Healthcare Workers' Motivations for Enrolling in Massive Open Online Courses During a Public Health Emergency: Evidence from a Case Study of COVID-19 Training

Jennifer Jones, Jamie Sewan Johnston, Ngouille Yabsa Ndiaye, Anna Tokar, Saumya Singla, Nadine Ann Skinner, Matthew Strehlow, Heini Utunen

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Abstract

Background: Massive Open Online Courses (MOOCs) are increasingly used to educate healthcare workers in low-income and lower-middle-income countries (LICs/LMICs). Early in 2020, the World Health Organization developed a series of MOOCs for COVID-19, introducing the disease and strategies to control its outbreak, with six courses specifically targeting healthcare workers as learners. In August 2020, Stanford University also launched a MOOC, the "COVID-19 Training for Healthcare Workers", designed to deliver accurate and timely education on COVID-19 for healthcare workers across the globe, improving their ability to provide healthcare safely and effectively to patients suffering from the novel infectious disease. While MOOCs in LICs/LMICs have expanded during the COVID-19 public health emergency, more descriptive data is needed in the literature regarding healthcare participants' characteristics and motivations for enrolling in MOOCs.

Objective: In this study, we conducted a descriptive analysis of the types of healthcare workers who enrolled in COVID-19 MOOCs. Furthermore, we sought insight into healthcare workers' motivations for enrolling in and completing COVID-19 MOOCs. Previous studies have shown that a primary intrinsic motivator for MOOC enrollment generally is for their personal interest or knowledge acquisition; however, there is minimal available data on motivating factors for enrollment in healthcare-specific MOOCs. We aimed to understand better the types of learners who enroll in healthcare-related MOOCs and their motivations for participation.

Methods: Surveys were distributed to all course completers of six OpenWHO COVID-19 courses and Stanford's "COVID-19 Training for Healthcare Workers" course. This study combines enrollment data, with survey responses, including demographic data, ranked motivations for course enrollment, and perceptions of the MOOCs.

Results: Among healthcare workers, the primary motivator for COVID-19 MOOC enrollment generally and across subgroup analyses was to improve clinical practice and for personal learning. To earn a certificate ranked consistently as a middle-tier motivator. However, 70% of respondents reported they chose to earn the certificate, with 59% indicating they would provide a copy to their employer and 63% indicating they would use the certificate to fulfill continuing education requirements.

Conclusions: The results demonstrate that the primary reason most healthcare workers enrolled in COVID-19-related MOOCs was for clinical practice improvement and personal learning. Furthermore, most healthcare workers used course certificates professionally. Identifying the motivations for specific groups of learners, like those in LICs/LMICs, will help the future design of MOOCs to encourage participation and completion.

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Healthcare Workers' Motivations for Enrolling in Massive Open Online Courses During a Public Health Emergency: Evidence from a Case Study of COVID-19 Training

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Abstract

Background: Massive Open Online Courses (MOOCs) are increasingly used to educate healthcare workers during public health emergencies. Early in 2020, the World Health Organization (WHO) developed a series of MOOCs for COVID-19, introducing the disease and strategies to control its outbreak, with six courses specifically targeting healthcare workers as learners. In 2020, Stanford University also launched a MOOC designed to deliver accurate and timely education on COVID-19 equipping healthcare workers across the globe to provide healthcare safely and effectively to patients suffering from the novel infectious disease. While the use of MOOCs for just-in-time training has expanded during the pandemic, evidence is limited regarding the factors motivating healthcare workers to enroll in and complete courses, particularly in low- and lower-middle-income countries (LICs/LMICs).

Objectives: In this study, we seek to gain insights on the characteristics and motivations of learners turning to MOOCs for just-in-time training to provide evidence that can better inform MOOC design to meet the needs of healthcare workers. We examine data from learners in one Stanford University and six WHO COVID-19 courses to identify (1) the characteristics of healthcare workers completing the courses and (2) the factors motivating them to enroll.

Methods: We analyze (1) course registration data of the 49,098 healthcare workers who completed the seven focal courses and (2) survey responses from 6,272 healthcare workers recruited from the course completers. The survey asked respondents to rank their motivations for enrollment and to share feedback about their learning experience. We use descriptive statistics to compare responses by types of healthcare professions and by World Bank country income classification.

Results: Healthcare workers completed the focal courses from all regions of the world, with approximately one third practicing in LICs/LMICs. Survey data revealed a diversity of professional roles are represented among learners including physicians (35%, 2171/6272), nurses (25%, 1599/6272), and other healthcare professionals including allied health professionals, community health workers, paramedics, and pharmacists (40%, 2502/6272).

Across all types of healthcare workers, the primary motivation to enroll was for personal learning to improve clinical practice. At the same time, continuing education credit and employer recommendation remained important motivators, particularly for non-physicians and learners in LICs/LMICs. Course cost and certification were also important to a majority of learners.

Conclusions: Our results demonstrate that a diverse range of healthcare professionals access MOOCs for just-in-time training during a public health emergency. While all healthcare workers are motivated to improve their clinical practice, different factors are influential across professions and locations. These factors should be considered in MOOC design to meet the needs of healthcare workers, particularly those in lower resource settings where alternative avenues for training may be limited.

Keywords: Massive Open Online Course; MOOC; online learning; healthcare education; medical education; COVID-19 training; infectious disease outbreak response; humanitarian emergency response

Introduction

Background

During the COVID-19 pandemic, Massive Open Online Courses (MOOCs) emerged as an invaluable source of training for healthcare workers globally [1-4]. Studies have demonstrated MOOCs' effectiveness in facilitating learning among practicing healthcare professionals [5-6], and their capability to deliver content rapidly and flexibly has established e-learning as a preferred method for transferring clinical skills and knowledge [6]. Their broad applicability, accessibility, and cost-effectiveness make MOOCs particularly appealing for continuing education (CE) requirements, also known as continuing medical education (CME) [5,7-8]. Consequently, MOOCs have been utilized for skill development and retention, competency assessment, and lifelong learning [9]. In low-income and lower-middle-income countries (LICs/LMICs), MOOCs potentially increase access to essential health education content and reduce training costs for healthcare professionals [5,10-11].

