A Spatial Data Model for HIV/AIDS Surveillance and Monitoring in Nigeria

Peter Adebayo Idowu, Obafemi Awolowo University, Nigeria

ABSTRACT

Sub-Saharan Africa is a region characterised by high rates of several deadly diseases most especially HIV/AIDS. HIV/AIDS alone has claimed the life of many people and turned many innocent children to orphans. There is relatively little consistent or reliable data that can be used for surveillance, monitoring, and management of these diseases in the region HIV/AIDS inclusive. To alleviate the problem of patchy and inconsistent epidemiological data, a well structured, interoperable spatial data model for HIV/AIDS surveillance and monitoring is proposed for Nigeria in this paper. This paper initially reviews some of the existing health data models which were modified and extended to develop a data model for HIV/AIDS surveillance, monitoring, and management. The data model captures information required for the development of HIV/AIDS surveillance systems. The model is developed using the Unified Modelling Language. The work aims to produce the model as an open standard in order to promote collaboration and encourage researchers in developing nations to contribute to the maintenance of the data model. The model is implemented in XML, and will be applied to a system using service oriented architecture.

Keywords: *Data Model, Epidemic, Epidemiology, HIV/AIDS, Surveillance and Monitoring, Unified Modelling Language*

1. INTRODUCTION

Epidemic diseases have highly destructive effects around the world and these diseases have affected both developed and developing nations. Epidemics are common in developing nations especially sub Saharan Africa. The most prevalent among these diseases in the region are Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome (HIV/AIDS), malaria, and tuberculosis. HIV/AIDS is the most serious of all these diseases as at the present time there is no cure for HIV. In some parts of the region, some people are infected with one or more of these diseases ("Deadly HIV-TB co-epidemic," 2007), most especially a combination of HIV and tuberculosis. Though HIV/AIDS prevalence rate is declining compared with what it used to be in the late 90s, sub Saharan Africa still hosts the highest number of people living with HIV/AIDS.

In sub-Saharan Africa, the problem is complicated by the unavailability of computer based information systems for the management and control of this epidemic. At present, there

DOI: 10.4018/jehmc.2012040104

Copyright © 2012, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

is almost no reliable method of epidemiological data collection. Despite the fact that sub-Saharan Africa is a region characterised by high rates of diseases, there is relatively little consistent or reliable data that can be used for surveillance, monitoring and management of these diseases. Most of the available epidemiological data in most developing nations, especially Nigeria, is often not useful for health management decision making due to the fact that the data are inaccurate, untimely, incomplete, and based on sentinel survey.

Out of all diseases, HIV/AIDS has been the most destructive epidemic and threatens to continue to create health, social, economic and developmental problems for developing nations. This incurable disease is one of the major causes of poverty in Africa, which, with around 10% of the world's population has over 75% of the people living with HIV/AIDS (UNAIDS, 2004), and 72% of the world's mortalities from HIV/AIDS. An estimated 2.8 million Africans became infected with HIV in 2006 alone - more than all other regions of the world (UNAIDS, 2007). Since the first case of HIV/AIDS in Nigeria was reported in 1986, the prevalence rate has increased steadily from 3.8% in 1991 to 5.8% in 2001 (Pyke & Ali-Akpajiak, 2003) with a slight decline to 4.4% in 2007.

Despite the decline, Nigeria still has the largest HIV/AIDS epidemic in sub-Saharan Africa. According to the latest statistics on HIV/AIDS, Nigeria now ranks second in the world with disease counts of over 3.0 million (UNAIDS, 2007) and almost half a million annual deaths (Adegoke, 2008). Some Nigerian states have a prevalence rate as high as 10% (Federal Ministry of Health Nigeria, 2006; Utulu & Lawoyin, 2007) but epidemiological data is patchy and inconsistent (Lawoyin & Adewole, 2004).

Coping with recent HIV/AIDS increases in Nigeria is consuming a large portion of the national health budget, and threatens the health sector (FMH & NACA, 2002). In 2000, Nigeria's overall health care system performance was ranked 187th out of the 191 World Health Organisation (WHO) member states (WHO, 2000) and this shows that the Nigerian health care system is weak. ICT facilities such as email, Internet, and electronic surveillance systems are vital for healthcare management and exchange of information. ICT has been identified as the backbone of health services to prevent, diagnose and monitor diseases (WHO, 2004); reduce the cost of running hospitals (Remler, 2007) and as a tool to address the scarcity of timely and accurate epidemiological data in Africa ("Information technology to improve," 2008).

However, there is almost no existing ICT infrastructure in any Nigerian hospital. The country faces a number of obstacles in the use of ICT and its implementation in the health sector, including an intermittent electric power supply, inadequate telecommunication system, a high cost of ICT equipment and the lack of reliable Internet facilities (Idowu, Cornford, & Bastin, 2008).

The control and management of any disease, in any country, requires that the spatial and temporal rates and trends of the disease must be determined in order to gain insight into the geographic coverage and prevalence rate of the disease (Waller et al., 2007). This information will assist public health officials and stakeholders to determine the locations and areas on which to focus their attention (Myers et al., 2000). In Nigeria at present, there is neither an electronic surveillance system nor any electronic national database for disease monitoring. As in most other African nations, the monitoring and surveillance of disease especially HIV/AIDS in Nigeria is limited to biennial sentinel surveys at less than 100 sites which focus on pregnant women between the ages 15 to 49 years attending antenatal clinics in health facilities across the country (Federal Ministry of Health Nigeria, 2006). The absence of a reliable national database on HIV/AIDS compounds the challenges facing the management of HIV/AIDS in the country (USAIDS, 2002).

There is a need for adequate epidemiological data for effectively monitoring, surveillance and prevention of HIV/AIDS; this is currently rare in many African nations, including Nigeria.

Copyright © 2012, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

17 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/article/spatial-data-model-hiv-aids/66418

Related Content

Issues in Interoperable Structures of Regional Health Information Networks
Stergiani Spyrou, Panagiotis Bamidisand Nicos Maglaveras (2010). *International Journal of Healthcare Delivery Reform Initiatives (pp. 59-74).*
www.irma-international.org/article/issues-interoperable-structures-regional-health/41720

EEMI - An Electronic Health Record for Pediatricians: Adoption Barriers, Services and Use in Mexico
Juan C. Lavariega, Roberto Garza, Lorena G. Gómez, Victor J. Lara-Diazand Manuel J. Silva-Cavazos (2016). *International Journal of Healthcare Information Systems and Informatics (pp. 57-69).*
www.irma-international.org/article/eemi---an-electronic-health-record-for-pediatricians/163441

Management of Healthcare Processes Based on Measurement and Evaluation: Changing the Policy in an Italian Teaching Hospital
Ulrich Wienand, Gabriele Rinaldi, Gloria Gianesini, Anna Ferrozzi, Luca Poretti, Giorgia Valpianiand Adriano Verzola (2014). *International Journal of Reliable and Quality E-Healthcare (pp. 15-35).*
www.irma-international.org/article/management-of-healthcare-processes-based-on-measurement-and-evaluation/115229

Enhancing ‘Fit' of Health Information Systems Design Through Practice Support
Craig E. Kuziemsky (2008). *Human, Social, and Organizational Aspects of Health Information Systems (pp. 50-66).*
www.irma-international.org/chapter/enhancing-fit-health-information-systems/22452

Dynamic Capacity Management (DCAMM™) in a Hospital Setting
Pierce Story (2012). *Management Engineering for Effective Healthcare Delivery: Principles and Applications (pp. 46-68).*
www.irma-international.org/chapter/dynamic-capacity-management-dcamm-hospital/56247