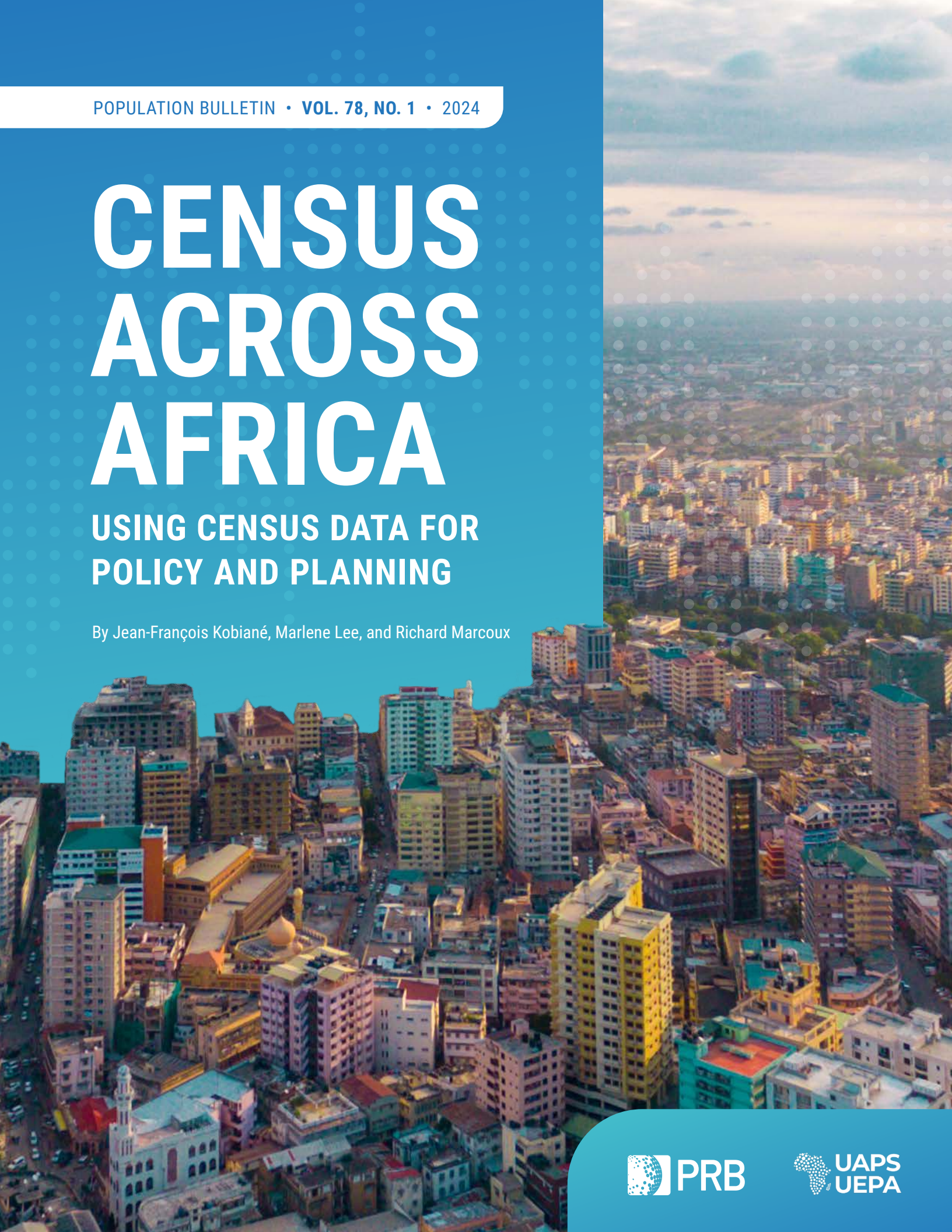
POPULATION BULLETIN • **VOL. 78, NO. 1** • 2024

CENSUS ACROSS AFRICA

USING CENSUS DATA FOR POLICY AND PLANNING

By Jean-François Kobiané, Marlene Lee, and Richard Marcoux



PRB

UAPS UEPA

CENSUS ACROSS AFRICA

USING CENSUS DATA FOR POLICY AND PLANNING

ABOUT THE AUTHORS

This *Population Bulletin* was written by **JEAN-FRANÇOIS KOBIANÉ**, Professor of Demography, Higher Institute of Population Sciences, Joseph KI-ZERBO University, Burkina Faso; **MARLENE LEE**, Associate Vice President, International Programs, PRB; and **RICHARD MARCOUX**, Professor of Sociology, Université Laval, Canada.

We would like to acknowledge the following PRB staff who provided valuable assistance in the development of this report, including **NANCY MATUSZAK**, Director of Communications and Marketing; **RAQUEL WOJNAR**, Communications Manager; and **ANNEKA VAN SCOYOC**, Head of Design.

ABOUT THIS PUBLICATION

Population Bulletins are published periodically by PRB are available on PRB.org.

SUGGESTED CITATION:
Jean-François Kobiané, Marlene Lee, and Richard Marcoux, "Census Across Africa: Using Census Data for Policy and Planning," *Population Bulletin* 78, no. 1 (2024).

PHOTO CREDITS
COVER: Moiz Husein Storyteller/iStock/Getty Images Plus via Getty Images
PAGE 4: Barry Lewis/Alamy Stock Photo
PAGE 7: AP Photo/Tsvangirayi Mukwazhi
PAGE 9: AP Photo/George Osodi
PAGE 10: Peterson Mbugua/Moment via Getty Images
PAGE 21: Hugh Sitton/Stone via Getty Images

ACKNOWLEDGMENTS

PRB thanks the Union of African Population Studies (Accra, Ghana) for partnering with us on this publication. The authors would like to recognize the researchers whose work is highlighted in this report:

HERVÉ BASSINGA, Higher Institute of Population Sciences (ISSP), Joseph KI-ZERBO University, Ouagadougou, Burkina Faso

MAURO BRUNO, National Institute of Statistics (Istat), Rome, Italy

GARIKAYI B. CHEMHAKA, University of Eswatini, Kwalunseni, Eswatini

AMINATA COULIBALY, National Institute for Statistics (INSTAT), Bamako, Mali

VALÉRIE DELAUNAY, Laboratory Population Environment Development (LPED), Research Institute for Development, Aix-Marseille University, France

BINTA DIEME, National Agency for Statistics and Demography (ANSD), Dakar, Senegal

IBRAHIMA DIOUF, United Nations Population Fund (UNFPA), Dakar, Senegal

GÉRALDINE DUTHÉ, National Institute for Demographic Studies (INED), Paris, France

MILENA GRASSIA, National Institute of Statistics (Istat), Rome, Italy

JEREMY D. GUMBO, University of the Witwatersrand, Johannesburg, South Africa (deceased)

CLIFFORD ODIMEGWU, University of the Witwatersrand, Johannesburg, South Africa

MARC PILON, Center for Population and Development (CEPED), Research Institute for Development, Paris Cité University, France

ARLETTE SIMO FOTSO, National Institute for Demographic Studies (INED), Paris, France

BASSIAHI ABDRAMANE SOURA, Higher Institute of Population Sciences (ISSP), Joseph KI-ZERBO University, Ouagadougou, Burkina Faso

EUGENE N. ZWANE, University of Eswatini, Kwaluseni, Eswatini

PRB

PRB Population Bulletin, in partnership with UAPS

This *Population Bulletin* was conceived during a meeting at the 8th African Population Conference in Entebbe, Uganda, between Samuel N.A. Codjoe, then-president of the Union for African Population Studies (UAPS); the authors; and Jeffrey Jordan, then-president of Population Reference Bureau (PRB). The opportunity to collaborate on a report focused on the work of researchers using census data to identify the changing needs of populations across Africa and inform solutions complemented the missions of both organizations.

Jean-François Kobiané (Joseph KI-ZERBO University, Burkina Faso) and Richard Marcoux (Université Laval, Canada) have served as co-chairs of the UAPS African Censuses Scientific Panel since 2012. In producing this report, they and coauthor Marlene Lee (PRB) sought to spotlight the scientific contributions of nearly 20 UAPS members and delve into two important topics identified by the African Censuses Scientific Panel:

1. What can be done to safeguard African demographic heritage (census data collection, storage, and analysis).
2. How to promote use of the rich data produced from censuses.

In publishing this *Population Bulletin* in both English and French and making it freely available for download, PRB and UAPS aim to advance this discussion by highlighting the importance of using census data and research incorporating these data in development planning.

Contents

Introduction

For most countries, conducting a population and housing census is a costly and time-consuming operation. While the cost is justified by the usefulness of censuses in providing a picture of a nation's population at lower administrative levels, the financial burden is not an easy one to bear.

Within Africa, countries engaged in the 2020 census round (underway from 2015 through 2024) are grappling with these and other constraints and hoping to take advantage of the wealth of data that a census offers about populations.

Census results can generally inform policy formulation and program implementation, as well as socioeconomic development. The 2020 round of censuses has become particularly important for establishing a baseline measurement of indicators required for assessing progress toward countries' Sustainable Development Goal commitments. This *Population Bulletin* provides an overview of the historical trajectory in African nations' administration of censuses, their use of technological innovations in the 2020 round, and prospects for innovation in using census data for development planning.