Despite the increasing data on general MOOC enrollee motivations [12-15], there remains a significant gap concerning the specific factors motivating practicing healthcare professionals. Understanding the motivations of healthcare workers in LICs/LMICs to enroll in and complete healthcare-related MOOCs is crucial, as engagement and completion rates among this group are notably low (16-18). By identifying what drives their participation, we can enhance MOOC design and dissemination, particularly for just-in-time learning initiatives during health emergencies—a time when organizations like the World Health Organization (WHO) and national governments increasingly rely on MOOCs to rapidly disseminate critical information to healthcare workers.

This study aims to uncover the characteristics and motivations of healthcare professionals who enrolled in healthcare-related MOOCs during the COVID-19 pandemic—a period marked by an urgent need to rapidly disseminate critical healthcare information. Research indicates several potential reasons for enrolling in MOOCs. As a teaching model, MOOCs support adult learning principles targeting self-directed learners [17]. The self-directed learning model allows individuals to

guide their learning process, establish their learning objectives, engage in individualized learning strategies, and manage their time based on their interests while still receiving access to curated content [17]. It can be presumed that learner motivations for engaging in MOOCs differ from those in traditional brick-and-mortar educational venues [19]. Prior studies suggest that primary intrinsic motivations for MOOC enrollment include personal interest and knowledge acquisition [12], while extrinsic motivations often involve certification and professional development opportunities [17]. However, the specific motivations driving healthcare workers, particularly in LICs/LMICs, remain underexplored.

While recent studies, such as Garrido et al. (2016) and a scoping review on MOOCs for health worker education in low- and middle-income countries, have begun to explore the usage of MOOCs for professional and workforce development, these insights predominantly focus on broad educational outcomes and employment advancements [20-21]. Such research underscores the potential of MOOCs to enhance skill sets and career opportunities, highlighting the alignment of MOOC coursework with job market needs and professional certifications. However, these studies generally do not delve deeply into the specific intrinsic motivations of healthcare workers in LICs/LMICs to enroll in MOOCs, especially during health emergencies. In fact, in 2023 the WHO commissioned three systematic reviews of the literature to support guidelines for building just-in-time training during public health emergencies, finding a gap in the literature regarding the motivations of learners enrolling in relevant online courses, particularly in LMICs [22-24]. Our study seeks to fill this void by examining the unique motivations behind MOOC enrollment, particularly during the unprecedented global crisis triggered by the COVID-19 pandemic.

This study contributes uniquely to the literature by investigating the key motivations for healthcare workers to enroll in MOOCs with a special emphasis on provider type and country income level during a global health crisis. These insights are vital as learners in LICs/LMICs face challenges such as linguistic and cultural barriers, limited access to digital technology, low-

bandwidth connectivity, infrastructure constraints, and limited digital literacy [5,10]. By understanding what motivates learners in these settings, our study provides foundational knowledge that can inform more thoughtful and effective MOOC design and recruitment strategies, ultimately improving knowledge transmission, learning outcomes, and course completion rates in regions with critical needs for healthcare worker training. This broad impact underscores the potential of targeted online education strategies to significantly enhance global health responses.

Methods

Study Design

In this study, we present a descriptive analysis of MOOC learner data to identify the characteristics and motivations of healthcare workers enrolled in seven MOOCs designed to serve as just-in-time education for clinically practicing healthcare workers during the COVID-19 pandemic. We examine two sources of data: (1) course enrollment data (N=49,098) collected during course registration and (2) follow-up survey data (N=6,272) collected from course completers.

Course Descriptions

  In Table 1, we detail the seven focal courses examined in this study. We selected six courses developed by the World Health Organization (WHO) early in 2020 to respond to the growing COVID-19 crisis. These courses were launched on the OpenWHO.org online platform, which serves as the WHO's learning hub for health emergencies. These courses build on the WHO's initial introductory COVID-19 course, which had 232,890 enrollments across thirteen published languages by the end of March 2020 and provided general information about the disease for a broad audience [25]. The six WHO courses were selected out of 43 total COVID-19 courses offered on the OpenWHO platform due to their greater content relevance to practicing healthcare workers. The six MOOCs focused on introducing healthcare workers to the novel disease and providing them with

strategies to control its outbreak. Three courses were designed to provide healthcare workers with the basic tools needed to combat the pandemic and protect themselves from infection when providing healthcare services. Another three courses were designed to provide healthcare workers with an overview of the COVID-19 disease and provide learners with specific clinical strategies to address the pandemic. The courses were initially published in English and then rapidly translated into over 19 languages in the subsequent two months.

To broaden the reach of learners in the study, we also included a Stanford University MOOC launched in August 2020 to equip healthcare workers with timely in-service education to improve their ability to safely and effectively treat patients suffering from the novel disease [26]. The Stanford MOOC was launched on both the Coursera and EdX platforms, two U.S.-based MOOC providers founded in 2012 that routinely provide university-level courses on various topics including health. As of November 2020, nearly 900 health-related courses were available on the Coursera platform alone [27]. The Stanford course was first developed in English and then translated into four additional languages.

[Insert Table 1 about here]

The courses were promoted via their respective institutional networks. No paid advertisements were published. The Stanford course was promoted starting in July 2020 with emails sent to over 100,000 Coursera listserv subscribers. The course was also promoted through a variety of Stanford-affiliated social media channels and online publications, YouTube's spotlight channel, and shared directly with a network of health education collaborators throughout the world by Stanford team members. The WHO courses were promoted as each course launched on the WHO website, the OpenWHO platform, and through WHO newsletters and mailing lists.

Data Collection

Figure 1 describes the flow diagram for study participation and data collection. We obtained data on all course enrollees via the respective course platforms (OpenWHO for WHO courses and EdX and

Coursera for the Stanford Course). Course completion was defined by course developers and identified through backend data available from the course platforms. Learner background data were collected via the respective platforms at the time of course registration and include learners' age, gender, geographic location, and profession. The healthcare worker profession category includes those identifying as employed in the following professions: allopathic medicine (including physicians and physician assistants); traditional medicine; nursing (including nurses, nurse practitioners, nurse midwives, nursing instructors, and certified nursing assistants); allied health (including physical therapy, occupational therapy, speech pathology, medical assistants, and home health aides); community health; emergency medical services (including paramedics and emergency medical technicians); pharmacy (including pharmacists and pharmacy technicians).

