotation] forces you to be adaptable. I think a big portion of that is . . . also being able to take those skills and bring them back to being adaptable in your next rotation in your new settings because whether we are in Malawi or in an ICU rotation there is things we are not going to know and things we have never faced before.”</i> – Focus Group Participant 2, Malawi</p>
High Income Countries Differences in Healthcare System Components	<p><i>“I gained a lot of respect for countries that provide national healthcare because they view it as a human right rather than a privilege. The fact that I was able to see so many oncology patients and none of them were worried about how they were going to afford their medications was amazing. . . Being in London, despite all the animosity to NHS wait times, gave me more reasons as to why I should care less about my paycheck and more about the millions of Americans that cannot afford health insurance.”</i> – Survey Participant 3, United Kingdom</p>
Pharmacy Practice and Education	<p><i>“I think one of the most important values I gained during my experience was observing the pharmacist’s role in transitions of care and medication adherence in the Australian healthcare system. The diligence of the pharmacist in completing medication histories, communicating with primary care physicians, and compiling weekly pill boxes for their patients were important roles that stood out to me. As someone very interested in ambulatory care pharmacy and transitions of care, these practices were very valuable to see and have empowered me to work toward these changes in the [United States].”</i> – Survey Participant 35, Australia</p>
Alternative Patient Care Approaches	<p><i>“I felt like the experience really opened my eyes to different types of medicine and helped me broaden my vision of pharmacy practice. . . After learning about kampo dispensing in Japan, I understood that some patients are much more comfortable using the traditional medicine, and that the role of the pharmacist is to optimize the patient’s health and well-being. . . In addition, some of the kampo formulations appear to have a lot of biochemical [mechanism of action] justifying its effects, which also made me realize that there is a lot of unexplored potential out there in traditional medicine that we just don’t understand yet.”</i> – Survey Participant 5, Japan</p>