The history of census-taking varies across countries in Africa, many of which have struggled not only with costs but also with data collection and storage. Some countries also struggled to carry out the census during the COVID-19 pandemic, when travel and interactions were at times strictly curtailed. Such challenges mean that census results have not effectively informed policy formulation and program implementation. Yet the situation is changing.

National statistics offices are making significant efforts to improve census-taking and incorporate technological advances in their processes. We highlight some of these efforts in this report and share how researchers are using census data to gain a better understanding of demographic characteristics. These research spotlights are a unique feature of this Bulletin and highlight the breadth of activity being undertaken across the continent to ensure census results can be used in policymaking and program planning. They also demonstrate the many opportunities emerging from the 2020 census round in African nations, from the promise of new technologies that support data collection and analysis to the prospect of more effective public planning and services.

DEFINING CENSUS TERMS

POPULATION CENSUS
Process of planning, collecting, compiling, evaluating, disseminating, and analyzing demographic, economic, and social data at the smallest geographic level relating to all persons in a country or in a well-delimited part of a country at a specified time.

HOUSING CENSUS
Process of planning, collecting, compiling, evaluating, disseminating, and analyzing data pertaining to the number and condition of housing units and facilities available to the households and data pertaining to all living quarters and their occupants in a country or in a well-delimited part of a country at a specified time.

TRADITIONAL POPULATION AND HOUSING CENSUS
Operation whereby each household in the country is approached with a request to provide the necessary information.

REGISTER-BASED CENSUS
Process by which information from households in the country and small areas within the country is produced based on administrative sources and registers, primarily by linking the population register with data from other registers, such as an employment register, educational register, health register, and so forth.

ENUMERATION
Each individual and each set of living quarters is counted separately, as are their characteristics.

ENUMERATION AREA
Well-delimited part of a country in which the enumeration of population and living quarters take place.

A Historical Perspective on Census-Taking in Africa

Population censuses provide the greater part of the basic information used to develop all public policies in Africa, including economic and social development policies and programs. In short, these vast data collection campaigns form the core elements of all planning exercises and constitute a vital tool for African nations.

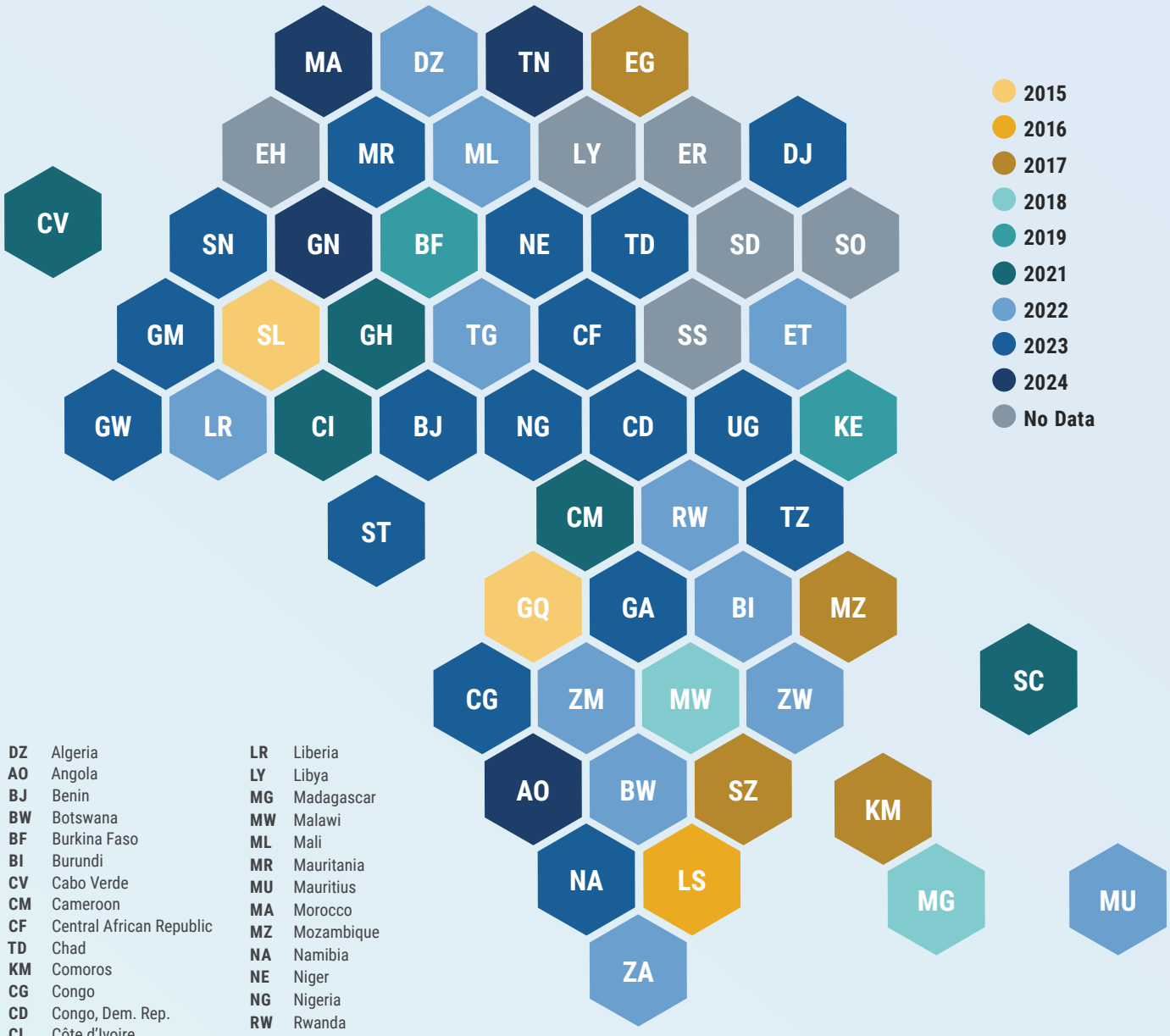
Systematic and regular conduct of modern censuses of national populations has varied across Africa, with Anglophone countries tending to conduct censuses except during times of political instability and Francophone countries implementing censuses less regularly.[1] At the end of the 1960s, conscious of the lack of basic information available on the populations living in most newly independent countries in sub-Saharan Africa, the United Nations Population Fund (UNFPA) set up the African Census Programmes, which provided support to about 20 countries on the African continent to take their first general census.[2]

Since the 1980s the majority of African nations have conducted population censuses and made huge progress in data collection. The combined efforts of various units within the United Nations, particularly the UNFPA, and other international organizations have shifted Africa from a data-poor to a data-rich situation, with most countries counting at least two censuses and several demographic surveys.[3] Forty-seven out of 54 African countries participated in the 2010 census round.

Disruption of Census-Taking in the 2020 Round

All 54 African countries were expected to participate in the 2020 census round, though the COVID-19 pandemic and other factors have delayed census implementation for several countries that were scheduled to begin enumeration.[4] (See **Figure 1**; see appendix for information on African nations' last census and planned years for participating in the 2020 census round.)

FIGURE 1 NATIONAL CENSUS DATES FOR AFRICAN COUNTRIES PARTICIPATING IN THE 2020 ROUND (2015–2024)



DZ	Algeria
AO	Angola
BJ	Benin
BW	Botswana
BF	Burkina Faso
BI	Burundi
CV	Cabo Verde
CM	Cameroon
CF	Central African Republic
TD	Chad
KM	Comoros
CG	Congo
CD	Congo, Dem. Rep.
CI	Côte d'Ivoire
DJ	Djibouti
EG	Egypt
EH	Western Sahara
GQ	Equatorial Guinea
ER	Eritrea
SZ	Eswatini (formerly Swaziland)
ET	Ethiopia
GA	Gabon
GM	Gambia
GH	Ghana
GN	Guinea
GW	Guinea-Bissau
KE	Kenya
LS	Lesotho
LR	Liberia
LY	Libya
MG	Madagascar
MW	Malawi
ML	Mali
MR	Mauritania
MU	Mauritius
MA	Morocco
MZ	Mozambique
NA	Namibia
NE	Niger
NG	Nigeria
RW	Rwanda
ST	São Tomé & Principé
SN	Senegal
SC	Seychelles
SL	Sierra Leone
SO	Somalia
ZA	South Africa
SS	South Sudan
SD	Sudan
TZ	Tanzania
TG	Togo
TN	Tunisia
UG	Uganda
ZM	Zambia
ZW	Zimbabwe

Note: See the appendix for the year of each country's most recent census and the year in which the 2020-round census happened or is planned.

Sources: United Nations Statistics Division, 2020 World Population and Housing Census Programme as of June 28, 2023.

According to the United Nations Economic Commission for Africa, which conducted a rapid assessment in April 2020, population and housing census activities that were suspended included pilot tests, planning, and mapping. Interruption of these activities potentially affects the entire census operations calendar for countries beyond those with enumeration planned for 2020. In addition, disruption to resource mobilization activities has blocked or delayed all follow-on activities in some countries. For instance, in Burkina Faso the post-enumeration survey of the fifth population and housing census conducted in 2019 has been postponed.

