

Perceived Roles, Benefits and Barriers of Virtual Global Health Partnership Initiatives: A Cross-Sectional Exploratory Study

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Abstract

BACKGROUND

Virtual global health partnership initiatives (VGHPs) evolved rapidly during the COVID-19 pandemic to ensure partnership continuity, however the current landscape for VGHP use and preference is unknown. This study aimed to increase understanding of GH partners' perspectives on VGHPs.

METHODS

From 15 October to 30 November 2020, authors conducted an online, international survey using snowball sampling to document pandemic-related changes in partnership activities; preferences for VGHPs; and perceived acceptability and barriers. Analysis stratified responses by country income classification and partnership type.

RESULTS

A total of 128 respondents described 219 partnerships. 152/219 (69%) partnerships were transnational, 157/219 (72%) were of >5 years duration, and 127/219 (60%) included bidirectional site visits. High-income country (HIC) partners sent significantly more learners to low- to middle-income country (LMIC) partner sites ($P<0.01$). Participants commented on pandemic-related disruptions affecting 217/219 (99%) partnerships; 195/217 (90%) were disruption to activities; 122/217 (56%) to communication; 73/217 (34%) to access to professional support; and 72/217 (33%) to funding. Respondents indicated that VGHPs would be important to 206/219 (94%) of their partnerships moving forward. There were overall differences in resource availability, technological capacity, and VGHP preferences between LMIC and HIC respondents, with a statistically significant difference in VGHP acceptability ($p<0.001$). There was no significant difference between groups regarding VGHPs' perceived barriers.

CONCLUSIONS

The pandemic disrupted essential partnership elements, compounding differences between LMIC and HIC partners in their resources and preferences for partnership activities. VGHPs have the potential to bridge new and existing gaps and maximize gains, bi-directionality, and equity in partnerships during and after COVID-19.

Introduction

Global Health (GH) is a rapidly growing field focused on advancing international and interdisciplinary healthcare (1-12). A core tenet of GH is addressing health inequities (13), and one central strategy of this approach is the implementation of Global Health Partnerships (GHPs), defined as a collaborative effort towards training, research, and capacity building (1, 14). The heterogeneity across diverse settings, individual preferences, and organizational interests are factors that determine the nature, duration, and future of GHPs. Moreover, the stages of development and maturity of GHPs are dependent on the

complexity of and investment in activities undertaken locally and internationally (1-12). The focus areas of GHPs range from electives for healthcare trainees; access to resources; capacity building; technical support; professional mentorship; and collaborative research, public health, or education initiatives (1, 5-7, 14-19). Many GHPs rely heavily on unidirectional travel, with faculty and trainees from high-income countries (HIC) disproportionately visiting host sites in low- and middle-income countries (LMIC) (1, 6, 7, 14-16, 20-24). Although bidirectional exchanges of information, resources, and personnel are considered ideal (1, 2, 6, 7, 14, 15, 20, 22, 25), implementing these and measuring their impact are often prohibitively expensive and complicated (6).

The COVID-19 pandemic disrupted in-person GHP activities while consequently worsening the existing inherent inequities in GH, especially in LMIC (26, 27). Since the start of the COVID-19 pandemic, traditional GHP operations have been affected through unprecedented travel restrictions, limitations of in-person interactions, and new standards for personal protection (16, 26, 28-30). Challenges to traditional approaches to GHPs, including communication, bidirectional exchange of staff and learners, and in-person site visits, have continued throughout the pandemic. Beyond that, hindrances due to financial constraints, visa entry tied to COVID-19 risk or vaccination status, and GHP programming may continue to limit in-person GHP activities (16, 29). Concerted efforts to ensure GHP continuity are therefore paramount. Consequently, there is an urgent need for GHPs to re-examine how they will operate during the pandemic and beyond (31).

To date, there has been little research dedicated to virtual approaches to GHPs, and there are few data on ways to sustain or improve GHPs partnerships during disruptive global challenges, such as a pandemic. Guidance exists on the use of virtual education for GH preparation, simulation, and educational initiatives [7, 15, 32-35], most commonly focusing on an individual activity, however less clear is how to maintain activities during the pandemic. Further, learner competencies for GH education exist (1, 32-35), but recommendations on how to reinforce competencies virtually or by distance while prioritizing the needs of partners in LMIC (16, 28, 36) are lacking. Finally, few papers compare different virtual engagement strategies or document preferences for or enablers and barriers to those strategies, particularly from the LMIC partner perspective. Virtual GHP initiatives (VGHPs), which we define as collaborative GHP activities conducted entirely online, may inform approaches for re-organization and re-prioritization of GH activities.

We hypothesize that VGHPs will improve upon and enable continuity of GHP activities during and following the COVID-19 pandemic, and that baseline data will be essential in establishing future best practice recommendations. Therefore, the impetus for this study was to generate preliminary descriptive data about VGHPs that may inform ongoing discussions about approaches for re-organization and re-prioritization of GH activities.

Methods

Survey Overview and Goals

We conducted a cross-sectional, online, international survey. The survey goal was to characterize GHPs and their practices; assess changes in activities during the COVID-19 pandemic; document perceived acceptability of and barriers to VGHPs; and enrich our understanding of alternative strategies to maintain GHPs.