We invited all enrollees who had completed the course in which they were enrolled to complete an online survey (Appendix A) on the respective course platforms. To recruit WHO course learners, we sent three survey invitations to the email addresses provided by learners at the time of registration and through the OpenWHO automated course message. To recruit participants from the Stanford course, we sent out three requests via Coursera and EdX email announcements. The survey window was open between December 11, 2020 – September 28, 2021. The survey completion rate among all course completers was 3% (12,170 / 305,849) and 13% (6,272 / 49,098) among healthcare workers completing courses.

The 23-question survey collected information on learners' personal and professional demographics, information about their professional experience with COVID-19, and their ability to connect with physicians in their daily work. Respondents were asked to rank six possible motivations for course enrollment in the order of importance to them. Additionally, respondents were asked about their use of course certificates, including whether their employer required a certificate, if they planned to provide it to their employers, or if they planned to use it for continuing education credit. Finally, respondents were asked about the cost of MOOCs and how it impacted their decision to

enroll in the course. All study authors were involved in the development of the survey. Questions were reviewed by all authors to include appropriate vocabulary, inclusive of globally used terminology. The survey was not adapted directly from any other source; however, the motivations included were drawn from anecdotal course feedback and the extant literature discussing motivations for MOOC enrollment.

Statistical Analysis

Because of the study focus, we limited our analytic sample to healthcare workers exclusively. To investigate the generalizability of our survey sample, we summarized the characteristics of all healthcare workers completing the courses (n=49,098) and healthcare workers completing the survey (n=6,272) using descriptive statistics (mean, standard deviation, and response rates). To compare the proportion of learners by characteristic between course completers and survey completers, we used Pearson's chi-square test. To examine ranked enrollment motivators and compare across learner subgroups, we conducted multiple comparison tests using one-way ANOVA, comparing the mean rank of motivations (dependent variable) by learner characteristics. The independent variables compared include differences by occupation (physicians vs. nurses; physicians vs. other health professionals) and country income classification (LICs/LMICs vs. UMICs/HICs). All statistical analyses were conducted using Stata SE V15.

Ethics Approval

Informed consent was obtained from all learners. Approval for all aspects of this study design, including consent, outreach, data collection, surveying, and data analysis, was obtained from the Stanford University School of Medicine Institutional Review Board (protocol number: 57831).

Results

Learner Characteristics

As shown in Figure 1, as of September 2021, the seven courses had 856,263 total enrollees, 90% (774,686 / 856,263) in WHO courses and 10% (81,577 / 856,263) in the Stanford course. Thirteen percent (113,902 / 856,263) of enrollees and 16% (49,098 / 305,849) of course completers identified as practicing healthcare workers at course registration. The course completion rate was higher among healthcare workers at 43% (49,098 / 113,902) compared to overall enrollees at 35% (305,849 / 856,263).

Table 2 shows that nearly half of the healthcare workers that completed a course were between the ages of 18-29 (47%, 15,238 / 49,098), and 61% identified as female (20,252 / 49,098). The region with the most healthcare workers that completed a course was Latin America and the Caribbean (25%, 10,665 / 49,098), followed by South Asia (17%, 7,264 / 49,098), North America (16%, 7,019 / 49,098), Europe and Central Asia (13%5,365 / 49,098), East Asia and the Pacific (12%, 5,278 / 49,098), Middle East and North Africa (9%, 3,816 / 49,098), and Sub-Saharan Africa (8%, 3,502 / 49,098). Approximately one third of the healthcare workers who completed a course were from low-income (2%, 828 / 49,098) or lower-middle-income countries (31%, 13,331 / 49,098).

[Insert Table 2 here]

Table 2 also compares the characteristics of healthcare workers completing the course with the 13% completing the survey (6,272 / 49,098). We observe slight differences in the age and gender composition of survey completers with course completers, with the survey sample skewing older and more male. The survey sample includes a slightly larger share of participants from LICs (4%, 222/6,272) and LMICs (39%, 2,468).

Table 3 describes the professions of the healthcare workers who completed the survey and their levels of physician supervision. Physicians represent 35% (2,171 / 6,272) of the survey sample,

followed by nurses representing 25% (1,599 / 6,272), followed by allied health professionals at 19% (1,190/6,272). This breakdown of professional roles is similar in LICs/LMICs and UMICs/HICs. Of non-physician healthcare workers, more than a third reported having access to a physician for consultation during less than 50% of their workday (36%, 1,315 / 6,272), though the majority could contact a physician by phone if needed. Most healthcare workers either already cared for COVID-19 patients or anticipated caring for them at the time of survey completion.

[Insert Table 3 here]

Learner Motivations

In the survey, healthcare workers were asked to rank in importance the following six potential motivating factors for course enrollment: to improve practice, to earn a certificate, continuing education (CE), course brand, free cost of course, and employer recommendation. Figure 2 shows the ranking preferences across survey respondents. Among survey respondents ranking all factors (n=5,518), the majority (56%) ranked "improve practice" as their top preference, with an additional 16% ranking it as the second most important factor, and 10% as the third most important factor. The second and third most important factors were CE and to earn a certificate, with employer recommendation as the least most important factor ranked.

[Insert Figure 2 here]

In Table 4, we show the ranking differences, by type of healthcare worker. While the motivation of improving practice was ranked highest across all subgroups, it was ranked higher by physicians, with a mean rank of 1.86, versus nurses with a mean rank of 2.06 and other healthcare providers with a mean rank of 2.24. Non-physicians ranked CE and employer recommendations higher in comparison to physicians. Certification also appears to matter more to non-physicians, with a higher proportion choosing to obtain a certificate, providing a copy of the certificate to their employer, and using the certificate for a continuing education requirement. The course brand appears to be a more important motivating factor to physicians compared to non-physicians. Course cost did

not appear to differentially influence course enrollment by type of healthcare worker.

[Insert Table 4 here]

In Table 5, we show ranking differences by the location of healthcare workers, comparing differences in UMICs/HICs compared to LICs/LMICs. In LICs/LMICs, healthcare workers ranked CE and employer recommendation higher on average compared to learners in UMICs/HICs. Conversely, course brand appears to matter more for learners in UMICs/HICs. Certification was obtained by roughly the same proportion of learners in both subgroups; although learners in UMICs/HICs were more likely to give a copy of the certificate to their employer, while learners in LICs/LMICs were more likely to use the certificate for a CE requirement.