The Use of Censuses Versus Civil Registration and Vital Statistics

Census data are vital tools for national planning in African states. In addition, much of the information they record on individuals and households is consistent with data requirement conventions established with the United Nations Educational, Scientific, and Cultural Organization and other UN agencies: age and sex of responders, national languages and mother tongues, literacy and school attendance, matrimonial situations, economic activities, housing conditions and household equipment, and others. In 2019, UNFPA launched the Population Data Fund to deliver technical, operational, and financial support to national statistical offices (NSOs) for the implementation of a modern population and housing census, improving civil registration, and using georeferenced population data (or population data linked to geographic coordinates) for national development.

Population censuses are often the only source of quality information that covers the entire population. Demographic sources are generally divided into three main types: registers and administrative files (civil registration, parochial registers); population censuses; and surveys. Registers and censuses represent the only complete form of data compilation since they list each person in the population by family name and first name. In contrast, surveys include samples that are sometimes quite small.

Civil registration and vital statistics (CRVS) are usually very specialized and cover a single theme in detail, such as births, marriages, or deaths. They can be cross-referenced with other sources of information to facilitate more in-depth analysis. However, in many countries in sub-Saharan Africa, CRVS contain gaps that make them unusable for purposes other than administrative work, particularly when it comes to examining long-term trends. In the 1970s, civil registration systems reached only about 26% of Africa's population.[5] More recent review of the systems shows little improvement, but several efforts are underway to improve them.[6]

Women and children in the Matador, Pikin neighborhood of Dakar Senegal. A census is organized by household because that is how the data are collected. Civil registration is not necessarily organized by household.

Opportunities and Challenges for African Nations' Census-Taking

The heavy, intensive operations demanded by undertaking a census require a considerable amount of labor and time, with countries making sacrifices and heavy investments to obtain critical information on their population and its composition.

Unfortunately, the large amounts of data collected, combined with poor data storage practices, make census data a challenge both to analyze and preserve. As a result, the data have been underutilized and census results from many African nations generally have not adequately informed policy formulation and program implementation. New and more affordable digital technologies available for data collection, storage, and analysis during the 2020 census round create the possibility for more extensive use of not only the latest census data but also historical census data, where they are available.

Census data are particularly useful because they allow for a clear picture of the populations at lower administrative levels. Most countries find that this local use justifies the cost of censuses. At the same time, they need to go beyond census analytical reports and the computation of basic demographic variables to develop key indicators that can be used in development planning.

Individuals' census data (also named microdata) are a potentially rich source of indicators and comparison across censuses that allow measurement of long-term trajectories. The enormous technological increase in the data-analytic capacity necessary to evaluate microdata and the possibility of merging census data with other administrative data mean that census microdata analysis is no longer constrained by technology but by human and financial resources.

Coordinating Resource Demands for Undertaking a Census

Infrastructure and human and financial resources present challenges to implementing census operations in African countries. A traditional census is a complex operation with many steps, each of which requires financial resources and operational timing to correspond with the other steps in the process. According to international recommendations, the steps include:[7]

- Legal basis for the census.
- Budget and financial resources.
- Planning.
- Administrative organization.
- Communication.
- Cartographic preparation.
- Questionnaire design.
- Quality assurance plan.
- Census tests.
- Staff recruitment and training.
- Enumeration (including supervision).
- Data processing (data entry, editing).
- Evaluation.
- Analysis.
- Dissemination.

The UN Statistics Division surveyed countries midway through the 2020 round, prior to the onset of the COVID-19 pandemic, and found countries grappling with three issues as major challenges: implementing new technologies (75%), improving coverage and data quality (72%), and insufficient financial resources (70%).[8] These challenges are amplified in low- and middle-income African countries where despite declines in the cost of technology, these expenses represent a substantial proportion of their census operations budgets. In addition, electricity and internet are not available in remote regions and are unreliable in substantial portions of the countries.

A traditional census is a complex operation with many steps, each of which requires financial resources and operational timing to correspond with the other steps in the process.

Improving Census Coverage and Data Quality

Improving census coverage and data quality are top priorities. Of the 23 countries for which we located published estimates of the UN Age-Sex Index, only South Africa's 2011 census scored as being accurate. (See appendix.) This index broadly gauges the accuracy of a census, with accurate censuses scoring less than 20, moderately inaccurate censuses scoring from 20 to 40, and highly inaccurate censuses scoring over 40. The index relies on age ratios and sex ratios for its estimation. When age distributions and sex ratios deviate from assumptions, the index interprets them as irregularities. It cannot distinguish true irregularities from structural changes or social disturbances that may cause changes in health behavior or labor migration or other processes that affect age structure. Beyond the UASI score, it is necessary to ascertain whether such structural changes are occurring.

Post-enumeration surveys (PES) are another way for countries to assess the quality of their census, both in terms of population coverage and content. Historically, implementation of these surveys has come and gone over time, with countries realizing the importance of PES but deciding at times that resources needed to be focused on census implementation and at other times encountering logistical obstacles that delayed PES and diminished their usefulness.[9]

Chuks J. Mba and others who looked at census accuracy for multiple countries across decades noted a consistent pattern of improvement.[10] This finding bodes well for increasing countries' ability to meet data needs for subnational decision-making, monitoring country development goals, and measuring progress toward their national commitments under the Sustainable Development Goals.

Advances in Analyzing Census Data, Obstacles to Understanding Population Change

National institutions and international data collection and harmonization programs such as Census Integrated Communications Program (ICP), Integrated Public Use Microdata Series (IPUMS), African Census Analysis Project (ACAP), Observatoire démographique et statistique de l'espace francophone (ODSEF), and United Nations Population Fund Integrated Management Information System (UNFPA IMIS), have made it increasingly easy to acquire and process recent demographic and statistical information. For the 2010 round of censuses, UNFPA's Special Initiative on the Census offered technical support and help in mobilizing resources to countries for census execution. Similar assistance is available for the 2020 round.

The increased availability of more powerful and more advanced computer equipment has greatly contributed to easier data processing. As a result, analysts have the capability of analyzing databases for more than 15 million to 30 million persons—equivalent to the total census data for the population of several countries—on small personal computers.

Despite the significant advantages of easier access to data and the ability to process data for multiple censuses, the rush to access the latest numbers can come at the expense of the deeper understanding gained from analyzing demographic progress over time. Historical data are key to understanding demographic transformation and social change. Past census data make it possible to examine trends and assess common perceptions or misperceptions about a country's past. In some countries such as those in Francophone Africa, analysts have great difficulty finding traces of censuses, civil registration data, or even surveys that preceded recent data collection operations. This lack of historical data limits scientists' abilities to effectively delimit and understand demographic transformations.

The Constraints of Financing a Census and Storing the Data

Most planning ministries in African countries have limited budgets, and funding for a general population census represents a very significant portion of that budget. This financial constraint explains why the international community is often called upon for assistance in such operations.

With the wealth of data now collected, sub-Saharan Africa no longer suffers from the scarcity of sociodemographic information that it once did.[11] Nonetheless, the rapid increase in available data on African populations has not been accompanied by a concerted effort to preserve the information collected, such as transferring data to new storage media. As a result, many African countries run the risk of losing newer census data, repeating the experience from earlier censuses whose information has been completely lost, either because the storage media used is now obsolete or because they have simply disappeared.[12]

An enumerator collects data from a family during Zimbabwe's 2012 national population census. As technology changes, the transfer of both paper forms and digital records stored on older digital media would ensure availability of historical data. This process can be costly and adds to the financial constraints posed by a census.

Applying Technological Innovations in the 2020 Census Round

Census data collected during the 2020 round is aided by technological advances that increase the computing power of small electronic devices like tablets. The relatively low cost of these devices means it is easier to use satellite data to map boundaries for enumeration areas and computer-assisted personal interviewing (CAPI), making them viable and attractive options for data collection.

Using satellite data for census mapping allows for a thorough scan of the territory under enumeration and the ability to then draw up finer boundaries of the enumeration areas. It also considerably reduces mapping costs (fewer mapping agents are needed and less time must be dedicated to the map processing phase). In addition, using CAPI for data collection considerably reduces the duration of data processing since responses are input electronically, removing the need to transfer them from printed questionnaires.

In the 2010 round of censuses, all African countries used pencil-and-paper interviewing (PAPI). PAPI is easier to undertake because it does not require much technical expertise to implement (as compared with CAPI). It also provides more flexibility in terms of changes in the questionnaires and checking questionnaires filled out in the field. At the same time, PAPI is time consuming because it requires more time to process the data and engage in quality assurance of data entry and cleaning from the field. In the 2020 round, 90% of African countries responding to a UN survey have used or planned to use face-to-face interviews with CAPI

as one method of data collection.[13] For most of those using CAPI, it will be the primary mode of data collection, with PAPI serving as a backup.[14]

Though CAPI offers some financial advantages, census implementers will face challenges with its adoption, including:

- Shifts in the timeline for deployment of human resources.
- Costs associated with the increased skill level required of field staff.
- Costs of handheld devices for all field staff.
- Available infrastructure (electricity and internet) in the country.
- Technological infrastructure within NSOs.
- Securing electronic data on mobile devices and during transmission.
- Development of technical skills for implementing CAPI within NSOs.

Other technologies for fielding census information include computer-assisted telephone interviewing (CATI) and computer-assisted web interviewing (CAWI). Both CATI and CAWI represent alternatives to face-to-face PAPI or CAPI and are considered potential solutions to the protracted interruption that the COVID-19 pandemic has created in census operations for many countries. At the same time, for most sub-Saharan African countries CAWI is not a viable option because internet coverage is so low, and CATI would likely exacerbate coverage issues.