Survey Development

Our team, which included members of diverse academic, non-profit, and clinical organizations, developed survey questions based on literature review and an iterative process until reaching consensus among the author group. We structured Likert scale questions to elicit baseline data on respondents' demographics; GHP characteristics; impressions of acceptability and barriers of VGHPs; and preferences for types of VGHPs. We included both closed-ended and free-text questions, and we allowed participants to comment on up to three GHPs. The survey and all study materials were translated from English into French and Spanish.

Expanding on previous definitions of GH (2-4, 9-12, 18, 26), for the survey, we defined a GHP as "*any trans- or multinational and/or domestic collaborative health partnership that bridges geographical distance and/or resource levels to promote the health and wellbeing of people anywhere in the world.*" Partnerships could include headquarter or satellite sites of a single entity or represent individual organizations linked by the coalition. The collaboration could include clinical, public health, research, community, educational, and/or development work, but each were required to share a mutual focus to advance health within the capacities of their respective organizations.

Survey Target Population

Eligible participants were faculty or staff who self-identified as key members of GHPs at an organization. Ineligible participants were people not directly involved in a GHP at an organization and trainees. Because of data protection restrictions impacting European Economic Area (EEA) countries and a resultant longer ethical review period, we excluded EEA respondents.

Survey Implementation

The survey was open from 15 October to 30 November 2020. We implemented snowball sampling to access a wide range of participants in the authors' professional networks. We invited survey participation by email correspondence from each author to known focal points for GHPs (i.e., program directors, GH pathway directors, organization presidents/directors, student organization focal points, and/or clinical directors/supervisors). We also contacted listserv operators (such as one for GH residency track and fellowship directors), and GH-related social media pages (such as the twitter account for an upcoming GH conference). Each invitation included a request to circulate the survey link to people both within and external to a participant's organization. We sent reminder emails twice during the data collection period to encourage participation.

Data Collection

We gathered data via an online survey created and stored via the standard encrypted online cloud platform for data collection and storage, REDCap (Vanderbilt University, <http://project-redcap.org>) (37). Participants received the REDCap survey link, a standard study information leaflet sheet, and study contact details. The link directed participants to a survey introduction and explanation page, and respondents who consented to participate continued to the survey. We de-identified all survey responses.

Statistical Analysis

We stratified responses by type of GHP (domestic, transnational, or both/blended) and by income status (HIC vs. LMIC) (38) of the participant's country of professional work. Using SAS software, version 9.4 (SAS Institute Inc., Cary, NC, USA), we summarized descriptive data using frequencies for dichotomous and categorical variables and measures of central tendency for continuous variables. We analyzed bivariate relationships between GHPs using chi-square tests for categorical variables. We determined statistical significance with an alpha of 0.05. We did not implement qualitative analysis of free-text responses as we did not receive adequate qualitative data in these portions of the survey.

Ethical Considerations

We obtained institutional review board approval from the Colorado Multiple Institution Review Board (University of Colorado, Aurora, CO, USA; #20-2099) and the Mbale Regional Referral Hospital Research Ethics Committee (Mbale, Uganda; #MRRHREC-OUT-011/2020).

Results

A total of 134 respondents from 34 countries completed the survey (Figure 1).

Five surveys were excluded due to respondents being in the EEA and one response was excluded due to missing location. Among respondents, 115/128 (90%) completed the survey in full, while 13/128 (10%) responses were partial.

Table 1 shows respondent characteristics. Among respondents, 62/128 (48%) were from LMIC while 66/128 (52%) were from HIC, and 79/128 (62%) were from health centers/hospitals. Respondents reported that 55/128 (43%) of their organizations focused on district/county/region level work. Respondents were permitted to indicate multiple roles or specialties within the same institution. They represented a wide range of institutional roles, with 68/128 (53%) working as professor/educators; among clinician respondents, 26/128 (20%) worked in pediatrics, the most common specialty represented.

Table 1
Characteristics of Respondents

		N (%)
Respondent Region	North America	65 (51)
	Africa	39 (30)
	South America	12 (9)
	Asia & Pacific	7 (6)
	Middle East	5 (4)
Respondent's Institution Type	Healthcare Center or Hospital	79 (62)
	Health Profession School	58 (45)
	Research Organization	26 (20)
	Non-Government Organization	23 (18)
	Public Health or Community Service Organization	12 (9)
	Governmental Agency	10 (8)
	Other	7 (5)
Geographical Reach of Respondent's Organization	District/county/region	55 (43)
	Village/town/city	40 (31)
	National	38 (30)
	Multi-continental	35 (27)
	Multi-regional/country	21 (16)
Respondent role	Professor or Educator	68 (53)
	Clinical Staff	57 (45)
	Researcher	38 (30)

	Director/President of Organization	29 (23)
	Administrator	25 (20)
	Other	11 (9)
Respondent Clinical Discipline, if applicable	Pediatrics	26 (20)
	Emergency Medical Services	11 (9)
	Internal Medicine	6 (5)
	General Medicine	5 (4)
	Surgery	3 (2)
	Obstetrics/Gynecology	2 (2)
	Other	8 (6)

Regarding partnerships, 77/128 (60%) of respondents provided survey responses on >1 GHP, and subsequently, our dataset represents 219 total GHPs. **Table 2A** describes characteristics of these GHPs. Of the 219 GHPs represented, 152/219 (69%) were transnational (partnerships between different countries); 30/219 (14%) were domestic (partnerships within one country); and 17% 37/219 (17%) were blended (partnerships with both domestic and transnational activities). Of domestic GHPs, 26/30 (87%) described partnerships in which both members were based in a LMIC, while 4/30 (13%) described partnerships in which both members were based within a HIC. The majority of GHPs described were >5 years old, with the longest partnerships between blended partnership types. The highest proportion of GHP activities reported were research and education. Domestic and blended GHPs were primarily based in LMIC, while transnational GHPs were primarily based in HIC.