Generally, the fact that MOOCs were free was a lower-ranked motivator. Though interestingly, in subgroup analysis, the course being free of cost was ranked lower in LICs/LMICs at 3.97 than in UMICs/HICs at 3.68 (Table 5). However, when survey respondents were asked about their perspectives on the cost of MOOCs, more than half of the healthcare workers indicated they would not have taken the course if there was an associated cost. This perspective was consistent across subgroup analyses of healthcare worker professional types and country-income levels.

[Insert Table 5 here]

Discussion

Through a survey of 6,272 healthcare workers worldwide who completed COVID-19 training MOOCs across multiple platforms and organizations, our study provides unique insight into the factors motivating healthcare workers to enroll in and complete MOOCs during public health emergencies. We identified that the primary motivator for enrollment among healthcare workers was to improve their personal practice, followed by the pursuit of continuing education credit and certification. Course cost is an influential factor in the decision to enroll in a MOOC, with nearly half of respondents indicating they would not have enrolled if the course had not been free. This first-of-

its-kind analysis of healthcare worker motivations in just-in-time training MOOCs during a public

health emergency fills an important gap in the existing literature, providing key insights for future

course development and marketing.

Our findings highlight the widespread demand among healthcare workers for MOOC training

during a public health crisis. Healthcare workers from over 200 countries and territories enrolled in

and completed the COVID-19 MOOCs examined in this study, with more than a third of course

completers located in LICs/LMICs. Compared to the typical MOOC completion rates of under 10%

[17-18], the 43% completion rate among healthcare workers in the COVID-19 MOOCs in this study

is notably high. While the high rate of completion likely reflects the limited alternatives for training

during the start of the COVID-19 pandemic, it may also indicate intrinsic motivation among

healthcare workers, whose predominant reason for enrollment was to improve their personal practice.

We also observed that the COVID-19 training MOOCs attracted a diverse range of healthcare

providers globally. While the majority of respondents were nurses and physicians, nearly 40%

reported working in other healthcare capacities including allied health, community health, emergency

medical services, and pharmacy. Furthermore, we noted that motivations for enrollment varied by

profession. Compared to physicians, nurses and other healthcare professionals were more motivated

by CE credit, employer recommendations, and certification. Nurses and other health professionals

were more likely to obtain certificates, provide a copy of the certificate to their employer, and use

certificates for CE requirements. Recognizing these differences in motivating factors across types of

healthcare workers can inform the design of MOOCs that more effectively respond to the interests

and needs of the targeted audience.

Despite these differences, the majority of all healthcare workers, including physicians, indicated their

intention to use their certificates professionally, either by providing them to their employers or by

earning CE credit. This finding underscores the potential for MOOCs to fill a gap in the CE arena,

where traditional approaches often present barriers to completion. The common traditional route for

obtaining CE credits involves attendance at national or international medical conferences [7-8]; however, many such conferences were either canceled or transitioned to a virtual format during the pandemic. Given the time and travel requirements associated with conference attendance, MOOCs can serve as a viable and accessible alternative for learners. Interestingly, our study found the use of course certificates for CE among learners in LICs/LMICs was higher than that in UMICs/HICs, which may reflect a lack of economically feasible options to earn CE credits in resource-limited geographies. Including certification in MOOC design may serve as an important motivator to increase enrollment and completion, particularly in LICs/LMICs, enhancing the attainment of timely healthcare education for the global healthcare workforce.

An additional benefit of online learning is the reduced cost for participants to obtain CE credits. Our study found that cost was a significant consideration for course participants, with nearly half of the learners indicating they would not have taken the course if it had not been free. While the course being free was slightly less to learners in LICs/LMICs than those in UMICs/HICs, we speculate that in lower-income countries, learners with access to the technology required to participate in an online course may be relatively better off financially within their respective countries and that those with lower incomes may not have the technology to enroll in the courses at all – only 3% of learners were from LICs. It is also possible that a single course participant may have shared access to the course with others.

Identifying the characteristics and motivations of specific groups of learners, like those in LICs/LMICs, will aid in the design of future healthcare-related MOOCs to encourage participation and completion. While many public health emergencies and disease outbreaks occur in LICs/LMICs with devastating impact, little data exists that examines the motivations of healthcare workers in these regions to enroll in just-in-time training MOOCs. Nevertheless, the World Health Organization and various national health agencies frequently leverage MOOCs to disseminate critical health information during these emergencies. Future work should particularly investigate how to overcome

barriers related to technology access and content accessibility with an eye toward equity, ensuring that delivery of crucial healthcare worker training, particularly in times of emergency, is available to all. Likewise, future investigations should examine how online content is used and shared offline in contexts where the broader population has limited access to digital platforms thereby enhancing the delivery of course materials through offline sharing.

Limitations

We recognize several methodological limitations inherent in our survey-based research. Firstly, the potential for social desirability bias and selection bias due to voluntary participation limits the generalizability of our findings. To mitigate these biases, we deployed the survey across multiple learning platforms (Coursera, EdX, and OpenWHO), each likely attracting different user demographics, and achieved a substantial sample size of 6,272 respondents representing a diverse economic and geographic distribution. Additionally, we examined and reported only marginal differences between survey respondents and the overall course participants as detailed in Table 2, though it remains a limitation that survey completers may not fully represent the broader learner population.

Secondly, the exclusive use of English for the survey dissemination likely influenced the diversity of the respondents and further constrained the study's generalizability. Future studies could incorporate multiple language options to better capture a wider demographic.

Thirdly, while the survey instrument was tailored to the specific contexts of the courses and discussed rigorously by experts across various fields—including educational assessment, emergency medicine, public health, and online learning—its lack of external validation presents a limitation. No prior studies identified during our review provided a validated instrument for assessing learner motivations in MOOCs, emphasizing the innovative aspect of our research while also necessitating a careful interpretation of our findings.

Fourthly, our study's scope was restricted by the limitations in identifying patient-facing

healthcare workers among enrollees, due to data collection methodologies on the OpenWHO platform until June 2020. This limitation hindered our capability to fully classify professions among participants. Future studies should aim to enhance the categorization of healthcare worker types and delve deeper into the differing motivations among these groups

Finally, the dynamics of the COVID-19 pandemic—characterized by fluctuating case rates and mortality—suggest that motivations for enrolling in COVID-related MOOCs likely varied over time. Some healthcare workers might have enrolled early in anticipation of patient care needs, while others joined after gaining first-hand experience. This temporal variation in motivations, coupled with the evolving availability of other educational tools, presents a complex backdrop against which these motivations were formed. Future studies could benefit from aligning course enrollment data with local COVID-19 case trends to better understand these motivations.

