PUBLIC HEALTH AND COMPUTER SCIENCE TECHNOLOGY

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ABSTRACT

The science of public health involves applying knowledge to practical situations in order to safeguard and enhance the well-being of individuals and their communities. The focus of this paper is on technology and public health. Health information technology is a new job field that has emerged from the information age. Utilizing computer hardware and software to handle patient data and healthcare is the aim of health information technology. Computer systems are used by healthcare workers to collect, process, store, safeguard, transmit, and retrieve information. Computers are employed in healthcare settings and are only loosely connected to one another over networks. Owing to the size and complexity of the healthcare network, hospitals could have one or more servers that store patient files centrally. With the use of cutting-edge computer science methods like machine learning, it is possible to glean insights from this data that may be used to identify high-risk individuals and customize health recommendations and interventions. The public health and technology groups will work together more frequently as these technologies become more integral to health promotion. This transition will be facilitated by providing computer science courses to public health trainees in addition to traditional public health subjects, enhancing public health's ability to use these technologies to promote the health of the population.

Keywords: Health, technology, healthcare, computer science.

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A study by Wickliffe Rose and William Welch was released by the Rockefeller Foundation in 1915 with the goal of outlining the body of knowledge required for public health practice in the US and developing an appropriate curriculum. Welch, Rose, and other stakeholders encountered difficulties due to the multidisciplinary nature of the area while putting together this report. A shared disciplinary focus characterizes most professions, whereas public health brings together various fields to accomplish a shared objective. [1] Public health is different from medicine and health care in that it focuses on avoiding disease and improving health at the population level. Although the foundation of medical education is a thorough understanding of biology and living sciences, public health demands a more diverse range of competencies, including those from the social sciences, public policy, biology and life sciences, and statistical analysis [2]. The five fundamental areas that make up the "intellectual framework" for public health professionals are biostatistics, epidemiology, environmental health sciences, health services administration, and social and behavioral sciences. The Council on Education for Public Health (CEPH), an independent organization approved by the US Department of Education to accredit public health schools and programs, emphasizes these areas. [3] One of the three goals of the CEPH is to promote the enhancement of public health education through periodic evaluation, consultation, research, publishing, and other channels. [4] Numerous reports have evaluated the situation of public health and offered suggestions for public health education since the CEPH was founded in 1974. A 1988 report on the future of public health by the US Institute of Medicine (now the National Academy of Medicine) recommended for more focus on public health practice and connections with academic fields other than public health, such as business administration and departments of physical, biological, and social sciences. [5] Following up on that report, in 2002 the Institute of Medicine again highlighted the need for public health schools to cross traditional boundaries and provide transdisciplinary training. This report specifically emphasized the need for training in computer skills and information technology [6]

The Lancet Commission on the Education of Health Professionals for the 21st Century echoed these views when it emphasized that the next generation of educators must be able to "discriminate vast amounts of information and extract and synthesize knowledge that is necessary for clinical and population-based decision making." [7] Public health informatics, or the methodical use of information and computer science and technology to public health practice and research, is now a specialty offered by several public health schools [8, 9]. However, the data management and analytical needs to comprehend the ramifications of emerging technologies have rarely been met by curriculum [10]. Disease surveillance is one instance of this, which is a crucial duty of public health. Information technology advancements have accelerated our ability to gather vital data in a cost-effective, timely, reliable, and remote manner. The continuous real-time collecting and analysis of health-related data is made possible by these technologies. Data from Twitter and Google Search have also shed light on other "digital epidemiology" research issues and illness surveillance.

THE DIGITAL AND MOBILE HEALTH REVOLUTION

The digital revolution has spurred technological advancement and innovation during the previous few decades. It is increasingly evident that mobile devices will contribute significantly to that process The number of Smartphone users has surpassed that of personal computers; projections indicate that by 2020, usage will top 6 billion. Due to the rise in Smartphone usage, mobile applications are becoming commonplace in users' lives; the majority of users say they use at least 20 apps on their devices.

The digital transformation over the past two decades has made health apps especially popular. Over 100,000 healths, fitness, and medical Smartphone applications are estimated to exist, according to a 2014 analysis [16]. The bulk of these apps concentrate on preventive topics such healthy living, diet and exercise, addiction, stress, relaxation, and sleep. In addition to the increasing use of wearable technologies (such as smart watches and fitness trackers), these applications are playing a part in the explosion of health-related data availability. These applications gather massive amounts of data in real time and can communicate with the user to allow for behavioral adjustments based on user data.