Of all GHPs described, 127/219 (60%) included bidirectional site visits while 79/219 (40%) included unidirectional site visits. Among GHPs that included bidirectional site visits, we found that HIC partners sent significantly more learners to LMIC partner sites than LMIC partners sent to HIC sites (36% vs. 20% respectively, $p<0.001$). Among GHPs that included unidirectional site visits, significantly more LMIC sites only hosted visitors when compared to HIC partners (16% vs 4% respectively, $p<0.001$).

Participants commented on pandemic-related disruptions to 217/219 (99%) GHPs, 97 (45%) from the LMIC partner and 120 (55%) from the HIC partner. Among GHPs described, 195/217 (90%) reported a significant disruption in activities; 122/217 (56%) in communication; 73/217 (34%) in access to professional support and resources; and 72/217 (33%) in funding. Overall, more respondents from LMIC versus HIC reported disruption to partnership activities due to the pandemic ($p=0.005$). Of partners in LMIC, 53/97 (55%) reported disruptions in funding, compared to only 19/120 (16%) partners in HIC ($p<0.001$). LMIC partners reported significantly more disruption in access to professional support and

resources than GH partners in HIC (54% vs 18% respectively, $p < 0.001$). Disruption in communication with partners was similar for both LMIC and HIC respondents (57% vs 55% respectively, $p = 0.75$).

Table 2B presents virtual activities within GHPs and future interest in VGHPs. Before the onset of the pandemic, 84/219 (38%) GHPs engaged in VGHPs, most commonly occurring weekly. Respondents indicated that in the future, VGHPs would be important for 206/219 (94%) of their GHPs; the ways in which VGHPs could be important, however, differed by partnership type.

Figure 2 shows the most preferred VGHPs during the COVID-19 pandemic among GHP sites stratified by country-level income status. We found a significant difference between LMIC and HIC respondents in the distribution of all preferred VGHPs ($p < 0.001$).

Figure 3 shows the status of technological capacity in respondents' home organization, stratified by connectivity, available infrastructure, and device accessibility. When comparing HIC and LMIC respondents, there were statistically significant differences between accessibility to a variety of resources.

Table 3 **Panel A** shows perceived barriers and attitudes about VGHPs. There was no significant difference between LMIC and HIC respondents on their perceptions of barriers to VGHPs. Regarding acceptability of VGHPs (Table 3 **Panel B**), LMIC and HIC respondents differed significantly in their perceptions that they needed additional education to succeed with VGHPs (48% and 14% respectively; $p < 0.001$); for preference of in-person activities versus VGHPs (51% and 74%, respectively; $p = 0.02$); for requiring technical support to adequately participate in VGHPs (53% and 22% respectively; $p < 0.001$); and for ease of participating in VGHPs (66% and 39% respectively; $p = 0.006$). LMIC respondents were more likely to agree that virtual applications and technology were complicated compared to HIC respondents (39% and 19%, respectively; $p = 0.04$).

Table 2
Global health partnerships – characterizations and virtual activities

		Partnership Type						P-value
		Domestic Partnerships		Transnational Partnerships		Blended Partnerships		
		N=30	(%)	N=152	(%)	N=37	(%)	
Characteristics of Global Health Partnerships								
Nature of Partnerships	Partnerships within country*	25	(83%)	8	(5%)	32	(86%)	<0.001
	Partnerships with LMIC-based organizations*	4	(13%)	115	(76%)	31	(84%)	<0.001
	Partnerships with HIC-based organizations*	4	(13%)	29	(19%)	28	(76%)	<0.001
Length of partnerships	<5 years	11	(37%)	42	(28%)	4	(24%)	0.009
	5-10 years*	14	(47%)	50	(33%)	6	(16%)	
	>10 years	5	(17%)	60	(39%)	22	(59%)	
Partnership activity types	Research*	19	(63%)	101	(66%)	33	(89%)	0.018
	Education	19	(63%)	120	(79%)	32	(86%)	0.07
	Clinical	12	(40%)	94	(62%)	20	(54%)	0.08
	Community Development*	11	(37%)	31	(20%)	17	(46%)	0.003
Physical interaction of partnership staff between sites?	Yes (%)	23	(77%)	137	(90%)	32	(86%)	0.12
Organization Country Income Status*	Low/Middle Income	26	(87%)	38	(25%)	34	(92%)	<0.001
	High Income	4	(13%)	114	(75%)	3	(8%)	
Virtual Activities within Global Health Partnerships								
Did your organization offer virtual partnership activities prior	Yes	12	(40%)	48	(32%)	24	(67%)	<0.001
	No	13	(43%)	85	(56%)	7	(19%)	