Conclusion

Our study examined the motivations and characteristics of healthcare workers who engaged with MOOCs during the unprecedented COVID-19 health emergency. The analysis showed that the primary motivation for healthcare professionals was enhancing their personal practice. Continuing education credit also proved to be a significant motivator, especially for those from LICs/LMICs. Additionally, the necessity of free access was clear, with half of the participants indicating they would not have enrolled if fees were charged. These findings are important for the future development and deployment of MOOCs, ensuring that they are not only accessible but also resonate with the intrinsic and extrinsic motivations of healthcare professionals from diverse geographies, training, and economic backgrounds. Future research should further investigate these motivations to see if they hold consistent across different types and stages of health emergencies.

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Data Availability

Some data are available on reasonable request to the corresponding author.

Authors' Contributions

JJ and JSJ led the conceptualization and design of the study, and oversaw all aspects of study implementation, writing, and editing. NN and AT conducted the data collection. JSJ and SS conducted the quantitative analysis. NAS contributed to organizing and writing the manuscript. NN, AT, NAS, HU, and MS contributed to the study's design, interpretation of findings, and revision of all drafts. All authors have read and approved the final manuscript.

Conflicts of Interest

None declared.

Abbreviations

CE: continuing education

HIC: high-income country

LIC: low-income country

LMIC: lower-middle-income country

MOOC: massive open-source online course

PPE: personal protective equipment

UMIC: upper-middle-income country

WHO: World Health Organization

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Table 1. Course Descriptions

Course Title and Description	Languages	Date Launched	Course Duration	Enrolled Learners
Stanford University				
COVID-19 Training for Healthcare Workers Designed for healthcare professionals, providing an evidence-based approach to life-saving techniques in treating critically ill patients with COVID-19.	English, Hindi, Portuguese, French, Spanish	July 17, 2020	8 hours	101,734
OpenWHO				
Hand Hygiene Designed to summarize the WHO guidelines on hand hygiene, associated tools and ideas for effective implementation. The WHO guidelines support hand hygiene promotion and improvement in health care facilities worldwide.	Arabic, Chinese, Dutch, English, French, Macedonian, Portuguese, Russian, Shqip, Sinhalese, Somali, Spanish, Tamil, Tetum, Turkish	June 3, 2020	1 hour	274,116
Personal Protective Equipment The course is a guide for healthcare workers involved in patient care activities in a healthcare setting. It aims to show the type of personal protective equipment or PPE needed to correctly protect oneself.	Albanian, Arabic, Chinese, Dutch, English, French, Kazakh, Macedonian, Portuguese, Russian, Sinhalese, Somali, Spanish, Tamil, Tetum, Thai, Turkish	April 15, 2020	15 minutes	346,200
Occupational Health and Safety This course is for health workers, incident managers, supervisors and administrators who make policies and protocols for their health facilities. WHO recommends a combination of measures for infection prevention and control, occupational health and safety and psychosocial support.	Dutch, English, Indonesian, Macedonian, Portuguese, Spanish, Swahili	August 30, 2020	1 hour	85,504
Clinical Management: Patient Rehabilitation The course is devoted to the rehabilitation of patients with COVID-19 by addressing needs of patients recovering from COVID-19, including patients with cognitive impairment, physical deconditioning and weakness, respiratory impairment, swallow impairment, communication impairment, and techniques for rehabilitation.	Chinese, English, French, Macedonian, Russian, Shqip	January 13, 2021	3 hours	22,704
Clinical Management: General Considerations This course gives background on the pandemic, discusses facility operations and addresses COVID-19 pandemic preparedness at all levels of healthcare	English, Indonesian, Macedonian, Shqip	October 22, 2020	3 hours	31,972

provision. It also discusses ethical issues arising during COVID-19 care.				

Clinical Management: Acutely Ill Patients Designed to prepare and support health providers as they provide emergency care to seriously ill COVID-19 patients, including a systematic approach via the WHO/ICRC Basic Emergency Care course content.	English Somali Spanish	May 5, 2021	6 hours	14,190

Figure 1. Flow Diagram for Study Participation
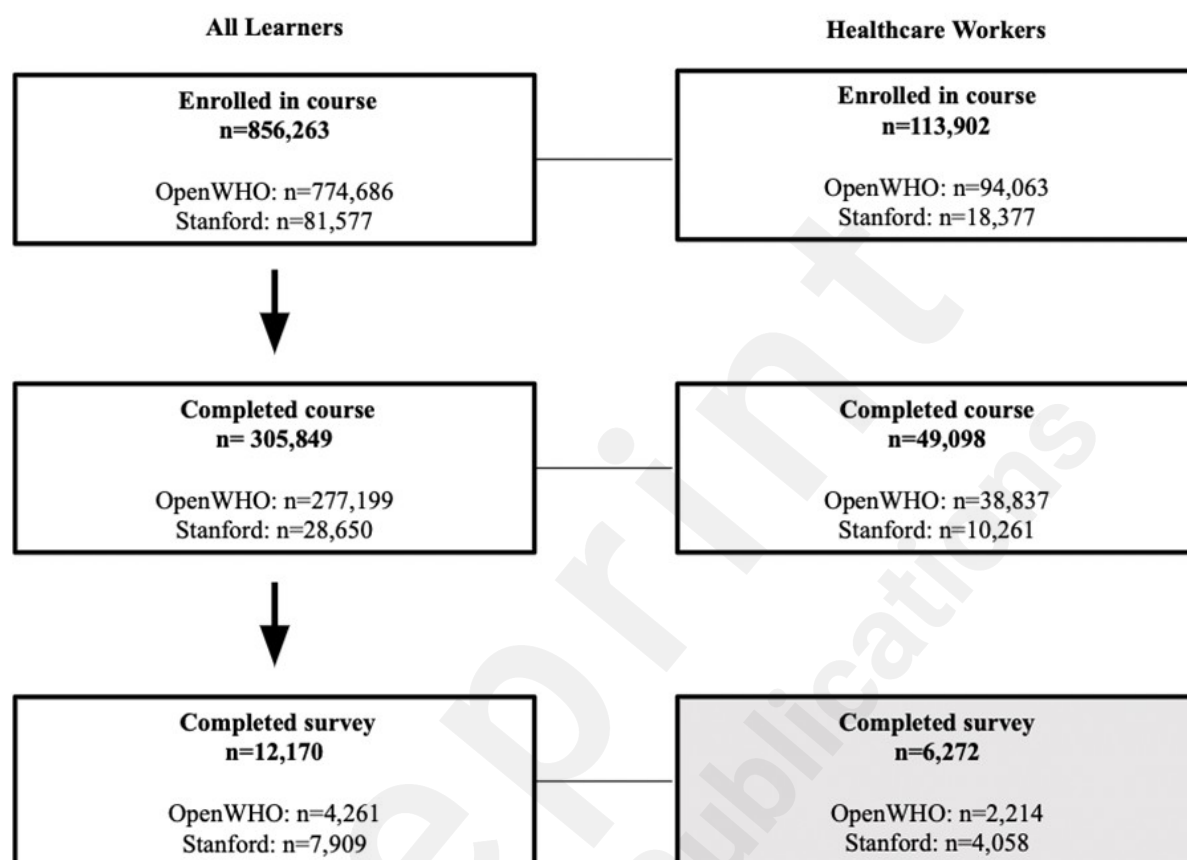
All Learners   **Healthcare Workers**

