



# Survey of One Health programs in U.S. medical schools and development of a novel one health elective for medical students

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## ABSTRACT

Lessons learned from recent pandemics, such as SARS-CoV-2 have illustrated that education and training in a One Health approach, which recognizes the interdependency of the health of people, animals and the environment, are essential in improving preparations for and responses to disease outbreaks. For this reason and others, there is a critical need to provide One Health (OH) training to medical professionals early in their careers. 133 U.S. medical schools were surveyed for the incorporation of OH learning activities. Results showed that 56% of surveyed programs included OH-related subject matter, primarily in the context of preclinical classroom learning. This supports previous findings that OH education efforts in medical schools lag behind veterinary schools, with many veterinary schools already including OH as a central part of their curricula.

A two week OH elective course for third year medical students was developed and implemented at Georgetown University School of Medicine. Topics such as emerging infectious diseases, zoonoses, vector-borne diseases, epidemiology, emergency preparedness, the human-animal bond, and effects of climate change on public health were discussed. The 21 participants were surveyed before and after the course regarding their knowledge and understanding of OH. Participation in the course enhanced the students' knowledge of OH and furthermore, the students' perception of the importance of incorporating OH within the curriculum and in their future careers changed significantly. This study provides clear evidence that successful integration of OH material is achievable at low cost through interdepartmental and interdisciplinary collaboration. A more holistic approach to health care that takes into consideration environmental, wildlife, and domestic animal factors, and introduction of concepts such as OH into the medical school curriculum, can help close the educational gaps identified in the surveys.

## 1. Introduction

Emerging zoonotic epidemics are increasing globally at an unprecedented rate due to many anthropogenic drivers, including environmental changes through deforestation, agriculture intensification, biodiversity loss and climate-induced flooding and droughts [1,2]. Moreover, lessons learned from current pandemics have illustrated that education and training in One Health approaches are not only essential in improving epidemic and pandemic preparedness but also in educating human and animal healthcare professionals and the public in zoonotic disease prevention [3]. OH is an approach that recognizes the interdependency of the health of people, animals and the environment [4] and can be broadly applied to address not just infectious disease outbreaks, but a wide host of regional and global problems such as food and water safety and security [5], climate change [6], poverty, gender equality,

health system strengthening [7] and antibiotic resistance [8] to name a few. A OH approach seeks to break down the silos of expertise and challenges us all to reach out beyond our own professional circles to better coordinate efforts and maximize use of resources and knowledge across disciplines. As noted by Togami et al., OH training results in enhanced preparation for disease outbreaks, facilitates partnership building and problem solving and reduces some of the logistical barriers to efficiently and nimbly respond to global health issues [9]. Providing OH training to medical, veterinary, and environmental professionals early in their careers is critical. Yet, despite this urgent need, medical and veterinary education and training remain isolated within their respective professions. Medical and veterinary students are rarely provided with opportunities for inter-professional learning during their coursework and clinical training [10]. Although an interdisciplinary OH approach has gained some momentum in recent years, OH education

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efforts in medical schools lag behind veterinary schools, with many veterinary schools already including OH as a central part of their curricula [11,12]. In 2016 the One Health Commission, a globally focused organization dedicated to implementing OH actions and implementation, conducted a review of North American OH training, research and outreach activities in academic and non-academic institutions and found few medical schools involved in OH activities [13]. Others have focused on core competencies important for a One Health based approach in education [9,14,15]. There are many challenges to incorporating OH activities into current medical schools such as rigidity of curriculum requirements, scheduling limitations due to accreditation requirements, lack of budget to fund OH experiences, and resistance to change [16]. There are many ways that these challenges can be overcome by incorporating the One Health lens every day into all aspects of the curriculum, especially introducing One Health principles while teaching about zoonotic diseases during the infectious disease course in medical school. Medical educators can also easily discuss how OH approaches can lead to better prevention, detection, and treatment of diseases beyond zoonoses. Another approach is to incorporate animal contact histories when teaching students clinical interviewing [12]. Questions about animal exposures and environmental settings could be incorporated into patient intake questionnaires. Additionally, clinical electives that have been developed at zoos and other facilities near medical schools are very effective in engaging interested medical students [17] and show promise for reinforcing OH concepts during clinical training [12].