to December 2019? *		Partnership Type						P-value
		Domestic Partnerships		Transnational Partnerships		Blended Partnerships		
		N=30	(%)	N=152	(%)	N=37	(%)	
	Planned but not implemented	4	(13%)	17	(11%)	5	(14%)	
What kinds of virtual partnership activities were you previously engaged in?	Access to online educational materials*	5	(17%)	29	(19%)	15	(40%)	<0.001
	Virtual face to face educational training*	6	(20%)	31	(20%)	21	(57%)	<0.001
	Virtual face to face clinical care*	1	(3%)	8	(5%)	12	(32%)	<0.001
	Virtual peer to peer support	4	(13%)	20	(13%)	10	(27%)	0.11
	Research Collaborations	5	(17%)	21	(14%)	9	(24%)	0.29
How often did these activities occur?	Daily	0	(0%)	3	(6%)	2	(9%)	0.25
	Weekly	5	(42%)	16	(34%)	10	(43%)	
	Monthly	3	(25%)	15	(32%)	8	(35%)	
	Quarterly	4	(33%)	5	(11%)	1	(4%)	
	Yearly	0	(0%)	1	(2%)	2	(9%)	
	No regular frequency	0	(0%)	6	(13%)	0	(0%)	
Would new or ongoing virtual health partnerships be important to your organization?	Yes (%)	27	(90%)	145	(95%)	34	(100%)	0.16
How? *	Enable continuity of activities between partners	18	82%	102	71%	34	100%	0.002

		Partnership Type						P-value
		Domestic Partnerships		Transnational Partnerships		Blended Partnerships		
		N=30	(%)	N=152	(%)	N=37	(%)	
	Guide planning for virtual collaborative initiatives	0	0%	15	10%	0	0%	
	Allow for safer partnerships	1	5%	20	14%	0	0%	
	Allows for career advancement	3	14%	6	4%	0	0%	
*Statistically significant distribution at p-value<0.05								
Abbreviations: LMIC = low- to middle-income country; HIC = high income country								

Table 3. Perceived barriers and acceptability of virtual global health partnership initiatives (VGHPs) among respondents

	LMIC		HIC		p-value
	N=61	(%)	N=66	(%)	
Panel A: Perceived Barriers of VGHPs					
Lack of institution accreditation/ acknowledgement	36	(60%)	35	(55%)	0.66
Lack of space/facilities	37	(62%)	32	(49%)	0.19
Lack of specialty accreditation/ acknowledgement	35	(58%)	30	(47%)	0.42
Lack of technological capacity	41	(68%)	36	(55%)	0.16
Physical participation/ interaction requirement	41	(68%)	39	(61%)	0.66
Time needed to train staff	43	(72%)	56	(86%)	0.06
Cost of training	45	(75%)	42	(65%)	0.44
Lack of institutional support	45	(75%)	48	(75%)	0.58
Lack of mentors/local champions	47	(78%)	51	(78%)	0.57
Lack of onsite technical support	48	(80%)	45	(70%)	0.27
Lack of equipment for virtual education	49	(82%)	46	(71%)	0.19
Lack of formal training curriculum	49	(82%)	49	(78%)	0.51
Panel B: Acceptability/Usability of VGHPs					
Starting VGHPs					
I must learn many things to succeed with VGHPs*	28	(48%)	9	(14%)	<0.001
I prefer in-person activities over virtual partnership activities*	30	(51%)	48	(74%)	0.02
I would feel confident in participating in VGHPs	48	(81%)	59	(91%)	0.28
I think my organization is interested in collaborating to expand VGHPs	49	(83%)	49	(75%)	0.55
I want to implement virtual partnerships	52	(88%)	56	(88%)	0.62
Participation in VGHPs					
I need for technical support staff to adequately participate*	31	(53%)	14	(22%)	<0.001
I think VGHPs roll out would be smooth	37	(63%)	30	(46%)	0.14
I anticipate continuing VGHPs in the future	54	(92%)	63	(97%)	0.19
Utilization of VGHPs					

	LMIC		HIC		p-value
	N=61	(%)	N=66	(%)	
I think VGHPs would be awkward/uncomfortable	12	(20%)	7	(11%)	0.22
I think VGHPs will be inconsistent at my organization	19	(32%)	23	(35%)	0.60
I think virtual applications and technology are complicated*	23	(39%)	12	(19%)	0.04
I think participation in VGHPs will be easy*	39	(66%)	25	(39%)	0.01
I think VGHPs can be implemented quickly	40	(68%)	34	(52%)	0.19
I think VGHPs would complement existing activities	56	(95%)	61	(94%)	0.35
<i>*Statistically significant distribution at p-value<0.05</i>					
<i>Abbreviations: VGHP=Virtual Global Health Partnership Initiative; LMIC=Low/Middle Income Country; HIC=High Income Country</i>					

Discussion

To our knowledge, our study is the first to explore the role of VGHPs and their perceived benefits and barriers for the resilience of GHPs during the COVID-19 pandemic. Further, our survey is the first to query current LMIC and HIC members of GHPs to document initial preferences for and interest in VGHPs. Although our data are descriptive only, our findings contribute critical information to advance previous discussions about supporting partners in LMIC during global challenges, such as epidemics or crises [10, 43]. Additionally our findings add a real-world perspective to recent discussions about shifting GHP activities virtually (16, 28, 36, 39), addressing LMIC partner needs thoughtfully (30), addressing virtual education needs within certain specialties (19, 26, 29), and proposing virtual programming relevant only in HIC (40, 41).