Enrolled in course n=856,263 OpenWHO: n=774,686 Stanford: n=81,577	Enrolled in course n=113,902 OpenWHO: n=94,063 Stanford: n=18,377
Completed course n= 305,849 OpenWHO: n=277,199 Stanford: n=28,650	**Completed course** n=49,098 OpenWHO: n=38,837 Stanford: n=10,261
Completed survey n=12,170 OpenWHO: n=4,261 Stanford: n=7,909	**Completed survey** n=6,272 OpenWHO: n=2,214 Stanford: n=4,058

NOTES: This figure shows the number of enrollees, course completers, and survey completers, for all learners and healthcare workers. The survey completer sample (shaded in gray) is the focal sample for this study. Healthcare workers include those who identified as employed as healthcare professionals at enrollment and/or in the follow-up survey. Healthcare professions include the following: allopathic medicine (including physicians and physician assistants); traditional medicine; nursing (including nurses, nurse practitioners, nurse midwives, nursing instructors, and certified nursing assistants); allied health; community health; emergency medical services (including paramedics and emergency medical technicians); pharmacy (including pharmacists and pharmacy technicians).

1

Figure 2. Percent of learners by motivation rank among healthcare providers (N=5,518)
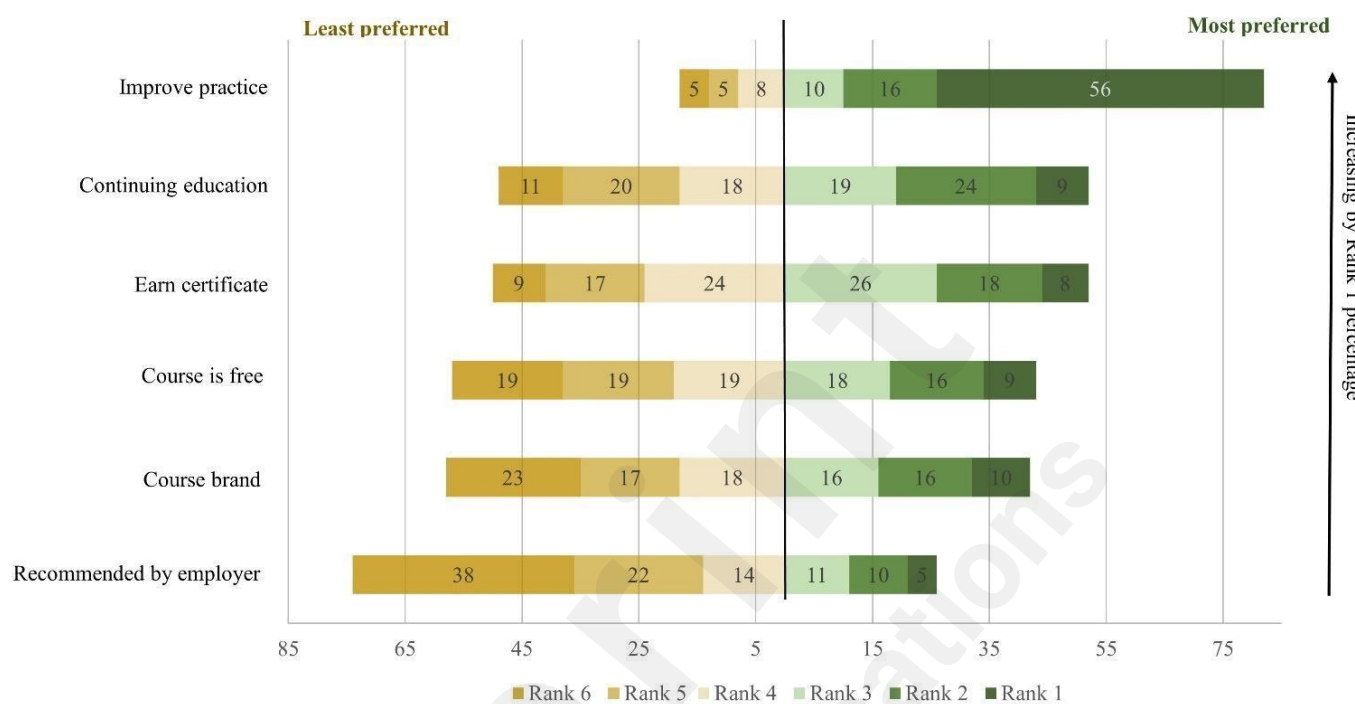
Table 2. Healthcare worker characteristics, by course and survey completion