In this paper we describe a survey conducted in 2020 of US medical schools evaluating OH curricular content. This work builds on the data collected in 2016 by Stroud et al. [13] from a variety of North American institutions and Togami's assessment of One Health educational programs [9]. We further describe the development of a novel OH elective course for medical students, with the goal of providing them with tools and knowledge to apply a OH approach to their medical careers. The course included lectures from a diverse range of multidisciplinary experts including veterinary, medical and environmental professionals, a zoonotic disease case study discussed in breakout groups, an interactive pandemic simulation exercise, current event presentations from the students and a virtual zoo tour.

## 2. Methods

### 2.1. Study population

The study population consisted of: 1) AMA accredited medical schools that completed our survey ( $n = 26$ ), and 2) Third-year medical students who participated in the Georgetown University One Health elective ( $n = 21$ ). These electives take place at the end of the students' core curriculum and prior to beginning their clinical rotations; thus the students possessed a well-rounded medical training foundation at the time of the elective course.

### 2.2. Data collection

Data was collected using three separate surveys created using Qualtrics survey software. The questions were developed following a review of the literature of the incorporation of OH into a range of medical and veterinary education and additional interprofessional education literature and using AMEE Guide No. 87 [18].

### 2.3. Review of One Health programs in AMA accredited medical schools

Our goal was to determine which of the responding AMA accredited medical schools include OH activities as part of their medical student education, and to define what these activities include. The request to complete an online survey was sent to the Deans/Directors of Medical Education of 133 AMA accredited medical schools. The survey included

14 questions divided into three sections: demographics, incorporation of OH subject matter into their curriculum, major roadblocks to doing so, and approaches for incorporation of OH activities and subject matter into the curriculum and/or medical school activities.

#### 2.1. One Health assessment survey of students before and after participating in the One Health elective

Students were asked to complete an on-line survey before participating in the course. The survey was composed of 16 questions divided into demographic questions and knowledge and rating of importance of OH. The majority of questions were multiple choice or open-ended response questions. Three questions asked participants to rate the value of various OH related situations with statements using a 5-point Likert scale (very important to no value at all). The students were also asked to complete a survey after completion of the course. This post-survey included 13 questions divided into rating importance of OH and evaluation of the course. The majority of questions asked students to provide feedback on the OH elective course using 3, 4 and 5-point Likert scales.

#### 2.2. Development and implementation of the One Health elective course

Two-week elective courses are offered to third year medical students at Georgetown University School of Medicine (GUSOM) in the Spring to provide an opportunity to explore basic science, foundational medicine, and humanities, and give them a greater depth and detail of a range of subjects of interest to them before they move into their fourth (and final) year. A course entitled "One Health: Exploring the Interplay of the Health of People, Animals and the Environment in Global Health Threats" was developed and implemented in May 2020. Twenty-one of the 175 (12%) third-year medical students selected the OH course from 27 options. This course was originally designed to be a highly interactive on-site course, and included a range of real-life scenarios. Unfortunately, due to the SARS-CoV-2 pandemic, the course format had to be revamped into an online format.

Topics were organized around four key categories relevant to OH: 1) Exploring the interdependency of the health of people, animals and the environment; 2) Understanding the value and challenges of using a OH approach in dealing with complex public health problems; 3) Recognizing the role and responsibilities of stakeholders involved during a zoonotic disease outbreak; and 4) Understanding the importance of coordination and communications across sectors (e.g., animals, humans and environment) and agency levels following detection of an outbreak. These key categories were chosen because of their relevance to OH from a human health perspective, their emphasis on key elements of OH approaches, and also as a means to engage with the students and encourage interaction and multidisciplinary discussion (Table 1). Course activities challenged the students to consider the many interrelated issues that are typical of complex public health problems, learning about the many stakeholders involved, and developing OH strategies for overcoming these challenges. Emerging infectious diseases, zoonoses and vector-borne diseases, epidemiology, emergency preparedness, the human-animal bond, and effects of climate change on the environment, wildlife, and public health were discussed. Clinical relevance was also integrated into the foundational topic discussions. Students were evaluated based on attendance, in-class participation, class presentations, a written memo related to regional emergency preparations for an influenza outbreak, and completion of online surveys.