Among our 128 respondents from 34 countries, there were a wide range of institutions and clinical specialties represented. Participants shared details of up to three of their GHPs, which allowed for an expanded dataset within a relatively limited participant group. The GHPs described in this study are like those in previous studies (1, 6, 7, 14-16, 20-25), and our data offer insights into VGHP considerations for similar GHPs. A few GHPs in our dataset represented domestic LMIC/LMIC or HIC/HIC partnerships, “global local” pairings whose unique needs should be considered during implementation of VGHPs (1, 2, 8). Most partnerships were bidirectional, but the reported exchanges, whether bidirectional or unidirectional, were mainly from the HIC to the LMIC partner. Previously described successful bidirectional and collaborative initiatives during crises (15, 42) may be just as (or more) easily done virtually and favor the needs of the LMIC partner. Such transferable activities include opening access to educational resources; connecting subspecialists from HIC to LMIC sites; assisting LMIC faculty with

grant writing and budget preparation; assisting LMIC trainees with residency application or entry examination preparation; offloading administrative tasks from the LMIC partner to HIC partner; and advocating for funds to improve LMIC partners' administrative, office and technological capacity. VGHPs provide an opportunity for complementing and coordinating efforts in GHPs, a tenet of ethical GH practices(43), more efficiently than ever before.

Not surprisingly, only a minority of GHPs were engaged in VGHPs before the pandemic, often with a weekly frequency. Thus, future studies looking at ideal activity frequency and ongoing activity preferences will be helpful in providing best practice recommendations. Interestingly, the respondents reported that VGHPs would be important to the vast majority (206/219, 94%) of their GHPs moving forward. The significant differences in opinion about how VGHPs would be important for domestic, transnational, and blended GHPs will be key discussion points for partnerships looking to incorporate or expand VGHPs. Although we only inquired about four ways in which VGHPs may be important (enabling continuity of activities vs usefulness in guiding planning vs increasing safety of partnerships vs allowing for career advancement), our findings suggest that partners' priorities and needs may not be aligned, and shared priorities should not be assumed. Likewise, data showing the significant differences between HIC and LMIC partners regarding preferred types of VGHPs, most specifically in terms of access to online materials (preferred by LMIC more than HIC respondents) and valuing virtual face-to-face trainings (preferred by HIC more than LMIC respondents), are telling. Because HIC and LMIC partners seem to value different components of VGHPs, these notable differences should prompt ongoing and intentional discussions to ensure all parties are mutually benefitting from VGHP implementation and roll out.

Our data show ongoing discrepancies between resource access and allocation that worsened since the pandemic began. For example, most respondents reported pandemic-related disruptions in communication at their GHP sites, but disruptions in funding, partnership activities, and access to professional support and resources were significantly more disruptive for LMIC compared to HIC respondents. This must be taken into consideration for future emergency responses and in how VGHPs are structured and planned from baseline.

Regarding barriers to VGHPs, although there were no significant differences between LMIC and HIC respondents on perceived barriers to VGHPs, the agreement between respondents could counter assumptions that members of GHPs may make about each other. The time needed for training and the lack of training curriculum were among the most frequently reported barriers by GHP sites. This suggests underlying healthcare system challenges in enabling continuous professional education within the GHPs. Regarding technological capacity, our findings agree with previous studies (1, 8, 14, 36, 44-46) that suggest a lack of internet connectivity is a severe concern for GHPs, with important implications for VGHPs. We found that LMIC partners reported less access to wireless internet, less trainee access to organization-owned hardware, poorer cellular phone service, and less access to physical spaces like meeting and simulation facilities. However, both HIC and LMIC respondents had reliable access to personal smartphones, to organization-owned technology, and video-conferencing services. Considering the technological capacity within GHPs and possibly investing into communication infrastructure will be

critical to ensure successful virtual engagement. Funding for in-person activities could be shifted towards resources that improve internet connectivity at LMIC partner-sites to address this challenge.

Between the LMIC and HIC partners, there were several key differences in opinion about VGHPi acceptability. Significantly more respondents in LMIC compared to HIC reported they would need to learn many things to succeed with VGHPis and require technical support to fully participate in VGHPis. This need for education and support must be considered moving forward to ensure the needs of LMIC partners are adequately heard and met. Interestingly, more LMIC respondents reported that participating in VGHPis would be easy, but that virtual applications and technology are complicated. This perhaps reflects the difference between using technology (something many LMIC partners are accustomed to as the hosting partner in a GHP) versus reliable access to technology (reflecting challenges in technological capacity), which indicates that reliable access must be accompanied by reliable training. This could be further examined in future studies.

Our study had several limitations. First, the pandemic likely hindered invited respondents from participating. We actively reached out to our professional networks to mitigate this challenge, but in doing so may have favored respondents from partnerships with greater resources. Second, as an initial exploratory survey, we pursued convenience sampling, which meant it was not possible to document response rate to the survey. Third, we chose not to include participants from the EEA due to lengthy ethical review processes to meet European data protection requirements, an issue we plan to address in future surveys. Fourth, our paper presents only descriptive data given that we received inadequate free-response data for a qualitative analysis. Finally, partial survey response may have affected results, though this was only 10% of the respondents; the pattern was determined to be missingness completely at random and did not disrupt results. Despite the limitations, we believe we gained valuable insight into a wide variety of GHPs at a key moment during the COVID-19 pandemic. Further, we approached this survey as a first step to inform future mixed-method and qualitative work about VGHPis, helping to direct further study.