Characteristics	Completed Course (N = 49098)	Completed Survey (N = 6272)	p-value
Course type			
OpenWHO	38837 (79%)	2214 (35%)	<0.001
Stanford University	10261 (21%)	4058 (65%)	<0.001
Age			
18-29 years	15238 (47%)	2020 (37%)	<0.001
30-39 years	9699 (30%)	1560 (29%)	0.103
40-49 years	4511 (14%)	950 (17%)	<0.001
50-59 years	2324 (7%)	662 (12%)	<0.001
60-69 years	691 (2%)	232 (4%)	<0.001
70+ years	233 (1%)	35 (1%)	0.558
Not specified	16402	813	
Gender			
Female	20252 (61%)	3057 (56%)	<0.001
Male	12758 (38%)	2349 (43%)	<0.001
Non-binary / other	139 (0%)	43 (1%)	<0.001
Not specified	15949	823	
Geographic region			
East Asia & Pacific	5278 (12%)	894 (14%)	<0.001
Europe & Central Asia	5365 (13%)	666 (11%)	<0.001
Latin America & Caribbean	10665 (25%)	1061 (17%)	<0.001
Middle East & North Africa	3816 (9%)	547 (9%)	0.655
North America	7019 (16%)	993 (16%)	0.292
South Asia	7264 (17%)	1393 (22%)	<0.001
Sub-Saharan Africa	3502 (8%)	718 (11%)	<0.001
Not specified	6189	0	
World Bank income classification			
High-income	14157 (33%)	1971 (31%)	0.014
Upper-middle-income	14593 (34%)	1611 (26%)	<0.001
Lower-middle-income	13331 (31%)	2468 (39%)	<0.001
Low-income	828 (2%)	222 (4%)	<0.001
Not specified	6189	0	

NOTES: This table compares the characteristics (N and %) of healthcare workers who completed the focal courses and follow up survey. A higher proportion of course completers did not specify characteristics compared to survey completers. Because response options for age and gender were voluntary, a number of learners did not specify these characteristics. We show the numbers not specified for each. For course completion, geographic region was identified via course platform analytics; however, we were unable to identify a subset, shown as "not specified" in the table. For survey completion, geographic regions were identified primarily through survey self-reports. In 177 survey responses, location was not reported. For these cases, we used the survey response IP address to identify the geographic region of the respondent. Percentages are shown for those for whom we have data on characteristics. Percentage for each categorical

3

variable sum to 100.

Table 3. Characteristics of healthcare worker survey sample			
	Total	HIC / UMIC	LMIC / LIC
Characteristics	(N = 6272)	(N = 3582)	(N = 2690)
Profession			
Allied Health	1190 (19%)	663 (19%)	527 (20%)
Community Health Worker	501 (8%)	296 (8%)	205 (8%)
Nursing	1599 (25%)	1012 (28%)	587 (22%)
Physician Assistant / Nurse Practitioner	103 (2%)	68 (2%)	35 (1%)
Paramedic / EMT	272 (4%)	159 (4%)	113 (4%)
Pharmacist	330 (5%)	106 (3%)	224 (8%)
Physician	2171 (35%)	1217 (34%)	954 (35%)
Traditional Medicine	106 (2%)	61 (2%)	45 (2%)
Frequency of physician on site1			
Always (100% of time)	1228 (34%)	660 (31%)	568 (38%)
Mostly (>50% of time)	1096 (30%)	586 (27%)	510 (34%)
Sometimes (<50% of time)	815 (22%)	482 (23%)	333 (22%)
Never (0% of time)	500 (14%)	409 (19%)	91 (6%)
Physician available via phone2			
Yes	1989 (85%)	1180 (82%)	809 (89%)
No	352 (15%)	256 (18%)	96 (11%)
Treats COVID-19 patients3			
Currently treating	2793 (45%)	1551 (43%)	1242 (46%)
Anticipated in future	1940 (31%)	1003 (28%)	937 (35%)
Not anticipated	460 (7%)	314 (9%)	146 (5%)
Not specified	1079 (17%)	714 (20%)	365 (14%)

1 This survey question was asked only to non-physician healthcare workers who work directly with physicians (N=3,639). Percentages shown are out of applicable participants only.

2 This survey question was only asked to non-physician healthcare workers that work directly with physicians and do not have a physician on site 100% of the time (N=2,411). Percentages shown are out of data provided with applicable respondents only. Not all applicable respondents responded to this question (N=70).

3 Data on whether healthcare workers treat COVID-19 patients is based on a voluntary question asked of patients at the time of course enrollment.

NOTES: Allied health includes physical therapy, occupational therapy, speech pathology, medical assistants, and home health aides. Nursing includes nurses, nurse midwives, nursing instructors, and certified nursing assistants. Question about the frequency of physician on site asked of non-physicians only. Physician available via phone asked of non-physicians indicating physicians not available on site 100% of the time. Across questions asking about the availability of physician and treating COVID-19 patients, survey respondents could indicate that the question is not applicable in their healthcare setting.

Table 4. Mean rank of motivation (1 = highest rank, 6 = lowest rank) and course perspectives, by healthcare worker type

	Physician (N = 2171)	Nursing (N = 1599)		Other (N = 2502)	
	mean (SD)	mean (SD)	p-value	mean (SD)	p-value
Motivation (mean ranking)					
Improve practice	1.86 (1.38)	2.06 (1.51)	<0.001	2.24 (1.60)	<0.001
Earn certificate	3.52 (1.36)	3.53 (1.36)	0.799	3.46 (1.42)	0.164
Continuing education requirement	3.63 (1.49)	3.31 (1.47)	<0.001	3.46 (1.55)	<0.001
Course brand	3.58 (1.61)	4.17 (1.62)	<0.001	3.92 (1.68)	<0.001
Course is free	3.83 (1.57)	3.77 (1.65)	0.266	3.81 (1.61)	0.684
Employer recommended	4.66 (1.54)	4.47 (1.55)	0.001	4.39 (1.61)	<0.001
Course perspectives (proportion agreeing)					
Would have taken course if not free	0.47 (0.50)	0.43 (0.50)	0.011	0.46 (0.50)	0.394
Chose to obtain certificate	0.63 (0.48)	0.71 (0.46)	<0.001	0.69 (0.46)	<0.001
Gave copy of certificate to employer	0.55 (0.50)	0.65 (0.48)	<0.001	0.63 (0.48)	<0.001
Will use certificate for continuing education requirement	0.71 (0.45)	0.81 (0.39)	<0.001	0.78 (0.41)	<0.001

NOTES: Physician is a reference category for comparisons. Nursing includes nurses, nurses/midwives, and nursing assistants. Mean ranking does not include observations that skipped ranking altogether (N=745). Course perspectives include observations that skipped ranking but provided responses for these questions.