In this section of the Bulletin, we present two research summaries that explore the adoption of technological innovations in Africa. Mauro Bruno, Filomena Grassia, Joshua Handley, Asres Abayneh Abate, Deriba Deremew Mamo, and Atreshiwal Girma provide the first case study, from Ethiopia. Mercy Kanyuka, Jameson Ndawala, Isaac Chirwa, Medson Makwemba, Richard A.P. Phiri, Chisomo Singano, and Grevazio Kapaswiche provide the second case study, from Malawi.

A census worker (right) gathers data from Mumini Abdul (left) at Isheri cow market in Lagos during Nigeria's 2006 census. Today, computer-assisted data collection and secure wireless transfer of data can reduce data processing time.

RESEARCH SUMMARY

Adopting Computer-Assisted Personal Interviewing in Ethiopia

Mauro Bruno, Filomena Grassia, Joshua Handley, Asres Abayneh Abate, Deriba Deremew Mamo, and Atreshiwal Girma, "Census Metadata Driven Data Collection Monitoring: The Ethiopian Experience," *Statistical Journal of the IAOS* 36, no. 1 (2020): 67-76.

The Ethiopian national census is designed to cover all population groups dwelling in the country, including nomadic populations. The census data will primarily be collected digitally using tablets. Mobile data collection offers capabilities that can improve the census's overall quality, including access to GPS data and real-time processing of the data collected. With data from each device routinely sent to a central database, analysts can identify nearly immediately which areas have already been covered and at what geographic levels. Having this information so quickly allows those overseeing the census to adjust field operations, improving efficiency, coverage, and data quality.

> *Mobile data collection offers capabilities that can improve the census's overall quality, including access to GPS data and real-time processing of the data collected.*

The Ethiopian Central Statistics Agency (CSA) chose a public domain software package, the Census and Survey Processing System (CSPro), as its CAPI system. By choosing a free, off-the-shelf solution, CSA only needed to invest in increasing the capacity of its own personnel to learn the software. At the same time, CSPro does not provide user-friendly extraction and elaboration of information from automatically constructed databases. With technical assistance from the Italian National Institute of Statistics (Istat), CSA developed a monitoring system to extract data and create regular reports on the progress of census enumeration activities, as well as conduct preliminary analysis on the quality of collected data. They accomplished these activities in cooperation with the U.S. Census Bureau and UNFPA.

Under the previous paper-based data collection, monitoring was accomplished by having field supervisors fill out summary sheets that were physically sent up the supervisory chain until they reached headquarters, where they were manually aggregated at different coordination and supervisory levels. Finally, those at the national level used compiled information to compute national indicators. Compared to the PAPI approach that Ethiopia used for its previous population censuses, the proposed CAPI system provides more timely and accurate monitoring of field activities while reducing the workload of field supervisors.

Despite delays in implementation of its census, Ethiopia's early experience with CSA allowed it to share knowledge with Malawi during that country's preparations for their 2018 census.[15]

For the full document, see "Census Metadata Driven Data Collection Monitoring: The Ethiopian Experience."

RESEARCH SUMMARY

Implementing Computer-Assisted Personal Interviewing and Satellite Imagery in Malawi

Mercy Kanyuka, Jameson Ndawala, Isaac Chirwa, Medson Makwemba, Richard A.P. Phiri, Chisomo Singano, and Grevazio Kapaswiche, "Malawi Population and Housing Census Technological Trajectory: Unpacking 2018 Experience," *Statistical Journal of the IAOS* 36, no. 1 (2020): 57-65.

Malawi's adoption of satellite imagery for mapping and CAPI for data capture and online transmission transformed the conduct of its population and household census between 2008 and 2018. The National Statistics Office's (NSO's) incorporation of technological innovations into 2018 census operations came with notable advantages, new challenges, and significant costs.

Advantages From Satellite Mapping Inputs

To conduct the 2018 census, Malawi required mapping updates that reflected boundary shifts that had taken place within the country. These boundary changes affected a variety of jurisdictions, from sub-traditional authorities in rural areas to city boundaries and land area for wards in cities. Updates were needed to create a current geographic frame with distinct boundaries to allow complete counts of persons, households, and structures within those areas; avoid duplication of data; and aid in disaggregation of data at any geographic and administrative level.

Advantages From CAPI

Malawi used CAPI technology in surveys prior to its decision to adopt the technology for its 2018 census. CAPI allows real-time logic checks, skip patterns, and validation, which improve the efficiency of data collection and increase data quality. The software used also makes georeferenced data more accessible and can facilitate data processing, though some customization was required.

Challenges of the Technology

Both the use of satellite imagery and CAPI methodology created logistical demands for sourcing, distributing, and ensuring the security of electronic equipment and software. Among the equipment acquired for its census were heavy-duty plotters, scanners, global positioning devices, geographic information system (GIS) software, information technology infrastructure—including three additional headquarters servers and a virtual private network—and 20,000 tablets. With a substantial portion of Malawi's population not connected to the electrical grid and persistent electrical power interruption in other areas, the NSO also had to purchase 2,000 electric power banks and solar chargers. Bluetooth provided a solution for data transfer in areas with poor internet connectivity. With Bluetooth, NSO supervisors needed to be present to secure data transfer in remote areas.

Costs of the Technology

New technology costs contributed significantly to Malawi's overall budget for the 2018 census. Both the United Kingdom's Department for International Development (DFID) and UNFPA-Malawi subsidized the cost through the donation of equipment and coordination of loaned equipment under South-to-South cooperation agreements. For example, tablets that DFID purchased for the Malawi census then went to Zambia for use in that country's population and household census, which was originally planned for 2020. Beginning in 2015 when initial preparations began—and despite projected funding gaps anticipated as late as two months before enumeration—Malawi optimistically implemented all activities that were fully funded and completed the preparatory work for activities yet to be funded.

Despite these challenges and the high cost of meeting them, Malawi's 2018 census proved to be efficiently administered. At a cost of US$1.13 per person enumerated in 2018, the enumeration costs were about 80% of the per person cost in 2008 and 63% of the average per person cost of most censuses in Southern Africa. The efficiency of Malawi's 2018 census operations extended to its release of results. The NSO issued a preliminary report on Jan. 10, 2019, four months after the completion of data collection, and the final report was issued four months after that, on May 30, 2019.[16]

For the full document, see "Malawi Population and Housing Census Technological Trajectory: Unpacking 2018 Experience."

Analyzing Census Data for Decision-Making and Planning in Africa

Countries rely on census data to inform decision-making and program planning on a wide variety of issues, but before the data can be used, they must be analyzed. In this section, we present examples of how analyses of census data are being used within Africa.

We consider examples in the areas of health and mortality. Three subregional analyses combine census-based small area estimates with established statistical and demographic techniques in their study of under-5 child mortality, spatial concentration of disability, and access to surgical care. In the case of the surgical care study, the researchers also rely on machine learning extrapolates drawn from census population data. (Machine learning is a form of artificial intelligence.)

We also look at an analysis of electricity access that relies on satellite imagery of night lights and other topographical information combined with census data. Following that analysis are studies on poverty and schooling, as well as domestic work, and an example of assessing census data quality for measuring fertility.

Nairobi, Kenya. Census data are used to help identify infrastructure needs, such as transportation and electricity to support cities and availability of health clinics and hospitals for those living in rural areas.

RESEARCH SUMMARY

Addressing Under-5 Child Mortality in Burkina Faso

Hervé Bassinga, "Inégalités provinciales de mortalité des enfants de moins de cinq ans au Burkina Faso à partir de deux recensements : une analyse descriptive," poster presentation at Colloque Démostaf Paris, France on October 16-18, 2019; and Hervé Bassinga and Bassiahi Abdramane Soura, "Decrease in Infant and Child Mortality in Burkina Faso Between 1996 and 2006: An Explanatory Analysis Using the Decomposition Method at the Provincial Level," *Revue Espace, Territoires, Sociétés et Santé* 3 no. 6 (2020): 147-66.

Child mortality is an indicator of development and social inequality. Policymakers and scientific actors' interests in the fight against under-5 mortality (the death of children under age 5) was emphasized with the adoption of the Sustainable Development Goals by the United Nations and its member states in 2015. To reach the targets envisioned in the goals, Burkina Faso should consider factors associated with provinces where the decline in child mortality is higher or lower than the average decline.

Child death is inversely associated with mothers' education and standard of living—women who receive more education and have a higher standard of living are less likely to have children who die before age 5. Children from rural areas often suffer from increased mortality in comparison with their urban counterparts. Although these social inequalities in child mortality in sub-Saharan Africa may be documented, analyzes of spatial inequality are rare.

Demographic and Health Surveys provide data for the biggest administrative units (regions in Burkina Faso) but not for smaller scales (such as provinces in Burkina Faso). Yet, environmental risk, socioeconomic or cultural differences, and differences in available health assistance vary across smaller geographic areas. Such intraregional variations make it necessary for public officials to localize public activities so they take place closer to where they are needed. To assess the effectiveness of these interventions and programs, evaluators must have precise estimates of mortality at these geographical scales.