Conclusion

GHPs were significantly disrupted by the COVID-19 pandemic, in particular their funding, communication, resource access, and activities, but the ways in which these disruptions affected LMIC versus HIC partners were disparate. Our survey of GHPs in both HIC and LMIC identified a strong enthusiasm for VGHPis despite several key barriers. VGHPis may bridge existing gaps and maximize gains of GHPs for enhanced bidirectionality, transparency, and equity in GHPs. Future study is needed to measure and guide best practices in this rapidly developing landscape.

Acronyms

EEA = European Economic Area

GH = global health

GHP = global health partnership

HIC = high-income country

LMIC = low- to middle-income country

VGHPI = virtual global health partnership initiative

Abbreviations

EEA = European Economic Area

GH = global health

GHP = global health partnership

HIC = high-income country

LMIC = low- to middle-income country

VGHPI = virtual global health partnership initiative

Declarations

ETHICAL APPROVAL and CONSENT TO PARTICIPATE

We obtained institutional review board approval from the Colorado Multiple Institution Review Board (University of Colorado, Aurora, CO, USA; protocol #20-2099, exempted 27 Aug 2020) and the Mbale Regional Referral Hospital Research Ethics Committee (MRRH-REC)/, Mbale, Uganda; protocol #MRRHREC-OUT-011/2020, accepted 30 Sept 2020). All participants provided consent to complete the study's survey as per ethical review board requirements.

CONSENT FOR PUBLICATION

Non-applicable

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING/SUPPORT

ATLAS International, Inc. provided funding for ethical review in Uganda.

AUTHORS' CONTRIBUTIONS

LU conceived project idea. LU and GP created initial project proposal and survey drafts

All authors contributed to survey edits and finalization and survey circulation and data collection. LU, CN, GA, and WW conducted survey and database creation and management. WW, LU, GP, and POO performed data analysis. LU, WW, GP, and POO created original manuscript draft. All authors contributed to manuscript editing and finalization.

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Authors information (optional)