#### 2.3. Survey data analysis

Although the analysis of the surveys was predominately descriptive, a 3–5 point Likert rating scale was used in a number of questions to assess respondents' knowledge and opinions. A Chi square test was used to determine if there was a statistically significant difference between

**Table 1**  
Course content of One Health elective course.

Format	Topics	Student Assignments
Guest lectures and discussions	<ul style="list-style-type: none"> <li>• Overview of one health</li> <li>• Using earth observations to strengthen one health collaborations</li> <li>• One Health and Catholic social doctrine</li> <li>• Vector ecology, mosquito disease transmission and emerging infectious diseases</li> <li>• Tick-borne diseases</li> </ul>	Required reading materials and participate in discussions
Case Study	Pet-associated Campylobacteriosis	Required reading and participate in break out group discussions
Current Events student presentations	A range of One Health related topics chosen by the students	Student prepared presentations
Simulation exercise including pre-recorded lecture, live presentation, small group discussion, and memo assignment	<ul style="list-style-type: none"> <li>• Simulation exercise designed to highlight critical health care and public health interface in the context of an infectious disease emergency.</li> <li>• Principles of public health emergency preparedness and healthcare crisis standards of care.</li> <li>• Fictional Influenza outbreak</li> <li>• How to prepare for an emergency planning meeting</li> </ul>	Required reading materials Pre-recorded lecture Two-page memo after completion of the exercise
Virtual Zoo Tour	<ul style="list-style-type: none"> <li>• Virtual tour of local zoo veterinary care facilities</li> <li>• One Health from a Zoological Vet's Perspective</li> <li>• Application of Operant Training in Zoological Medicine</li> <li>• Considerations of Practical Clinical Comparative Nutrition</li> <li>• Comparative Mammalian Anesthesia and Anesthetic Techniques</li> </ul>	Participate in discussions
One Health Immersion Experiences	<ul style="list-style-type: none"> <li>• Climate Change and the Practicing Clinician</li> <li>• Discuss experiences with Health in Harmony ASRI Clinic in Indonesian Borneo</li> </ul>	Participate in discussions

student survey responses versus expected responses. The expected value was calculated by dividing the total responses by number of categories. The 3–5 Likert scales were combined, e.g., agree and strongly agree into one category and the disagree and strongly disagree into another category resulting in the comparison of two categories. Open-ended questions were also used to gain insight into types of OH knowledge and preferences for incorporating OH into the curriculum. *P* value ( $p < 0.05$ ) was set as significant (Figs. 1-3). The Wilcoxon signed rank test (R Version 4.0.0, MASS) was used to determine if there was a statistically significant difference between student ratings for the importance and relevance of OH before and after participating in the OH elective course (Figs. 4-5).

2.4. Ethical considerations

The two studies were reviewed and granted an “exemption” by the Georgetown University Institutional Review Board.