Table 5. Mean rank of motivation (1 = highest rank, 6 = lowest rank) and course perspectives, by country classification

	HIC / UMIC (N = 3582)	LIC / LMIC (N = 2690)	
	mean (SD)	mean (SD)	p-value
Motivation (mean ranking)			
Improve practice	2.10 (1.52)	2.01 (1.49)	0.038
Earn certificate	3.45 (1.38)	3.57 (1.38)	0.001

Continuing education requirement	3.58 (1.54)	3.37 (1.48)	<0.001
Course brand	3.77 (1.65)	3.97 (1.66)	<0.001
Course is free	3.68 (1.59)	3.97 (1.61)	<0.001
Employer recommended	4.58 (1.58)	4.41 (1.57)	<0.001
Course perspectives (proportion agreeing)			
Would have taken course if not free	0.45 (0.50)	0.46 (0.50)	0.606
Chose to obtain certificate	0.68 (0.47)	0.67 (0.47)	0.223
Gave copy of certificate to employer	0.65 (0.48)	0.57 (0.50)	<0.001
Will use certificate for continuing education requirement	0.73 (0.44)	0.81 (0.39)	<0.001

NOTES: This table shows differences by World Bank income classifications: high-income country (HIC), upper-middle-income country (UMIC), lower-middle-income country (LMIC), and low-income country (LIC). Mean ranking does not include observations that skipped ranking altogether (N=745). Course perspectives include observations that skipped ranking but provided responses for these questions.
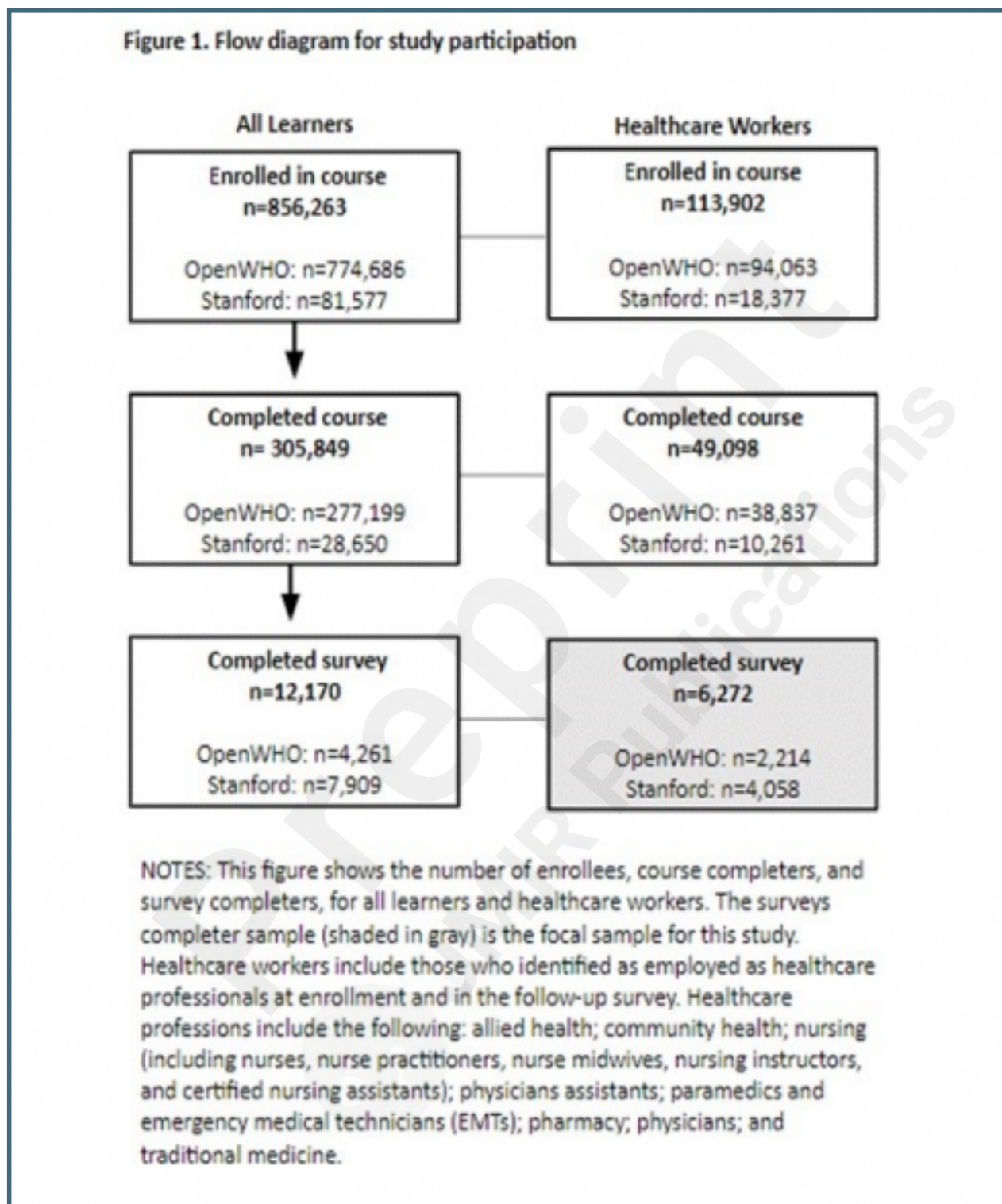
Supplementary Files

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URL: http://asset.jmir.pub/assets/176ea6b1224ce7303e01485746a85f4f.xlsx

Figures

Flow Diagram for Study Participation.

Figure 1. Flow diagram for study participation

All Learners

Enrolled in course
n=856,263

OpenWHO: n=774,686
Stanford: n=81,577

Completed course
n= 305,849

OpenWHO: n=277,199
Stanford: n=28,650

Completed survey
n=12,170

OpenWHO: n=4,261
Stanford: n=7,909

Healthcare Workers

Enrolled in course
n=113,902

OpenWHO: n=94,063
Stanford: n=18,377

Completed course
n=49,098

OpenWHO: n=38,837
Stanford: n=10,261

Completed survey
n=6,272

OpenWHO: n=2,214
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NOTES: This figure shows the number of enrollees, course completers, and survey completers, for all learners and healthcare workers. The surveys completer sample (shaded in gray) is the focal sample for this study. Healthcare workers include those who identified as employed as healthcare professionals at enrollment and in the follow-up survey. Healthcare professions include the following: allied health; community health; nursing (including nurses, nurse practitioners, nurse midwives, nursing instructors, and certified nursing assistants); physicians assistants; paramedics and emergency medical technicians (EMTs); pharmacy; physicians; and traditional medicine.

Percent of learners by motivation rank among healthcare providers (N=5,518).

Figure 2. Percent of learners by motivation rank among healthcare providers (N=5,518)