Census data are representative at the national level, regional level, and in urban and rural areas, allowing indirect estimation of child mortality rates without complete vital statistic data. By using census data on the estimated number of living and deceased children for women ages 15 to 49, child mortality ratios can be calculated at the province level in Burkina Faso. Hervé Bassinga summarized the distribution of under-5 child mortality rates in provinces with classification into groups that minimize the variance within each group and maximize the variance between groups.[17] This information is vital for local planning efforts.

Dichotomy of the Center and the Periphery in Child Mortality

Figure 2 displays a map of child mortality rates in 2006 that illustrates a dichotomy between provinces at the center of the country and those in periphery, with the mortality rate becoming higher as one moves from the center of the country to the periphery. Kadiogo Province (where the capital city, Ouagadougou, is located) had the lowest mortality rate, 81 under-5 child deaths for every 1,000 live births.

Lower Child Mortality Between 1996 and 2006

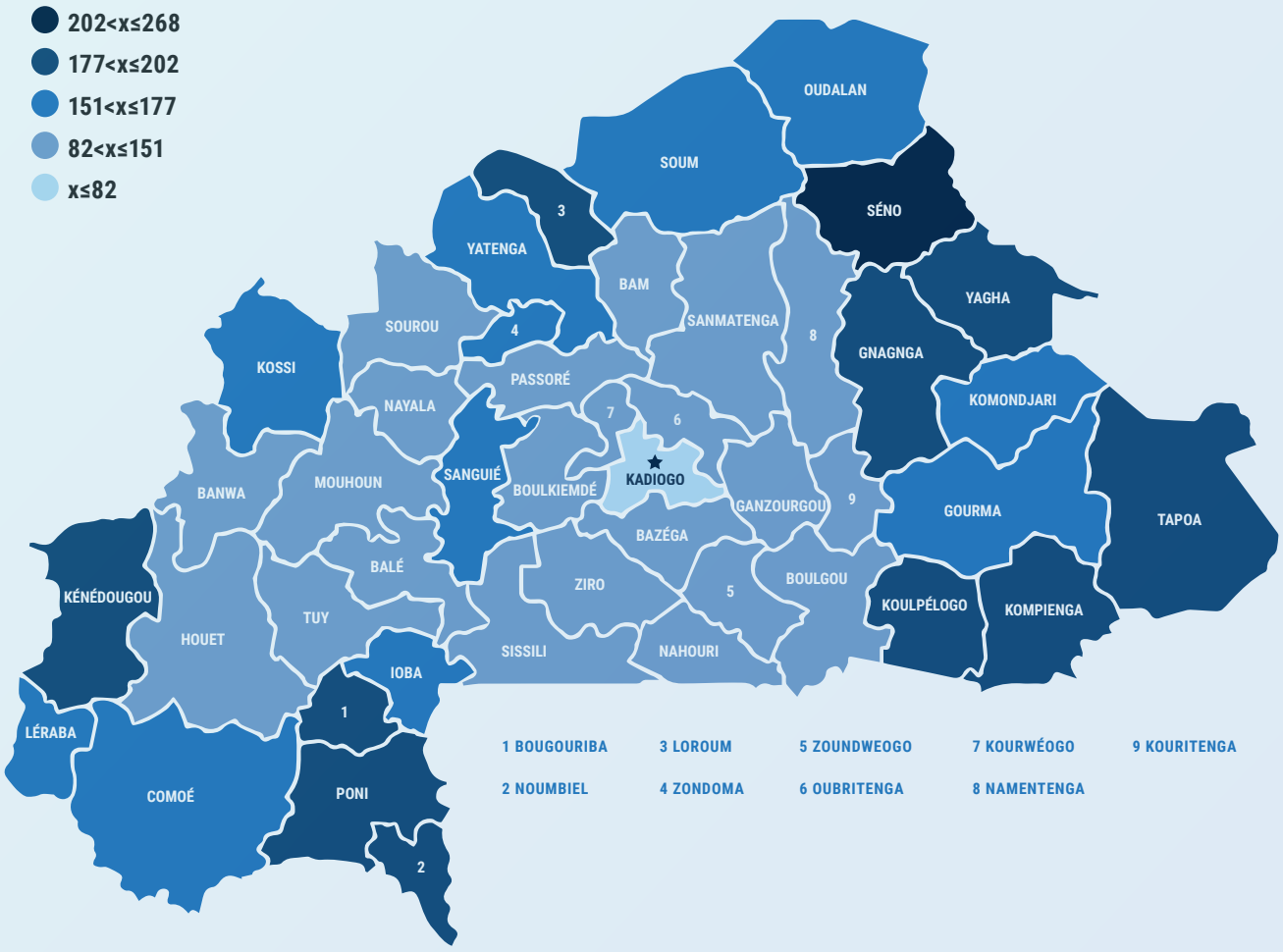
Between 1996 and 2006, most provinces in Burkina Faso saw a decrease in their under-5 mortality rates. These changes were not concentrated in any part of the country or even in provinces that had the highest under-5 mortality in 1996. Using a decomposition method that separates the change in under-5 child mortality rates into the amount due to characteristics of the women and changes due to health behavior, estimated for each of Burkina Faso's 45 provinces for both the 1996 and 2006 censuses, Bassinga and Bassiahi Abdramane Soura show that the awareness-raising program to change behavior surpasses the compositional effect in explaining the gap between the rates for these years.[18]

Effects of Sensitization and Living Conditions

The trend analysis of some behavioral indicators attests to improvements in vulnerable populations' health behavior. This improvement can be explained by sensitization programs performed at the local level and led by local organizations, which have influenced people's way of life and health behaviors. In Burkina Faso, health policy since 1993 has rested on a system built around health

FIGURE 2 **CHILD MORTALITY RATES ARE HIGHEST IN PROVINCES FARTHEST FROM BURKINA FASO'S CENTER**

UNDER-5 CHILD MORTALITY (DEATHS PER 1,000 BIRTHS) BY PROVINCE, 2006



Source: Hervé Bassinga, "Inégalités provinciales de mortalité des enfants de moins de cinq ans au Burkina Faso à partir de deux recensements : une analyse descriptive," poster presentation at Colloque Démostaf Paris, France, on October 16-18, 2019.

districts that cannot be divided across two provinces. As a result, provinces are responsible for implementing health programs.

Changes in the population composition (compositional effect) that contribute to declines in child mortality have been driven mainly by women's education levels and economic empowerment, population density, the rate of urbanization, and household standard of living. As the analysis shows, in addition to efforts to improve living conditions among the poorest groups, sensitizing the population to change behaviors remains an essential element in the fight against child mortality.

For the full documents, see "Inégalités provinciales de mortalité des enfants de moins de cinq ans au Burkina Faso à partir de deux recensements : une analyse descriptive," and "*Decrease in Infant and Child Mortality in Burkina Faso Between 1996 and 2006: An Explanatory Analysis Using the Decomposition Method at the Provincial Level*."

RESEARCH SUMMARY

Assessing the Prevalence and Spatial Concentration of Persons With Disabilities in Senegal

Arlette Simo Fotso, Ibrahima Diouf et Géraldine Duthé,
"Concentration spatiale du handicap au fil des âges au Sénégal,"
Demography of Africa, working paper no. 12, March 2021.

Acknowledgment: This project received funding from the European Union's Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement n°690984 (DEMOSTAF). The researchers would like to thank the Senegalese statistical office, ANSD, for census data access.

Public authorities need to be able to quantify and describe disabilities resulting from health problems experienced by the population so they can identify and manage assistance based on the location of people with disabilities. Senegal's 2013 census collected information on the experience of difficulties with functioning (sight, sound, mobility), cognition, or engaging in everyday activities. Using this data, the analysis by Arlette Simo Fotso, Ibrahima Diouf, and Géraldine Duthé described in this section assesses the spatial concentration of the prevalence of disability among children, adults, and older persons in Senegal and identifies zones where the prevalence is significantly higher.[19]

The Nature and Prevalence of Disability Across Age Groups

The disability prevalence increases across age groups: 2% of children ages 10 to 17 were reported to experience at least some difficulties in at least one indicator, with 6% of working-age adults ages 18 to 59 and 33% of people ages 60 and older reporting difficulties. Older people most frequently reported problems with seeing (20%) and mobility (21%). Between the ages of 10 and 60, less than 1% of people reported having difficulties with the activities of daily life, such as dressing and eating. They are dependent on others in society to help meet these daily needs. Eight percent of adults ages 60 and older need such assistance. (See **Table 1**.)

TABLE 1 DISABILITY PREVALENCE IN SENEGAL BY AGE GROUP, 2013 (PERCENT)

Type of Difficulty Measured	Children (ages 10 to 17)	Adults (ages 18 to 59)	Older Adults (ages 60 & older)
Some difficulty on at least one indicator	2.3%	5.9%	33.1%
A lot of difficulty on at least one indicator	0.8%	1.4%	9.6%
FUNCTIONAL LIMITATIONS			
Difficulty seeing	0.9%	2.9%	20.4%
Difficulty hearing	0.5%	1.1%	11.6%
MOBILITY LIMITATIONS			
Difficulty walking or going up stairs	0.6%	2.4%	21.3%
COGNITIVE LIMITATIONS			
Difficulty remembering or concentrating	0.5%	1.1%	11.1%
Difficulty communicating	0.6%	0.7%	4.5%
DIFFICULTIES WITH ACTIVITIES OF DAILY LIVING			
Difficulty with personal care such as bathing	0.5%	0.7%	8.1%
TOTAL NUMBER OF PERSONS COUNTED	**2,459,703**	**6,123,469**	**744,516**

Source: Calculations are from the Census of Population and Agriculture in Senegal, 2013, by Arlette Simo Fotso, Ibrahima Diouf, and Géraldine Duthé, "Concentration spatiale du handicap au fil des âges au Sénégal," *Demography of Africa*, working paper no. 12, March 2021.