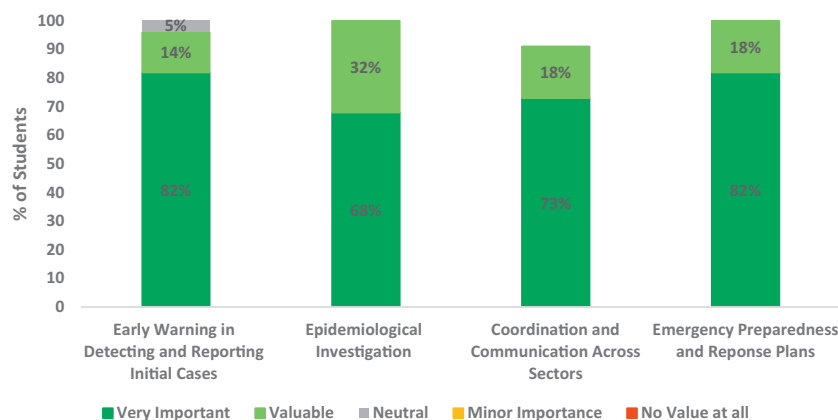
3. Results

3.1. Review of One Health programs in AMA accredited medical schools

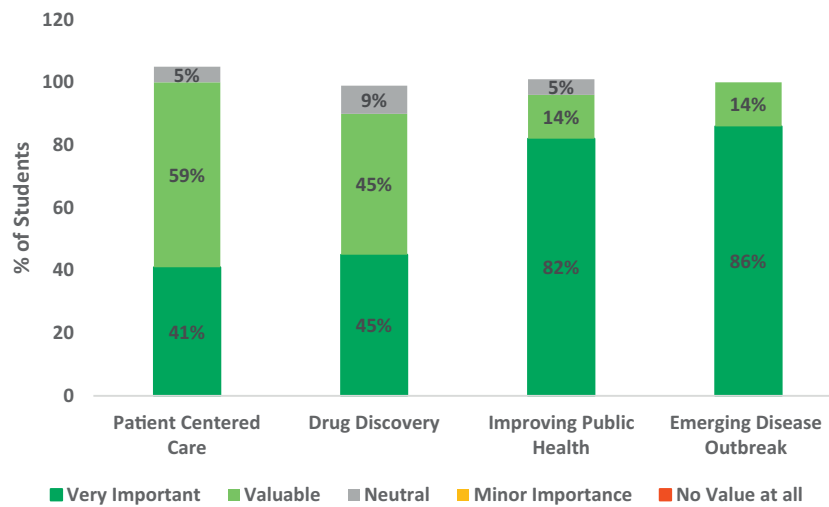
Twenty-six of the 133 AMA accredited medical schools across 19 states (South Dakota, New York, North Dakota, Rhode Island, Florida, California, Oregon, Georgia, Texas, South Carolina, Ohio, Pennsylvania, New Hampshire, Minnesota, Missouri, Michigan, Mississippi, Vermont, and Puerto Rico) completed the survey, a response rate of 20%. Seven respondents were private medical schools, and the rest were public. Student body size varied with five schools having up to 100, 16 had 100–200, 4 had 200–500, and 2 had 500–1000 students per year.

According to the survey data, 69% of the responding medical school representatives were aware of the term “One Health” and 54% include some form of OH related subject matter in the curriculum. Fifty-four % responded that it was “very important” or “important” that OH activities be incorporated into medical school curricula; 31% said it was “moderately important”; and 8% said it was “not important”. For the 46% of surveyed schools that did not include OH related subject matter, 6 responded there would be an interest or possibly be an interest in incorporating OH activities into their curriculum. Table 2 summarizes comments regarding interest in incorporating OH into the curriculum. The majority of respondents stated that the main roadblock to incorporating OH training into existing programs is an already too full curriculum, followed by lack of expertise to teach OH.

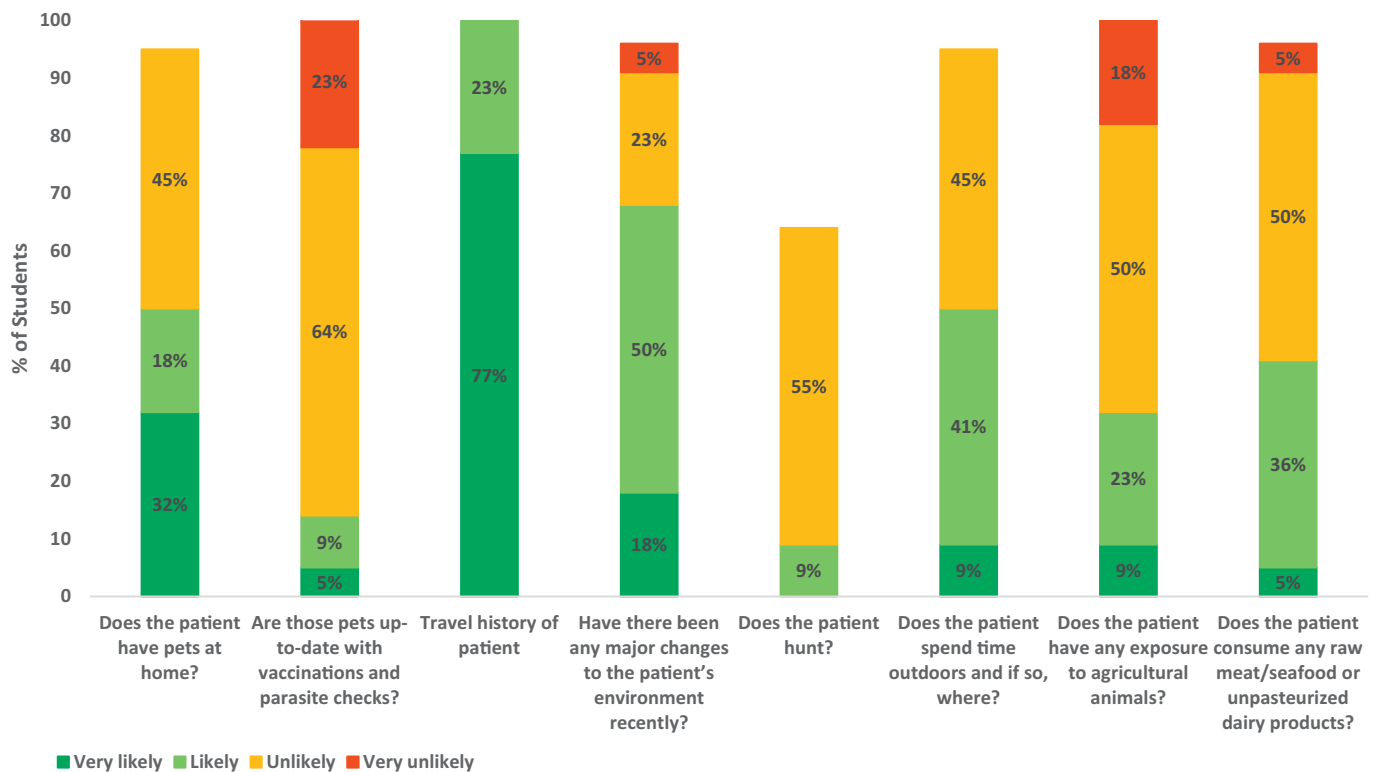
For the schools that responded to the question regarding considering the incorporation of OH subject matter or having already incorporated One Health into the curriculum, the year that would be preferable was