Non-applicable

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Figures

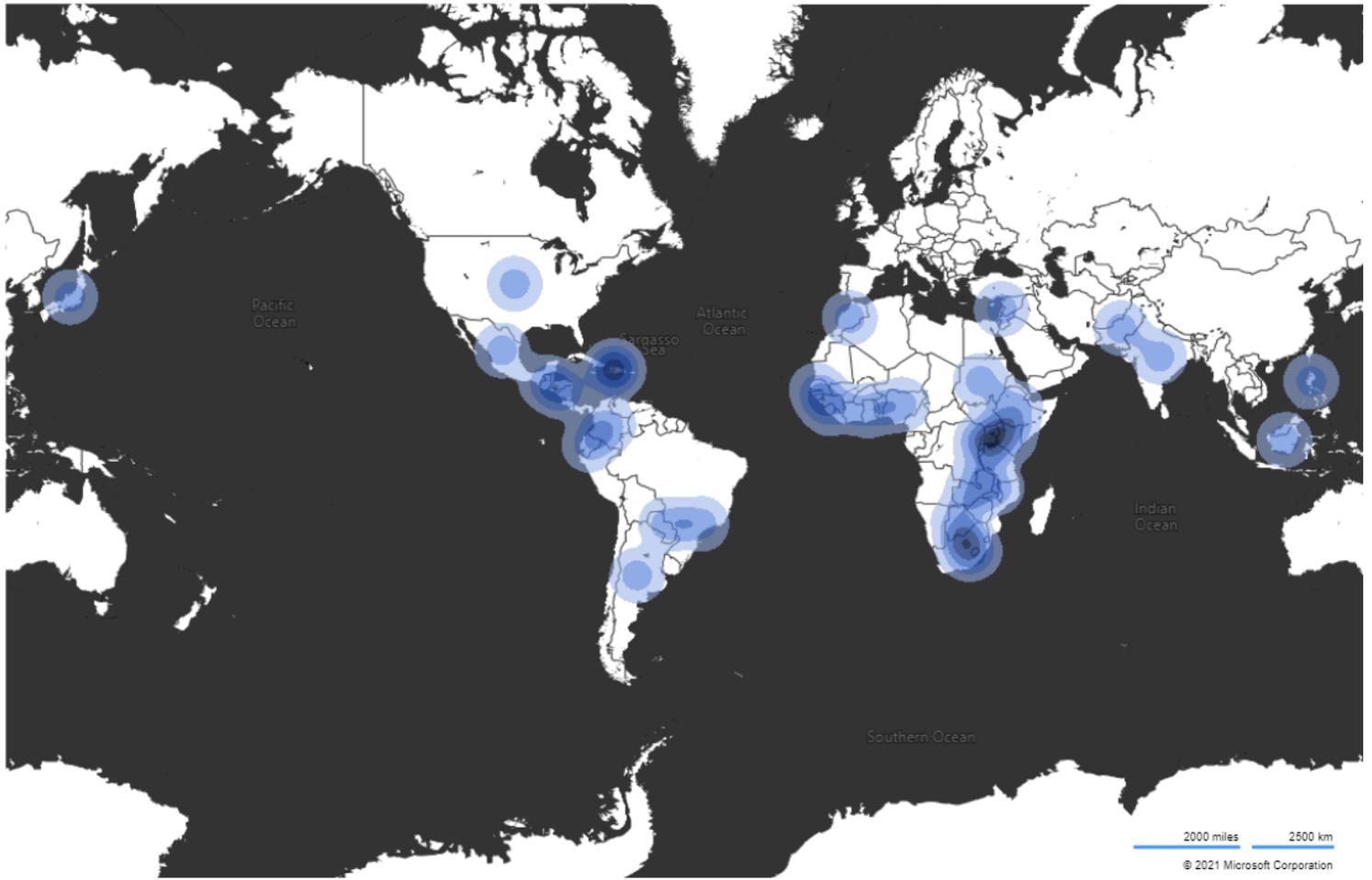
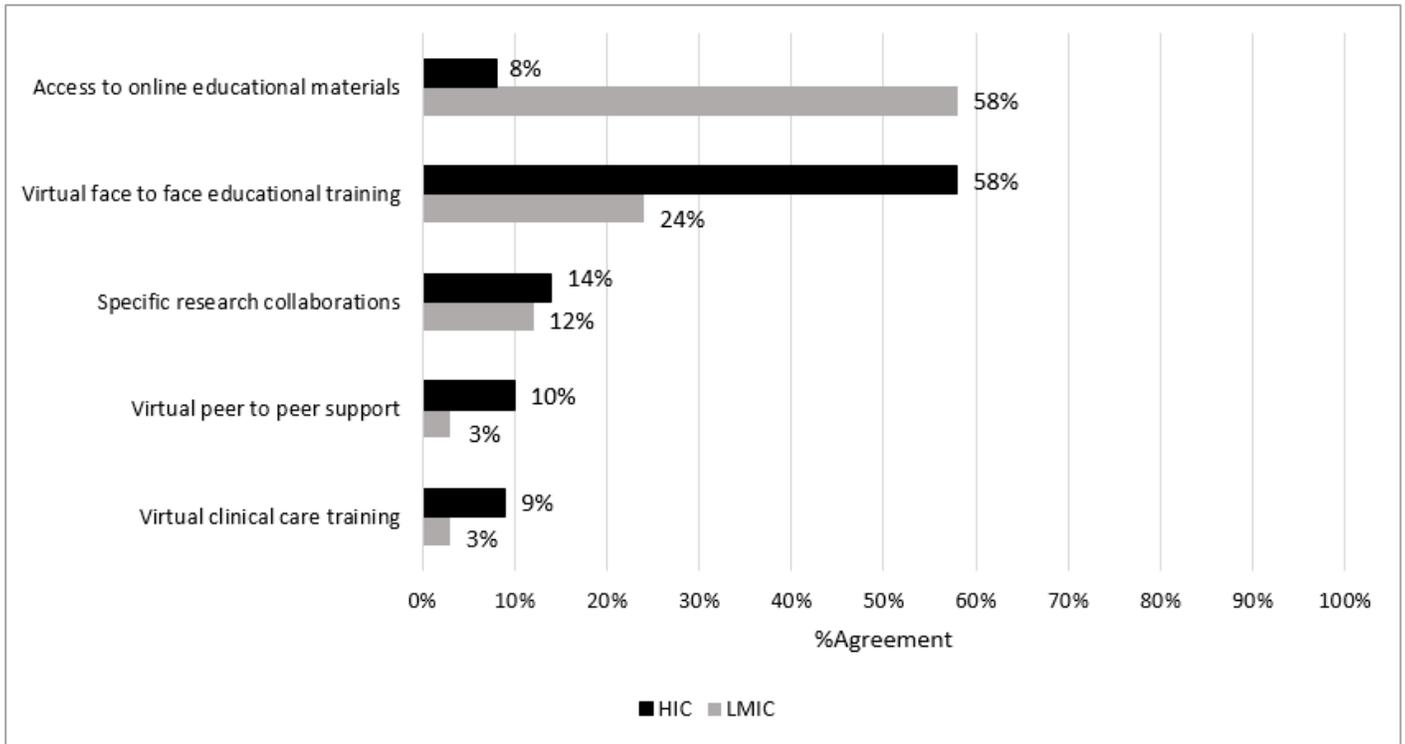