It is important to note that this estimated prevalence is probably underestimated. Most of the information was collected from the head of the household or from one person responding for the entire household. The respondent may not be aware of all the difficulties that members of the household are experiencing, particularly if these difficulties remain moderate and do not restrict activities in ways that indicate a dependence. In addition, this estimation is based on information provided by household residents. It does not consider individuals residing in institutions who, though they may comprise a small share of the population, are often in worse health than the general population and thus more likely to have a disability.

Geographic Concentration

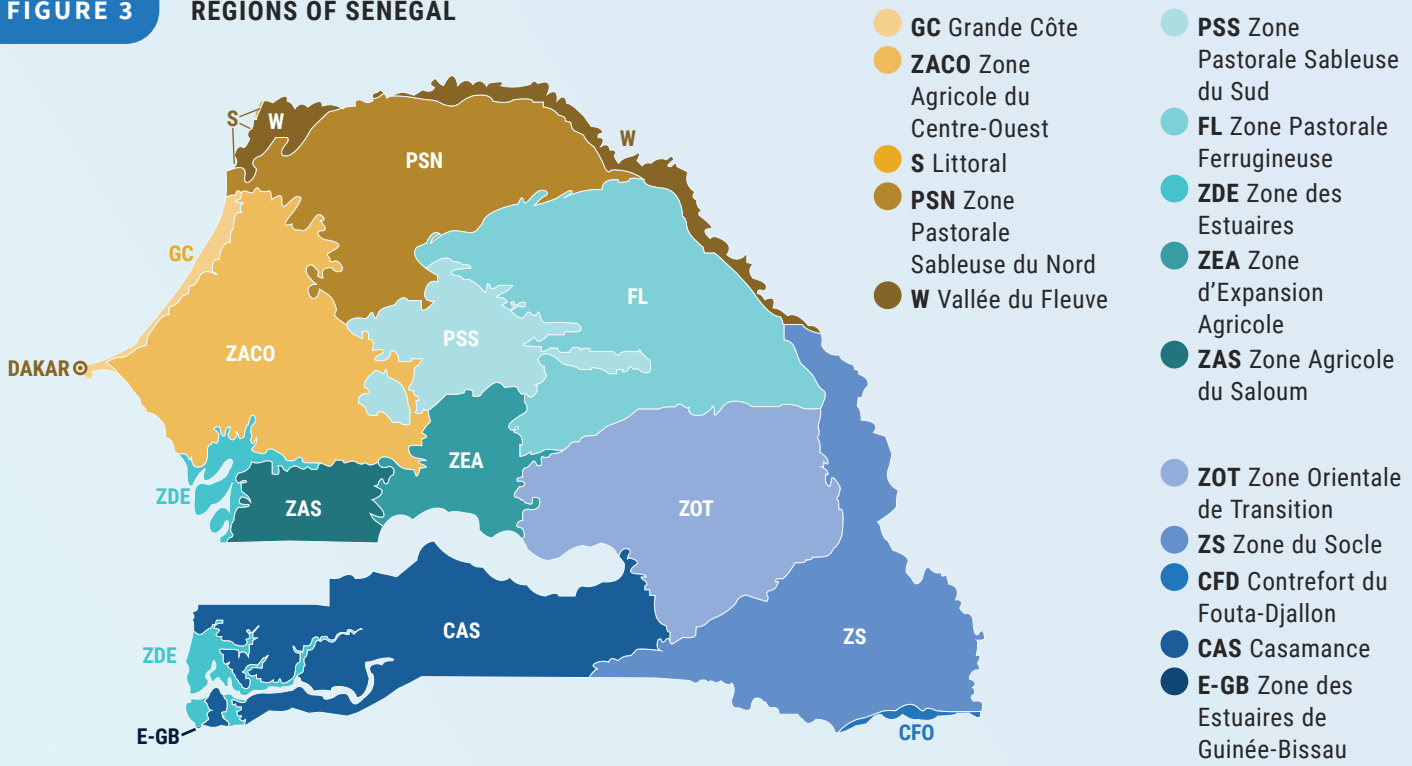
Certain areas in Senegal have a greater spatial concentration of disability than others. All households interviewed in the 2013 census were attached to one of the country's 551 administrative territories, or communes. A commune's population size varies from 1,500 to 400,000 residents. In preparation for the census, the communes were mapped to allow for spatial analysis and comparison of indicators.

Despite the relatively low prevalence of disability for children in the population, important variations are found across communes. For instance, the proportion of difficulties that children experience varies from 0.2% to 18.5%, with one quarter of communes having a disability prevalence for children higher than 2.9%. For five of six dimensions of disability, the proportion ranges from 0% to 10% across communes. The highest proportion—for difficulties in communicating—is 17.3%. Communes with the highest disability prevalence for children are concentrated in the country's northeast, center, and southwest, a similar geographical distribution also found for the other age groups.

Identification of Local Hotspots

Using spatial analysis and the Moran global index (a measure of spatial autocorrelation), researchers identified a higher concentration of communes according to disability prevalence than expected. Communes with relatively high prevalence that are surrounded by communes with similarly high prevalence levels were designated hotspots. The recurrence of certain regions as hotspots is notable: Casamance in the southwest of Senegal; the Kolda region, southeast of the capital Dakar; the center of the country; and along the Senegal River in the north. (See **Figure 3** for the localization of the regions.)

FIGURE 3 **REGIONS OF SENEGAL**



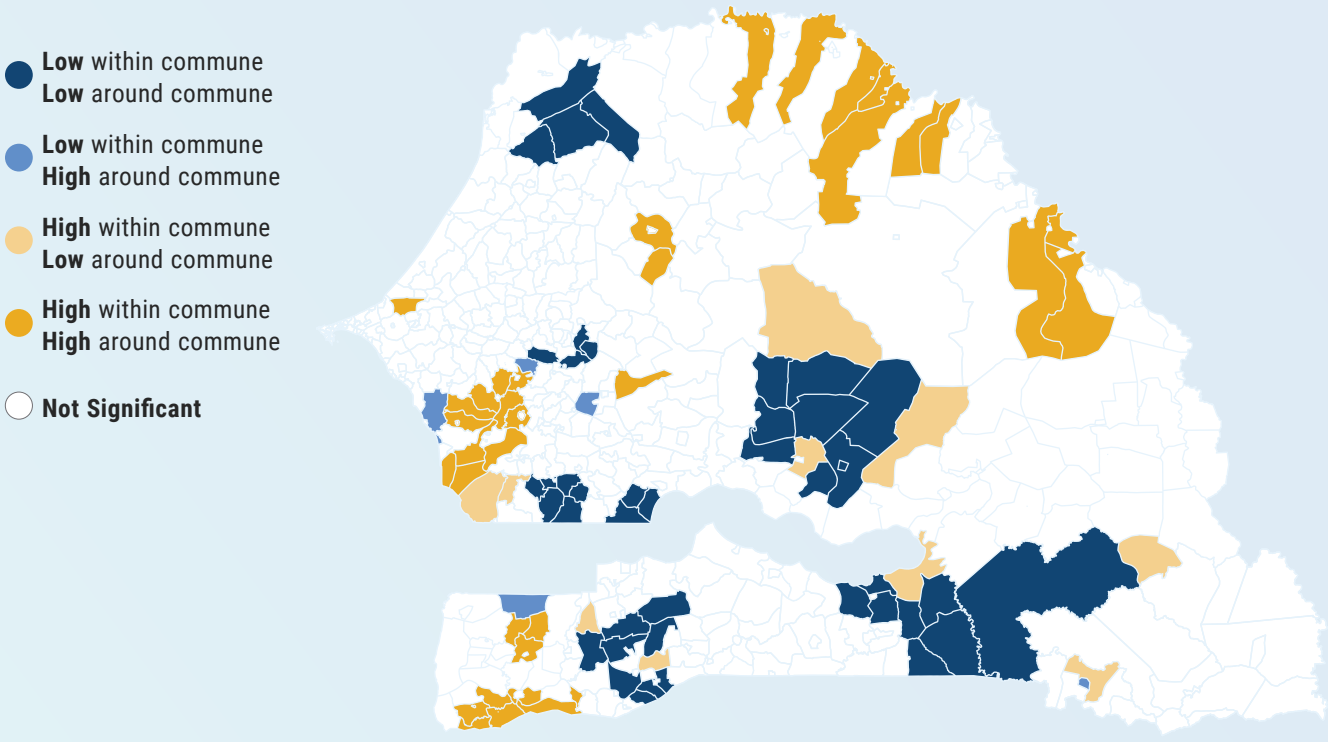
Source: United States Agency for International Development and U.S. Geological Survey, Ecoregions and Topography of Senegal.