COMPUTATION AND PUBLIC HEALTH: MACHINE LEARNING AS AN EXAMPLE

Machine learning is one instance of how computer methods may enhance public health. This methodological technique has surfaced as a way to make sense of huge data that is becoming more and more complex and volumetric, like what comes from apps. This area of study is known as the "field of study that gives computers the ability to learn without being explicitly programmed," according to machine learning pioneer Arthur Samuel.

Regression, decision trees, neural networks, clustering, network analysis, and other techniques fall under the wide category of machine learning and can be classified as either supervised or unsupervised learning. Despite the fact that the discipline has been around for more than 50 years, recent advancements have made it possible to create practical applications, such as Face book photo recognition, Amazon product suggestions, and Google News clustering. Acknowledging the need for machine learning proficiency, students are swarming into the subject; at Stanford University, one of the most sought-after courses is a graduate-level machine learning course.

The advent of big data has led to a growing utilization of machine learning in practical applications that are revolutionizing several sectors. The convergence of big data analytics, cloud computing, and learning technologies, according to an IBM statement from 2013, would bring about "a new era of cognitive systems where machines will learn, reason, and engage with us in a more natural and personalized way." Stanford College

Investing in machine learning resources (including academic talent) has been a driving force behind this drive for major digital businesses like Amazon, Facebook, Google, IBM, and Microsoft. These strategies are being used by numerous smaller firms in a range of industries, and they are also getting funding from investors. Over 40 agreements totaling US $309 million were made by investors in artificial intelligence and machine learning firms in 2014. Web search, spam filters, recommender systems, ad placement, credit scoring, and fraud detection are examples of common uses for machine learning.

In addition, more and more parties involved in the delivery of healthcare are realizing the need of human-machine cooperation in the creation of affordable and potentially cost-saving solutions. Google, IBM, and Microsoft have collaborated with numerous healthcare institutions to apply machine learning techniques for intricate issues such as drug compliance, cancer therapy, and reimbursement of claims. Memorial Sloan Kettering Cancer Center, for instance is offering patients and oncologists individualized therapy options based on clinical data and The Center's highly specialized knowledge by utilizing IBM Watson Analytics's cognitive computing technology. Google and Stanford University are collaborating to explore how machine learning might revolutionize drug discovery by more precisely identifying which chemical compounds could be used to treat a range of disorders by utilizing data from several sources. Computational techniques like machine learning have the potential to be applied to public health in both predictive and explanatory modeling contexts. Predictive modeling involves determining which individuals will benefit from an intervention and explanatory modeling entails better understanding the relationship between various exposures and health outcomes. In the field of predictive modeling, machine learning has the potential to combine information from many different sources, including as social media, mobile sensors, genetic sequencing, claims data, and electronic health records, to more accurately identify people who are at high risk for particular medical diseases.

A CALL TO ACTION FOR PUBLIC HEALTH TRAINING

Big data, machine learning, and other computational methods can shed light on a variety of public health issues, such as illness prevention, surveillance, and treatment. In the United States and a large portion of the world, chronic illnesses like diabetes, obesity, arthritis, cancer, heart disease, and stroke are the main causes of death and disability. Encouraging changes in behavior with regard to exercise, diet, smoking, drinking, taking medications as prescribed, and mental health could significantly reduce the burden of chronic illness. Machine learning-based personalized health technologies have demonstrated potential in promoting behavior change in many domains. Public health professionals should embrace big data and machine learning techniques, just like the health care and other industries, if they are sincere about preventing disease. The lack of skill at the intersection of computer science and public health, however, is a major barrier to maximizing the potential of big data for public health. Prominent entities such as the Institute of Medicine, the US Centers for Disease Control and Prevention, and The Lancet have underscored the importance of information technology competencies and suggested modifications to public health curricula. For example, statistical programming classes in SAS and STATA are offered by many public health programs; but, more advanced computer programming abilities are typically not covered in curriculum. Although there are certain schools that offer specific training in public health informatics, there are still knowledge and skill gaps. Although computer science fields have expanded to include health, computer science is still not widely taught in public health colleges. It may be more important to integrate computer science into public health education than to make public health the primary focus of computer science, as well-trained public health

professionals are crucial in promoting discussion on crucial topics like the ethical implications of big data for health and its methodological limitations.

CONCLUSION

There is a long tradition of formal interaction and cooperation between public health schools and other disciplines, such as commerce, law, nursing, social work, and medicine. In order to more effectively and efficiently address the urgent public health issues of today, it is essential to expand this collaboration to computer science and technology, as established public health education in the United States marks its 100th anniversary.

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