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Visualizing the dynamics of COVID-19 modeling with dental students

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1 | PROBLEM

The coronavirus disease 2019 (COVID-19) pandemic has shown how underprepared the United States is to prevent the spread of a highly contagious infectious disease. Ensuring that healthcare providers, not just researchers and the modelers who collaborate with them, understand the dynamics of infectious disease must be a new priority. However, mathematical modeling of disease transmission is complex and usually requires a certain minimal level of mathematical expertise on the part of the user. The software application, Epidemix 2, was specifically developed to make visualizing and understanding infectious disease transmission available to a wider audience, including undergraduate students and policy-makers.[1] The software is free to all users and can be used via an easy-to-use interactive interface. In this paper, we describe the development of a virtual instruction course in infectious disease modeling for dental students that uses Epidemix 2 to visually explore trends in the transmission dynamics of COVID-19.

2 | SOLUTION

We provided virtual instruction on the Zoom platform as part of our ongoing journal club in the summer 2020 session, and we ensured students in the school were aware the sessions were available to all dental students. The teaching objectives focused on key principles rather than breadth of coverage. The 8 objectives described below were taught over 3 sessions of approximately 1 hour each in length, with the first 7 objectives taught in the first 2 sessions and a focus on the eighth objective in the third session. The 8 objectives included instruction to ensure the student would be able to (1) describe the different types of infectious agents; (2) describe the pre-infectious, infectious, and incubation periods; (3) describe the basic and net reproductive numbers, the secondary attack rate, herd immunity, and herd immunity threshold; (4) describe the different immune outcomes from being exposed to an infectious disease; (5) describe the impacts of disease control measures such as vaccination; (6) describe what infectious disease models are, the most common structures for models to describe infectious disease transmission, and the key steps to setting up these models; (7) describe the key input parameters for using simple infectious disease models; and (8) understand how to use Epidemix 2 to model, visualize, and understand the spread of COVID-19 and other infectious diseases. The content was delivered by 1 faculty member in the form of lectures in sessions 1 and 2 and through faculty demonstration of the software in session 3. The software demonstration was done in session 3 after ensuring the needed primary content was provided.

3 | RESULTS

On average, 20 students participated in each of the 3 virtual Zoom sessions and 16 completed the course evaluation. All the students said the course was very useful (87.5%) or

somewhat useful (12.5%) in improving their understanding of infectious disease modeling. Our current D1 evidence-based course focuses on teaching important concepts in epidemiology, including the core concepts of epidemiological design. We will incorporate the infectious disease modeling content into the current D1 evidence-based curricula in the Spring of 2021. This course provided evidence that infectious disease modeling, which has been traditionally considered too complex for those without the specialized mathematical training, can be successfully taught to dental students and can improve dental students' understanding beyond basic epidemiological principles.

DISCLAIMERS

None.

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REFERENCE

1. Muellner U, Fournie G, Muellner P, Ahlstrom C, Pfeiffer D. Epidemix-an interactive multi-model application for teaching and visualizing infectious disease transmission. *Epidemics*. 2018;23:49-54.

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