Twenty-one communes, located in Senegal's central and southern regions, are identified as having relatively high proportions of children with at least one of the six disabilities measured. By nature of disability, 22 communes are identified as hotspots with relatively high proportions of children who have difficulty seeing, 11 regions for hearing, 24 for mobility, 12 for concentration, and 14 for communication. These hotspots are not identical for all types of disability. The lower Casamance (the extreme southwest of Senegal) has a spatial concentration of visual disability, but mobility limitations are more concentrated in the center of the country.

Thirty-seven communes are hotspots for adults who have difficulties with at least one of the six disabilities measured. A similar number of communes were identified as hotspots for visual limitations, notably Casamance in the south, the Kolda region, and along the Senegal River in the north. Forty-three communes were identified as hotspots for mobility limitations in these same regions and the center of the country.

For older adults, the number of communes identified as hotspots reached 63 for difficulties hearing. Along the Senegal River in the north, in the Kolda region, southeast of the capital Dakar, as well as in the Casamance, there is a concentration of communes with populations that have high proportions of functional (vision and hearing) and mobility limitations. Meanwhile, cognitive limitations (concentration and communication) and restricted mobility—which are the most limiting disabilities—have hotspots in other regions, specifically in the central part of the country. (See **Figure 4**.)

FIGURE 4 **COMMUNES IN SENEGAL WITH CONCENTRATIONS OF POPULATION AGES 60 AND OLDER WITH AT LEAST ONE DISABILITY**



Note: The Moran map makes it possible to visualize specific areas from the point of view of disability: the communes where the prevalence is relatively low and surrounded by communes where the prevalence is relatively low (low-low); the communes where the prevalence is relatively low surrounded communes where the prevalence is relatively high (low-high); the communes where the prevalence is relatively high surrounded by communes where the prevalence is relatively low (high-low); and, finally, the communes where the prevalence is relatively high surrounded by communes where the prevalence is relatively high (high-high), also called hotspots.

Source: Arlette Simo Fotso, Ibrahima Diouf et Géraldine Duthé, "Concentration spatiale du handicap au fil des âges au Sénégal," *Demography of Africa*, working paper no. 12, March 2021.

Serving Local Administration

Public authorities can use the quantification and description of disabilities resulting from health problems to help identify needs for assistance or management in the administrative territory. Such assistance or management could consist of adapting street and signal lights for people with reduced mobility or low vision, equipping public establishments with disability access ramps and adequate communication tools, or equipping health facilities with both the material and human resources needed to take better care of certain pathologies or limitations.

Future studies could take advantage of the zones identified here as hotspots to produce specific analyses that can better serve the needs of local authorities. This research can also be used at local levels to help communes in the management of their territories, be it upstream to prevent risks of having a disability or downstream to improve the lives of persons with disabilities. For example, communes with a high prevalence of mobility limitations due to on-the-job accidents could implement upstream prevention programs to prevent such accidents, while zones with high childhood disability levels linked to droughts could establish nutrition programs.

Further, zones with a high concentration of disability due to conditions such as malaria and meningitis could improve medical and vaccine coverage. Downstream, specialized health centers for each type of functional limitation should be developed in zones to assure compensation or better address the needs of individuals with visual, auditory, cognitive, and communication limitations. Public buildings should be systematically endowed with access ramps to aid those with mobility limitations, while adaptive language (Braille or sign language) and/or translations should be the norm in areas with a high concentration of people with visual, auditory, or communication impairment.

For the full document, see "Concentration spatiale du handicap au fil des âges au Sénégal."

Portrait of a blind man in southeastern Senegal. Research incorporating census data has been used to identify geographic hotspots of disability in Senegal so public authorities can identify where assistance is needed.

RESEARCH SUMMARY

Planning Improvements to the Population's Access to Surgery in Sub-Saharan Africa

Sabrina Juran, P. Niclas Broer, Stefanie J. Klug, Rachel C. Snow, Emelda A. Okiro, Paul O. Ouma, Robert W. Snow, Andrew J. Tatem, John G. Meara, and Victor A. Alegana, "Geospatial Mapping of Access to Timely Essential Surgery in Sub-Saharan Africa," *BMJ Global Health* 3, no. 4 (2018): e000875.

Since 1915, access to surgery in low- and middle-income countries has been considered a neglected area of global health. The study of access to surgery by Sabrina Juran, P. Niclas Broer, Stefanie J. Klug, Rachel C. Snow, Emelda A. Okiro, Paul O. Ouma, Robert W. Snow, Andrew J. Tatem, John G. Meara, and Victor A. Alegana shows that Nigeria—the largest country in sub-Saharan Africa in terms of population size and one of the more densely populated—has the greatest number of hospitals with potential surgical capacity among the 47 countries for which data were available.[20]

The evaluation of the geographic accessibility to essential surgery combined population 100-meter grid maps developed from census data with travel times to hospitals to estimate the burden of surgery. It relied on information about regional and district-level hospitals with the potential capacity to perform bellwether procedures such as laparotomy, cesarean section, and treatment of an open fracture. Travel times were adjusted for mode of travel and topography.

Estimates based on the data show that 100% of Nigeria's population lives within two hours of a major hospital with the potential to carry out bellwether procedures, reflecting the country's high numbers of health facilities. (See **Table 2**.) West Africa in general outperforms other subregions in sub-Saharan Africa, with 96% of the population two hours away from hospitals (the catchment area) able to perform surgery compared with 91% in Eastern Africa and Southern Africa and 87% in Central Africa.

The burden for surgery in sub-Saharan Africa, based solely on travel time estimation, is highest in densely populated countries like Nigeria, Democratic Republic of the Congo (DRC), and Ethiopia, with 50 million to 58 million people in the two-hour catchment area for Nigeria and 20 million to 25 million people in the two-hour catchment area for DRC and Ethiopia.

TABLE 2

COUNTRY-LEVEL ESTIMATES OF THE POPULATION WITHIN 30 MINUTES, ONE HOUR, AND TWO HOURS OF HOSPITALS WITH POTENTIAL FOR SURGERY

	Estimated 2015 Population (in millions)	Number of Hospitals **With Potential Surgical Capacity**	Proportion (Mean) of People **Within 30 Minutes of a Surgical Facility**	Proportion (Mean) of People **Within One Hour of a Surgical Facility**	Proportion (Mean) of People **Within Two Hours of a Surgical Facility**
Nigeria	**182.14**	**879**	**0.90**	**0.98**	**1.00**
Ethiopia	**99.29**	**161**	**0.42**	**0.61**	**0.79**
Democratic Republic of the Congo	**77.24**	**435**	**0.59**	**0.77**	**0.93**

Source: Sabrina Juran et al., "Geospatial Mapping of Access to Timely Essential Surgery in Sub-Saharan Africa," *BMJ Global Health* 3, no. 4 (2018): e000875.

These estimates provide a foundation for estimating absolute access by country when assessing hospital infrastructure based on surgical assessment modules. Health facility-level data on infrastructure, workforce, and medicine are essential to providing a true indicator of surgical access. Evidence from East Africa suggests that once these additional factors are accounted for, far fewer hospitals would be considered capable of performing bellwether surgeries. However, the preliminary estimate can be useful for policymakers and others engaged in strategic planning and assessments of the need to increase service provision.

For the full document, see "Geospatial Mapping of Access to Timely Essential Surgery in Sub-Saharan Africa."

RESEARCH SUMMARY

Combining Census Data and Geospatial Technology to Address Unequal Access to Electricity in Eswatini

Wisdom M. Dlamini and Lindiwe C. Dlamini, "Spatial Assessment and Monitoring of Household Electricity Access and Use Using Nighttime Lights and Ancillary Spatial Data: A Case of Eswatini," *African Geographical Review* (2021).

In Eswatini, where three of every four individuals live in rural areas, electrification provides a means for development. But its geographic distribution is historically inequitable, with urban areas having greater access than rural areas. While data exist on average access to electricity, none are available explicitly by geography. Using machine learning, Wisdom M. Dlamini and Lindiwe C. Dlamini modeled access to electricity and its use for lighting and cooking in Eswatini. Their findings provide information on how the distribution of electrical power in the country varies across space and time.[21] This information can be used in the development of urban and rural electrification plans to focus electrification efforts and help Eswatini achieve universal access to affordable, reliable, sustainable, and modern energy—an important development indicator in the Sustainable Development Goals.

The study made use of Eswatini's most recent population and housing census, administered in 2017. This census used geospatial technology to collect data on the forms of energy that households used for lighting and cooking. The researchers then used this data to estimate the proportion of households using on-grid electricity for either lighting or cooking. This proportion is the measure of access to electricity and the response variable in their analyses. Each model used either the proportion using electricity for lighting or the proportion using electricity for cooking as a response variable. The model based on electricity use for cooking highlights areas of intensive usage, while the lighting-based model provides a more general picture of access to electricity.

The lowest available unit of analysis was the enumeration area, which ranged in size from 0.012 to 194.19 kilometers squared. For the analysis, Dlamini and Dlamini combined census data for each enumeration area with nighttime light data from satellite imagery and other spatial data on roads, rivers, land cover, land tenure, climate, topography, and building footprints. Across a series of models, they assessed the importance of variables for predicting access to electricity, the ranking among which remained consistent. Nighttime light radiance explained most of the variance in access to electricity as measured either by use of electricity for lighting or cooking. Land tenure, land cover, and the proximity to urban areas were also important in explaining access to electricity, though the model needs refining to improve predictions in areas with very low or zero values.

