Chapter 2.32
Peering into the Black Box:
A Holistic Framework for Innovating at the Intersection of ICT & Health

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ABSTRACT

This chapter begins with an overview of public health in developing regions. From this population-level perspective, we discuss the information challenges in each of the four domains of public health: research, education, health-care delivery, and disease surveillance. We introduce health-related use classes—categories of specific use cases—to provide a structured presentation of health and information communication technologies in developing regions. In this regard, we define and discuss the following six use classes: (a) surveillance and information gathering, (b) research, (c) provider to provider, (d) provider to patient, (e) education, and (f) logistics. Defining ICT broadly, we argue that the design or selection of technology requires consideration of the cost, ease of use, infrastructure, culture of ICT use, penetration of different ICTs, and population health profile. All of these factors vary among resource-scarce settings, and each factor can greatly impact the appropriate choice in any given setting. We discuss the following three types of assessment, each of which plays a crucial role in project evaluation: systems issues, usability, and health outcomes. Designing ICT for health applications in developing countries requires a deep

understanding of various contextual factors, such as health and ICT infrastructure, disease burden, and sociocultural issues. With this in mind, and with some understanding of future trends in health and ICT utilization, we provide forward-looking recommendations for practitioners, researchers, funders, and policy makers.

INTRODUCTION

Human and societal development without health is not sustainable. The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948, Preamble). Public health can be categorized into four domains: research, education, health-care delivery, and disease surveillance. In this chapter, when we refer to public health, we refer to the bundle of health-related activities that fall under those four domains, which have an impact on the individual (e.g., delivery of medical treatment or health education) and the larger population (e.g., health-care infrastructure capacity or tracking HIV infections).

Unhealthy people have difficulty being productive members of their communities, and unhealthy nations cannot be productive partners in the global community (Deaton, 2003; Hancock, 1993). For many developing economies, disease burdens debilitate entire populations and have a significant impact on a range of factors such as economic growth and development (Baldacci, Clements, Cui, & Gupta, 2005; "Health and Wealth," 2002; Sachs et al, 2002). Poor infrastructure, lack of health systems, lack of access to medical care and medical goods, and financing are major barriers to improving population-wide health and national development. According to the WHO (2004), in 2002 the combined public and private per capita health-care spending in developing countries averaged $70 per year compared to $3,055 in high income countries. The global disease burden comes from a variety of causes such as malaria, HIV, diarrhea, tobacco-induced chronic diseases, poor sanitation, and lack of clean water. The scope and scale of challenges facing such regions is great and requires innovative solutions. This is the context in which information and communication technologies must operate, and in this chapter, our aim is to discuss the promises and challenges of using such technologies to tackle global health problems in low-income regions.

ICT for development has received considerable interest outside of public health for a variety of applications that are discussed elsewhere in this book, such as in education and governmental affairs. While the application of ICT into health care has been on the periphery of ICT innovation, the intersection of ICT and health may be one of the greatest means to positively enhance development. Information access, exchange, and brokering are central to the delivery of health care on both an individual level via clinical providers and a macrolevel via policy makers. Access to information has a significant impact not only on the delivery of health care, but also on increasing equity in health, and thus ICT intervention offers promise in improving health care (e.g., in education, delivery, and clinical outcomes). This promise, however, is tempered by the complex interface of the design, development, and maintenance of ICT, and the nature of public health in developing regions. The application of ICT to improve health similarly depends on access to relevant, reliable knowledge in forms that are appropriate, readily assimilated, and easily applied, whether by a biomedical researcher, a nurse, a doctor, a midwifery student, or a mother.

A range of applications involving ICT for health have been undertaken in recent years. Activities range from the Ptolemy project that links full-text clinical journal access from the University of Toronto with a network of several dozen East African surgeons, to a satellite-based radio feed across Asia with health-education local programming run by Equal Access, a nonprofit organiza-

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