**Fig. 1.** Student survey responses before participation in the One Health elective when asked to rate the value of early warning, epidemiological investigation, coordination and communication and emergency preparedness in the detection of zoonotic disease outbreaks Chi square test analysis of the Likert rating scales (very important to no value at all) showed statistical significance ( $p < 0.05$ ).



**Fig. 2.** Student survey responses before participation in the One Health elective when asked to rate the value of a One Health approach in: p patient-centered care, drug discovery, improving public health systems and emerging infectious disease outbreaks. Chi square test analysis of the Likert rating scales (very important to no value at all) showed statistical significance ( $p < 0.05$ ).



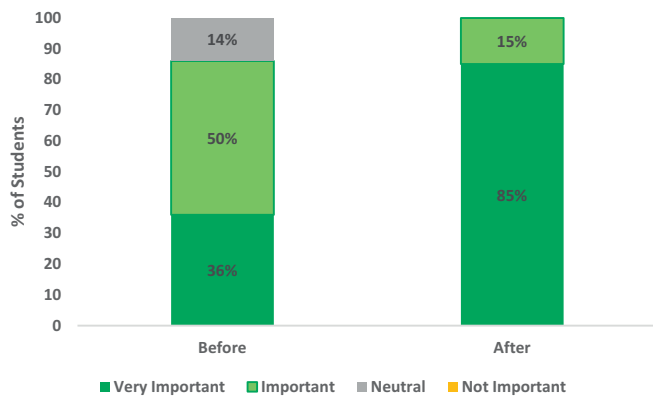
**Fig. 3.** Student survey responses before participation in the One Health elective when asked if a patient presented with a disease of unknown etiology, how likely they thought the primary care physician would be to ask certain questions as shown. Chi square test analysis of the Likert rating scales (very likely to very unlikely) showed statistical significance ( $p < 0.05$ ), except for responses to the question regarding whether the patient has pets at home.

the second year, as part of the preclinical classroom and required curriculum (see Table 3). For schools that have incorporated OH, survey responses indicated that OH subject matter was incorporated into a range of subjects including infectious diseases, zoonotic diseases, emergency preparedness, foodborne illness, patient safety and living environment assessment.

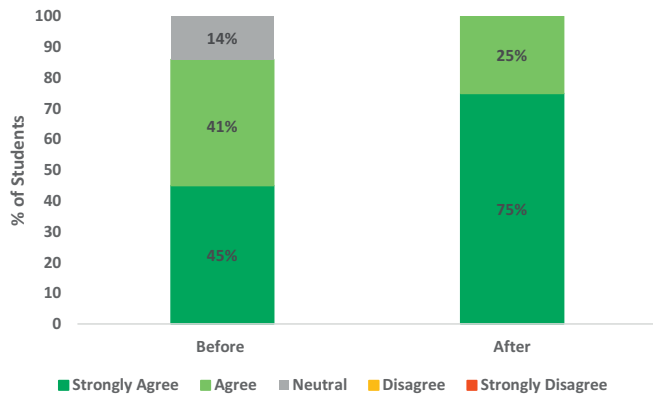
### 3.2. Student responses to survey before participating in the One Health elective course

