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# Scale-up of networked HIV treatment in Nigeria: Creation of an integrated electronic medical records system

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## ABSTRACT

**Objectives:** The implementation of PEPFAR programs in resource-limited settings was accompanied by the need to document patient care on a scale unprecedented in environments where paper-based records were the norm. We describe the development of an electronic medical records system (EMRS) put in place at the beginning of a large HIV/AIDS care and treatment program in Nigeria.

**Methods:** Databases were created to record laboratory results, medications prescribed and dispensed, and clinical assessments, using a relational database program. A collection of stand-alone files recorded different elements of patient care, linked together by utilities that aggregated data on national standard indicators and assessed patient care for quality improvement, tracked patients requiring follow-up, generated counts of ART regimens dispensed, and provided ‘snapshots’ of a patient’s response to treatment. A secure server was used to store patient files for backup and transfer.

**Results:** By February 2012, when the program transitioned to local in-country management by APIN, the EMRS was used in 33 hospitals across the country, with 4,947,433 adult, pediatric and PMTCT records that had been created and continued to be available for use in patient care. Ongoing trainings for data managers, along with an iterative process of implementing changes to the databases and forms based on user feedback, were needed. As the program scaled up and the volume of laboratory tests increased, results were produced in a digital format, wherever possible, that could be automatically transferred to the EMRS. Many larger clinics began to link some or all of the databases to local area networks, making them available to a larger group of staff members, or providing the ability to enter information simultaneously where needed.

**Conclusions:** The EMRS improved patient care, enabled efficient reporting to the Government of Nigeria and to U.S. funding agencies, and allowed program managers and staff to conduct quality control audits.

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## 1. Introduction

This report describes the development of an electronic medical records system (EMRS) for an HIV/AIDS care and treatment programs in Nigeria. The rapid scale-up of HIV treatment with antiretroviral therapy (ART) in sub-Saharan Africa (SSA) brought with it many challenges, including the need for EMRS in settings with no prior experience. In response to this need, there have been a diverse set of approaches to EMRS implementation in SSA. Each program's unique experiences and approaches provide valuable learning opportunities, and sharing these solutions, along with their challenges, can benefit other programs with similar needs, preventing the cycle of "reinventing the wheel". Our system is unique in that it was developed with a commercially available database program, was relatively simple to design and implement, did not require constant internet connectivity, and was created to scale up as a sustainable system.

### 1.1. Background

Nigeria is the most populous African country, with an estimated 170 million people living there as of mid-2013, and covers approximately 924,000 km<sup>2</sup>. It is comprised of 36 states and a Federal Capital Territory, where the capital city, Abuja, resides. Nigeria is diverse, with more than 200 ethnic groups [1]. The country is 50% Muslim and 40% Christian, with concentrations in the northern and southern parts of the country, respectively [2]. Despite being the largest economy

on the continent with a \$1052 GDP per capita (USD), the majority of the population live on <\$1.25 per day [3]. There is also a sharply uneven distribution of wealth—the poverty rates are strikingly higher in the northern two-thirds of the country than in the south [4]. Health care coverage is similarly uneven, with measurable health outcomes lower in the north-east and northwest regions than in the rest of the country [5]. Infrastructure is also better in the more population-dense, wealthier southern tip of the country; but everywhere in Nigeria, power supply is a severe challenge, despite relatively high rates of electrification. As much as 35% of the installed power supply is not functioning and power outages are so common that the majority of businesses own back-up generators [4]. Internet coverage is sparse in many places and often unreliable, although GSM coverage is growing rapidly [6].

The first cases of AIDS in Nigeria were identified in 1986; by 2000, 5% of the adult population was infected with HIV. Implementation of large-scale prevention, care, and treatment programs reduced the national HIV prevalence estimate to 4.1%; but with a population of over 160 million, the burden of disease is the second highest worldwide. In response to the epidemic, the Government of Nigeria established the National ART Program in 2002 to treat 10,000 adult HIV patients. In 2004, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) provided additional funding to scale up and further support the HIV program. The Harvard School of Public Health and AIDS Prevention Initiative in Nigeria (Harvard/APIN) PEPFAR program in Nigeria began with six centers in 2004 and expanded to 33 by 2012, distributed over a broad geographic area (Fig. 1). We partnered with existing medical institutions to expand their HIV



**Fig. 1 – Map of Nigeria, showing Harvard/APIN facilities, 2004 through 2012. Larger tertiary sites are represented as stars; secondary and primary sites are represented as circles.**

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