Comparability, diagnostic validity and completeness of Nigerian cancer registries

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ABSTRACT

Background: Like many countries in Africa, Nigeria is improving the quality and coverage of its cancer surveillance. This work is essential to address this growing category of chronic diseases, but is made difficult by economic, geographic and other challenges.
Purpose: To evaluate the completeness, comparability and diagnostic validity of Nigeria's cancer registries.
Methods: Completeness was measured using children's age-specific incidence (ASI) and an established metric based on a modified Poisson distribution with regional comparisons. We used a registry questionnaire as well as percentages of death-certificate-only cases, morphologically verified cases, and case registration errors to examine comparability and diagnostic validity.
Results: Among the children's results, we found that over half of all cancers were non-Hodgkin lymphoma. There was also evidence of incompleteness. Considering the regional completeness comparisons, we found potential evidence of cancer-specific general incompleteness as well as what appears to be incompleteness due to inability to diagnose specific cancers. We found that registration was generally comparable, with some exceptions. Since autopsies are not common across Nigeria, coding for both them and death-certificate-only cases was also rare. With one exception, registries in our study had high rates of morphological verification of female breast, cervical and prostate cancers.
Conclusions: Nigeria's registration procedures were generally comparable to each other and to international standards, and we found high rates of morphological verification, suggesting high diagnostic validity. There was, however, evidence of incompleteness.

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1. Introduction

Nigeria is the most populous country in Africa, and is also unique on the continent for having begun cancer registration in 1960, soon after independence [1,2]. Today, there are at least 24 cancer registries in Nigeria. Of these, one (Ibadan) has had data published in the International Agency for Research on Cancer (IARC) publication *Cancer on Five Continents* [3–6].

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As in other countries, many Nigerian cancer registries are attempting to become population-based or, if they already consider themselves population-based, they are working on improving case ascertainment within catchment areas. This, however, is difficult because of weak health-sector infrastructure and access, challenging geographies, inadequate case ascertainment in older populations, insufficient diagnostic facilities, and poor collaboration among reporting sources.

In this paper we study comparability, diagnostic validity and completeness of participating Nigerian cancer registries [7–10]. These qualities are essential for characterizing cancer epidemiology in a given population.

2. Materials and methods

In collaboration with the Institute of Human Virology, Nigeria [11], and the Federal Ministry of Health [12], ethical approval was sought and granted from the University of Minnesota Institutional Review Board [13] and the National Health Research Ethics Committee of Nigeria [14]. Twenty-four Nigerian cancer registries were invited to participate regardless of whether they considered themselves population- or hospital-based. Fourteen of these received permission to participate from their local authorities. Two submitted data with 4.5 and 61.4 cases per year, with more than 88% of the cancer classification codes missing; these were excluded from the study. The remaining 12 registries were: (1) University of Abuja Teaching Hospital Cancer Registry; (2) The Abuja Cancer Registry, National Hospital, Abuja; (3) University of Calabar Teaching Hospital Cancer Registry; (4) The Ibadan Cancer Registry; (5) Professor Olikoye Ransome-Kuti (Midwestern Nigeria) Cancer Registry; (6) Abeokuta Cancer Registry; (7) Cancer Registry, Federal Medical Center, Ido Ekiti; (8) University of Nigeria Teaching Hospital Cancer Registry; (9) Ife Ijesha Cancer Registry; (10) Ilorin Cancer Registry; (11) Nnewi Cancer Registry; and (12) University of Port Harcourt Teaching Hospital Cancer Registry (see Fig. 1).

2.1. Data

Participating cancer registries submitted data from the years of their choice. Registries were also surveyed with a questionnaire to establish working catchment areas and to gather other pertinent metadata. Data were cleaned and standardized. Some registries included standardized case addresses, which were used for case inclusion in working catchment areas. If registries did not use CanReg4 (case registration software created and maintained by the International Agency for Research on Cancer, IARC) and did not code cases using any internationally recognized pathological classification system, a professional cancer registrar was hired to code these using the International Classification of Diseases for Oncology, third edition (ICD-O-3) [15]. Case data were then harmonized for subsequent calculations of age-standardized cancer rates (ASRs). The professional registrar also recoded a previously ICD-O-3-coded registry (Ibadan) that had been stripped of coding to examine fidelity.