#### 3.2.1. Demographic information

The response rate for students before and after participating in the course was 100% and 95% respectively. The majority of students were in the 25–30 age range (10 students), followed by 20–25 (8 students) and 30–35 (3 students). Fifteen students were male and seven were female. The majority of students' areas of interest were internal medicine or



**Fig. 4.** Comparison of student survey responses rating the importance of incorporating One Health activities, before and after participation in the One Health course. Wilcoxon signed rank test analysis of the Likert rating scales (very important to not important) showed statistical significance ( $V = 28$ ;  $p$ -value = 0.01471).



**Fig. 5.** Comparison of student survey responses to a question regarding relevance of One Health to their future career as a medical professional before and after they participated in the one health course. The Wilcoxon signed ranks test analysis of the Likert rating scales (strongly agree to strongly disagree) showed statistical significance ( $V = 21$ ;  $p$ -value = 0.02627).

**Table 2**  
Comments from Deans/Directors of AMA Accredited Medical Schools.

If One Health activities are not currently included in curriculum, do you think there is an interest in incorporating One Health subject matter?		
Yes	No	Maybe/Possibly
“Likely not as a required activity.”	“We don’t have any veterinary programs nearby, so this would be unlikely to happen due to these barriers.”	“Maybe in our microbiology course.”
“We are always considering the addition of curricula in order to remain up to date.”		“The challenge currently is identifying how to incorporate all the important topics in the curriculum with the time available.”

primary care (10), followed by emergency medicine (3), anesthesiology (3), and obstetrics & gynecology (2).

3.2.2. Survey data

The students were asked to rate the value of different aspects of zoonotic disease outbreak responses (Fig. 1), One Health approaches in a

range of medical/public health situations. (Fig. 2) and “animal related or environmental questions a primary care physician is likely to ask (Fig. 3).

3.3. Comparing student responses to surveys before and after the One Health elective course

When students were asked if they were aware of the term “One Health” 27% of students either answered “No” or said that they had “never heard of the term” before reading the course syllabus. Table 4 shows some representative responses before and after the course (responses were anonymous but matched using IP addresses). A dramatic change in how students defined OH was evident. Beforehand, the responses were generally basic and vague in content. After the course responses were much more detailed and concise using terms such as “multisectoral”, “collaborative”, “interconnection”, “intersection of human, animal and environmental health” and the “integration of environmental, animal, and human health.”

Before participating in the OH elective, 36% of students considered incorporating OH activities into medical school curricula as very important compared to 85% of the students afterwards ( $p$ -value = 0.01471, Wilcoxon signed rank test) (see Fig. 4). After completion 75% strongly agreed that OH training is relevant to their future career as a medical professional compared to 45% before the course ( $p$ -value = 0.02627, Wilcoxon signed rank test) (see Fig. 5).

3.4. Student course feedback

The majority of students felt that the course met their expectations very well (70%), clearly explained learning objectives (80%), fulfilled learning objectives (80%), and clarified questions or concerns (90%). Sustaining interest was more challenging given the shift to a virtual environment. The number of reading assignments and writing assignments was considered appropriate (80% and 90% respectively). 80% of students said that they would very likely recommend the OH elective course to their peers. Overall comments were positive with students stating that the course was well executed, gave them a wider perspective about how the environment is related to human health, and that they are looking forward to applying OH concepts to their future medical practice.

4. Discussion

The first challenge was to get medical school administrators to respond to the survey invitation. The 19.5% response rate (26 out of 133 US medical schools) was in line with expectations given general response rates to surveys of this nature [19]. Our findings that only 56% of medical schools included OH related subject matter builds on the 2016 survey findings of Stroud et al. that few medical schools incorporated OH [13]. While it appears that more schools are now incorporating what they consider as OH material into the curriculum, our results demonstrate that OH education and training programs are still lacking, although we note that our findings were limited to medical schools in the United States. A pilot study assessing aptitude of physicians in OH-related subject matter further supports our findings [20]. Ribeiro et al. [21] performed a systematic literature review to determine root causes hampering OH initiatives and potential solutions. Education and training of OH practitioners was identified as a primary deficit; specifically, the lack of training in collaborative approaches, lack of field training, and lack of academic support for inter-disciplinary research and training related to OH. Evidence suggests that training programs that focus on application of concepts, rather than simply theoretical knowledge, are more successful for professional development [22]. Few medical schools offer OH training programs that are truly interdisciplinary [16,17]. However, increasing accessibility to OH education can be achieved through high-quality experiential training programs that