Figure 1

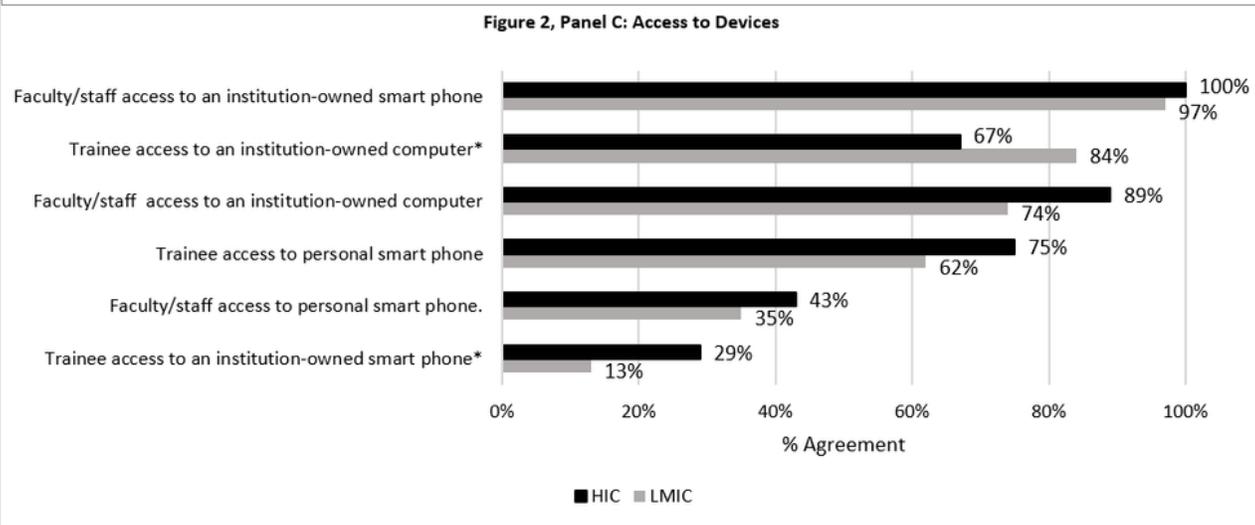
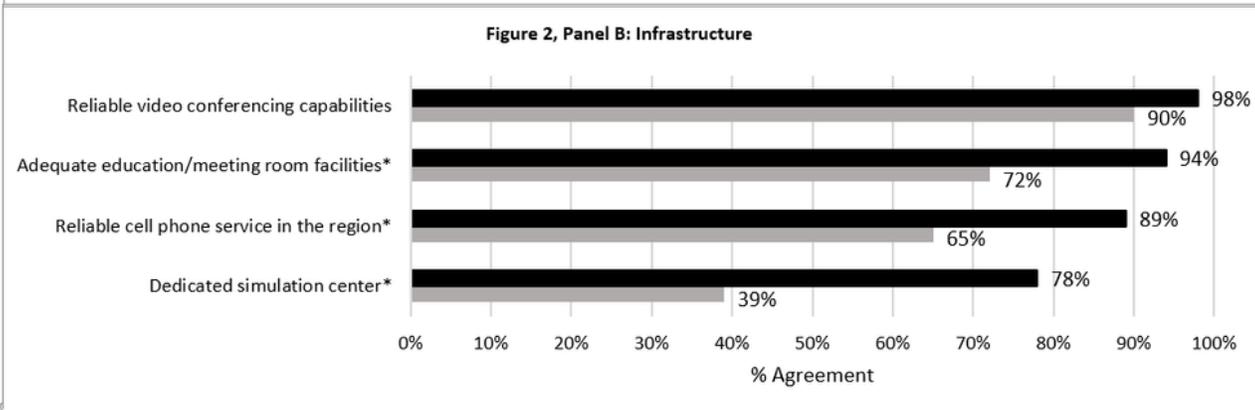
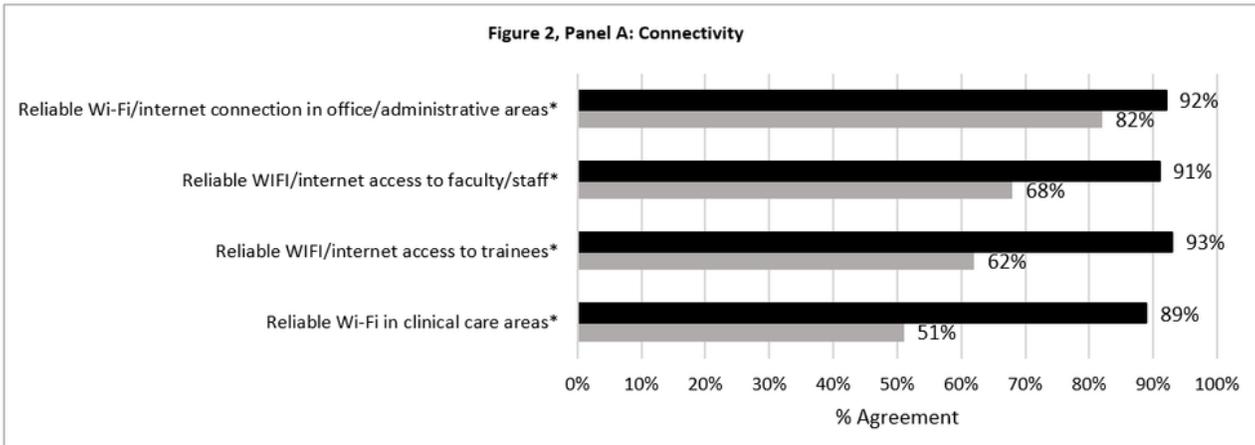
Distribution of Respondents to the Virtual Global Health Partnership Initiatives during COVID-19 Survey



The distribution of preferred VGHPs by country income status was statistically significant at $p < 0.001$
 Abbreviations: LMIC=Low/Middle Income Country; HIC=High Income Country

Figure 2

Most highly preferred virtual global Health partnership initiatives (VGHPs) during the COVID-19 pandemic



*Statistically significant distribution at p-value<0.05
 Abbreviations: LMIC=Low/Middle Income Country; HIC=High Income Country

Figure 3

Technological capacity for virtual global health partnership initiatives (VGHPs) among respondents