Population data from the 1991 and 2006 censuses came from the National Bureau of Statistics [16] and the National Population Commission of Nigeria [17]. Geographic data came from the Global Administrative Areas project [18].

2.2. Population imputation, age-specific incidence and age-standardized rates

Using the population data at the state and local government area (LGA) level, a linear model was used to impute the population growth from 1989 to 2011 in 5-year age groups [19]. Cancer
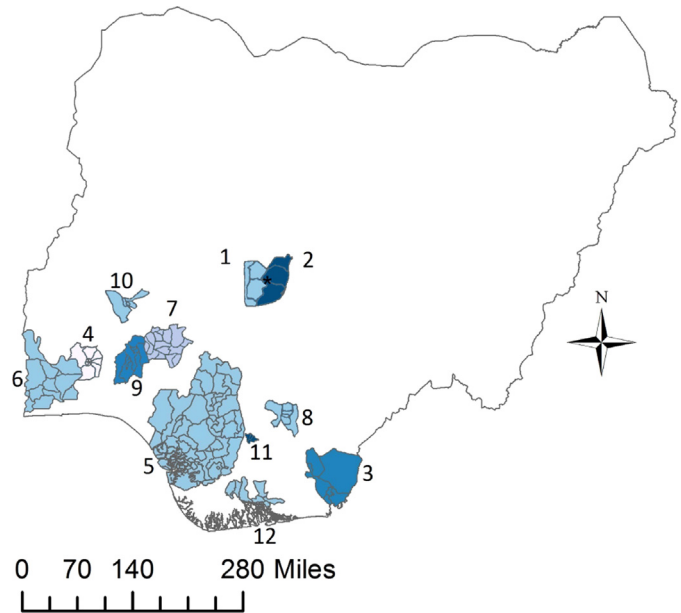

Fig. 1. Participating cancer registry coverage in Nigeria. (1) * University of Abuja Teaching Hospital Cancer Registry, (2) * The Abuja Cancer Registry, National Hospital, Abuja, (3) University of Calabar Teaching Hospital Cancer Registry, (4) The Ibadan Cancer Registry, (5) Professor Olikoye Ransome-Kuti (Midwestern Nigeria) Cancer Registry, (6) Abeokuta Cancer Registry, (7) Cancer Registry, Federal Medical Center, Ido Ekiti, (8) University of Nigeria Teaching Hospital Cancer Registry, (9) Ife Ijesha Cancer Registry, (10) Ilorin Cancer Registry, (11) Nnewi Cancer Registry and (12) University of Port Harcourt Teaching Hospital Cancer Registry. *For this work, these catchment areas were considered together as merged.

age-specific incidences (ASIs) by gender were calculated and then used for estimation of the ASRs using the World Standard Population [20].

2.3. Children's ASIs

Completeness was first examined using childhood cancer rates. Although there are well-documented exceptions [21], these rates are relatively homogeneous across populations compared to adult rates [7,21,22]. As such, this measure estimates absolute completeness by examining individual registry rates for all cancers in boys and girls aged 0–4, 5–9 and 10–14 years. These were compared to the 10th and 90th percentiles of the global rates from Volume VIII of Cancer Incidence in Five Continents [7,22].

2.4. Regional completeness

Registry completeness was examined by comparing registry ASRs for select cancers by measuring the individual registry rates' distances from the mean rate of the GLOBOCAN 2012 estimated rates from The Gambia, Mali, Guinea Conakry and Niger in terms of a Z^2 score distributed in a χ^2 distribution using the method established by Bray and Parkin [23–25].

Registries with scores >3.84 (corresponding to the probability distribution < 0.05) were considered as exhibiting evidence of incomplete recording [23,24].

2.5. Comparability

Comparability of registry data was evaluated through: (1) the system used for classification and coding of neoplasms; (2) the definitions of incidence dates; (3) how primary cancers were differentiated from recurrent or metastatic cancer; and (4) the percentages of cancers detected through autopsy [10,15,26,27].