**Table 3**  
Survey responses: Incorporation of OH subject matter into medical school curricula

Survey question	Percentage of medical schools			
<b>For medical schools that have already incorporated OH subject matter into the curriculum:</b>				
Within which year(s) is the OH subject matter incorporated?	M1 28% (7/25)	M2 36% (9/25)	M3 16% (4/25)	M4 20% (5/25)
Where in the curriculum is the One Health subject matter incorporated?	Preclinical Classroom 53% (10/19)	Core Clerkship <sup>a</sup> 11% (2/19)	Advanced Clinical Classes 21% (4/19)	Other 16% (3/19)
What type of curriculum is One Health subject matter incorporated into?	Required Curriculum 50% (10/20)	Elective curriculum 35% (7/20)	Extra-curricular 15% (3/20)	
<b>For the schools considering the incorporation of OH subject matter into the curriculum:</b>				
Which year(s) would be preferable?	M1 29% (5/17)	M2 47% (8/17)	M3 12% (2/17)	M4 12% (2/17)
Where in the curriculum is preferable?	Preclinical Classroom 67% (8/12)	Core Clerkship 17% (2/12)	Advanced Clinical Classes 17% (2/12)	Other 0%
What type of curriculum is preferable?	Required Curriculum 47% (7/15)	Elective Curriculum 27% (4/15)	Extra-curricular 27% (4/15)	
Which approach do you think would be most effective?	Additional Presentations incorporated into curriculum 45% (5/11)	Extra-curricular activities, e.g., seminars or workshops 27% (3/11)	Immersion of research opportunities 0%	Interprofessional activities and active learning experiences 27% (3/11)

<sup>a</sup> A *Core Clerkship* is when medical students rotate through a combination of required clerkships and electives. Most medical schools require rotations in internal medicine, surgery, pediatrics, psychiatry, obstetrics and gynecology, family medicine, radiology, and neurology.

apply OH core competencies [9,14,15] and collaborative problem solving with diverse participants [23,24]. Mor et al. described a successful OH experiential training experience for veterinary students using a local parklands area as the backdrop for OH scenarios [25]. While many programs for medical students provide exposure to community-based clinical care, OH-based experiences that fill some of the identified criteria of a cross-cultural and cross-disciplinary model are lacking. This raises questions as to whether medical schools are equipping their graduates to deal with important local, regional, and global health threats [25,26].

The majority of our surveyed schools stated that the main roadblock to incorporating OH training into existing programs is that their curriculum is already too full and there is a lack of expertise to teach OH. This supports the findings of others that significant cultural barriers remain to incorporating OH into medical education, i.e. weaving it into every subject and course. It also supports observation by others of a predominately “human-centric” focus and hyper-specialization [27] and that the curricula of both medical and veterinary schools are generally oversaturated, with little bandwidth to add new material. Our medical school survey results align with previous findings that the integration of OH approaches in medical education must recognize and address constraints such as a tightly packed curriculum. Examples of how this can be achieved without overwhelming students include introducing the basics of OH during the teaching of zoonotic diseases and epidemiology in their early coursework. Still, this is likely to provide only a rudimentary understanding and still through the lens of patient-centered care [12]. Clinical electives for students interested in exploring OH approaches in partnership with other institutions relevant to OH offer a more immersive and experiential opportunity. Better yet, programs that bring medical and veterinary medical professionals together can truly allow both professions to benefit from knowledge and skills unique to their own professional training yet applicable to human and animal health [28,29]. The low response rate from medical schools (20%) was unfortunate as this limited our ability to draw broad conclusions. However, we feel that the results are likely representative across the range of AMA accredited medical schools; with responses from a wide range of programs, including small, medium and large-sized medical schools, and both private and public institutions across the tiers in 19 different states.

Our student survey prior to starting the elective course provided valuable insight into the students’ clinical impressions and that it was unlikely when a patient presents with a disease of unknown etiology, that the primary care physician will ask a range of questions regarding

pets at home, preventative zoonotic measures for pets, contact with farm animals or wildlife. Our student surveys also compared their responses before and after the elective course, which was helpful in determining if the course influenced the students’ perceptions of the importance of OH in diagnosing individual patients and in solving public health problems, improved their knowledge of OH approaches and/or emphasized the relevance of OH approaches in their future medical careers. Before the course, 27% of students were unfamiliar with the concept of OH. This lack of awareness could be addressed by introducing OH fundamentals earlier in the curriculum within the context of studying infectious diseases, zoonotic diseases, emergency preparedness, foodborne illness etc., as suggested by our survey respondents. It is clear from our student surveys that participation in the OH course enhanced their appreciation for OH as a framework for medical practice. Importantly the data indicated that the students’ perception of the importance of incorporating OH within the medical school curriculum and in their future careers was significantly enhanced.

This elective course was originally designed to be a highly interactive in-person learning experience involving simulation exercises, in-person discussion groups and a trip to the nearby zoo. Adapting these experiences into a remote learning platform due to the SARS-CoV-2 pandemic was not without its limitations in terms of length of time spent on-line rather than in-person, resulting in inevitable attention fatigue. However, the pandemic itself provided a very tangible backdrop to teaching about the importance of OH approaches to tackle global health issues. The students gained a unique insight into the importance of emergency preparedness and multidisciplinary communication during a pandemic, the environmental and animal-related events that contributed to the SARS-CoV-2 outbreak, and the socioeconomic, cultural and political factors that added to the complexity and challenges.

We have demonstrated the successful integration of an OH elective into an existing medical school curriculum, which should help dispel deep-rooted beliefs that adding new educational material into the curriculum is simply not possible. This study provides clear evidence that successful integration of OH material is achievable at low cost through interdepartmental and interdisciplinary collaboration. We hope to continue offering this elective course, and to create additional opportunities by developing an interprofessional experiential learning program in partnership with an international well-established organization.

**Table 4**

Responses from students before and after participating in the One Health Elective Course.

Representative examples of responses when asked what One Health means	
Before Course	After Course
Yes. One Health is the principle that the health of humans, plants, animals and the environment are interconnected. At this interface is a significant opportunity to prevent and mitigate public health crises.	Collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment.
I am not aware of the term “One Health,” but I think it has to do with the connection between our health and the living/non-living world that surrounds us.	The interaction between humans, the environment, and animals and the impact it plays on human health.
Based on my limited understanding, it is an attempt to create optimal outcomes for all while taking into consideration not only humans, but also other living organisms (plants, animals, etc) and nature.	The <u>intersection</u> between humans, animals, plants, and everything else on the earth and how our interactions impact one another, with a particular focus on human and animal health.
I have never heard of the term before this course.	One Health is the idea that animals, the environment, and the interplay between those two, have a significant impact on human health.
I have heard of the term. My understanding is the interrelationship between humans and their environments with respect to better health outcomes for both.	The integration of human animal and environmental entities brought together to treat and prevent zoonotic transmission of disease while identifying common preventative practices designed to provide better health outcomes for all.
That the health of all animals and ecosystems are interconnected.	The integration of environmental, animal, and human health.
Trying to integrate veterinary medicine with human medicine and pulling on the strength of both fields to advance public health.	The <u>intersection</u> of human, animal and environmental health and incorporates many different aspects such as comparative medicine.
No	The interplay between animals, environment, and humans that affect the health of each other
I was unaware prior to reading about it in the course descriptions. It deals with health issues derived from interactions between multiple areas of life (e.g., human-animal interactions, sanitation, vaccination...).	One health is the study of and application of connections btw human health and animal health and the environment.
No	The <u>intersection</u> between human health, animal health and the environment.
Groups working together for the good of people and environment.	One health is a multidisciplinary collaborative effort that acknowledges the interconnected nature between humans, animals, and the environment and focuses on improving their overall collective health.

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## Author statement

Lorraine Docherty: Conceptualization, Methodology, Investigation, Resources, Data analysis, Writing – Original draft, review and editing.

Patricia Foley: Conceptualization, Methodology, Investigation, Resources, Supervision, Writing – Review and editing.

## Declaration of Competing Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest

in the subject matter or materials discussed in this manuscript.

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