With detailed data for the whole country, the researchers could make comparisons across administrative units. The share of households using electricity for cooking and lighting is relatively small in rural areas compared with urban and peri-urban areas (those areas immediately adjacent to an urban area). Urban areas within Eswatini's Manzini and Hhohho regions have comparatively higher levels of electricity access than elsewhere, with more limited access in the Shiselweni and Lubombo regions. The data from these analyses can be used to develop scenarios of energy access and demand and track local progress that affects national development objectives.

For the full document, see "Spatial Assessment and Monitoring of Household Electricity Access and Use Using Nighttime Lights and Ancillary Spatial Data: A Case of Eswatini."

RESEARCH SUMMARY

Identifying the Relationship Between Poverty and Schooling in Mali

This work was part of a research project on the "Education of Vulnerable Children in Mali" conducted by Jean-François Kobiané in 2008 and coordinated by Richard Marcoux.

One of the advantages of census data is its large number of observations. With a country's entire population counted and described, it is possible to create refined gradients of poverty as measured by durable goods or assets at all levels of geography. This measurement can be an important tool in analysis of the adverse side effects of development policies or the impact of national poverty reduction strategies. It is particularly important when classic monetary measures of poverty such as income or consumption expenditures are not available.

Most population censuses do not collect data on consumption expenditures. And, in Mali, the data released on income cannot be easily used to evaluate household income against absolute poverty thresholds. The census does contain information on the characteristics of housing and households' assets, making it possible to construct proxy measures of living standards. This section highlights how census data may be used to construct a poverty index for a finer analysis of the relation between poverty and schooling.

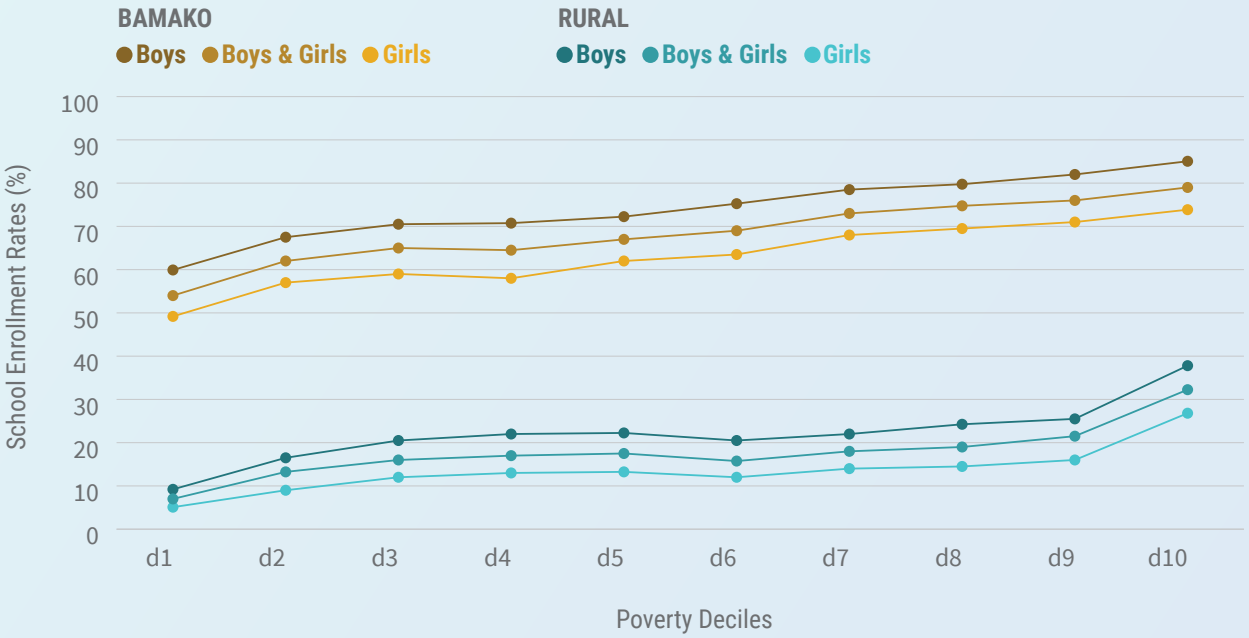
With information on the characteristics of housing and households' assets, it is possible to construct proxy measures of living standards.[22] In the example presented here, Jean-François Kobiané constructed a synthetic poverty index using principal component analysis (PCA). The first component of the PCA that explains the largest share of variance in the data is considered to be the resulting indicator of poverty measurement, which is based on housing characteristics and the possession (or not) of durable goods such as household appliances. The indicator must be constructed separately for each place of residence, particularly urban and rural.

The results displayed in **Figure 5** (see p. 22) draw from an analysis of the nation as a whole and of the capital city, secondary cities, and rural areas. Kobiané focused on the capital city and rural areas, and his analysis looks at school attendance rates within poverty index deciles, where the first decile includes the poorest households and the tenth decile the richest households.

In both the capital city Bamako and rural areas, children's school attendance rates are progressively higher in each poverty decile. Children in the capital have higher school attendance rates than children in rural areas, at all levels of poverty. Children in the poorest decile in Bamako have a higher school attendance rate than children in the richest decile in rural areas.

A school girl in Mali stands before a chalkboard. Researchers can use census data as a component in micro-level analyses on such topics as the relationship between household income and school attendance.

FIGURE 5 **POVERTY INDEX DECILES HIGHLIGHT THE RELATIONSHIP BETWEEN HOUSEHOLD ECONOMIC STATUS AND CHILDREN'S SCHOOLING**



Source: Jean-François Kobiané and Richard Marcoux.

RESEARCH SUMMARY

Measuring Domestic Work in Senegal and Mali

Marc Pilon, Valérie Delaunay, Richard Marcoux, Aminata Coulibaly, and Binta Dieme, « Essai de mesure et d'analyse de la présence de domestiques dans les ménages en Afrique subsaharienne, » *Politique africaine* 2 no. 154 (2019): 121-43.

Domestic work is a topic of global interest linked to other global phenomena such as the informal economic sector, immigration, and the care economy. It includes work in or for a private household or households providing direct and indirect care services (those related to the care of persons in private households or the maintenance of private households or premises). In Africa, domestic workers can be identified through population and household censuses and a variety of national household surveys. A comparative analysis by Marc Pilon, Valérie Delaunay, Richard Marcoux, Aminata Coulibaly, and Binta Dieme of two West African capitals (Dakar, Senegal, and Bamako, Mali) based on census data allows for critique of the measurement of domestic workers and characterization of girls and women residing in homes where they are employed in domestic work.[23]

These findings from only 10 countries and two capital cities are not representative of sub-Saharan Africa. Their value lies in their statistical approach to analysis of resident domestic workers.

Measurement of Live-In Domestic Work

Surveys and population censuses rely on a household questionnaire that gathers sociodemographic and economic characteristics about each member who resides in a household. The question about profession or economic activity undertaken makes it possible to identify those who engage in domestic work, but it does not tell us if those individuals work within the households where they live. Some census and survey operations are better able to identify and classify those engaged in this work (or the equivalent) because they look beyond kinship ties of

individuals living in the household and also ask about work done in the household by those living there.

Eight censuses in the Integrated Public Use Microdata Series international database include "domestic" in their question about kinship ties to the head of household: Togo (for urban areas only, 1958-1959), Benin (1979), Guinea (1983), Lesotho (1996 and 2006), Nigeria (2006), Mali (2009), and Senegal (2013). Each of the these countries has conducted just one census collecting information on domestic servants who live in the households where they work, except for Lesotho, which has conducted two.

Mali's census data from 2009 and Senegal's data from 2013 identify kinship ties with the household head for each member of a household, including domestic as a possible classification. The data reveal that nieces, other relatives, and non-relatives are found to engage in domestic work. As a member of the household, people classified as "domestics" in response to the kinship question place themselves unequivocally in the category of live-in domestic worker. This measure does not fully capture all individuals who provide live-in domestic work; it can, however, serve as the lower bound of the phenomenon.

A Profile of Live-In Domestic Workers in Dakar and Bamako

Individuals who declare they engage in live-in domestic work reveal the phenomenon to be essentially female and urban. Based on the census data for Senegal and Mali, live-in domestic work is particularly notable in the capital cities of Dakar and Bamako, where its prevalence is 3.6% and 5.2%, respectively.

In Bamako, one out of five girls between ages 10 and 19 are classified as domestic workers, and half of live-in domestic workers are younger than age 17. Nine out of 10 people identified that they live in households where they work. In Dakar, half of girls and women who live in the household where they work are younger than age 23.

The majority of individuals engaging in domestic work in both cities have no schooling: 60% in Dakar and more than 80% in Bamako. The recent shift to universal primary education in Senegal led to a change in migration behavior as young girls working as maids who previously followed the agricultural calendar now follow the school calendar. In Dakar, some young girls choose domestic employment at the end of their school career, starting work at a later age than previous generations.

Descriptive analysis of sociocultural and economic characteristics shows differences between live-in residents and household labor. In Bamako, girls and women engaged in domestic work are overly represented by the Dogon ethnic group and, to a lesser extent, Bobo. They report their religion as Christian more often than any other kinship category in the household. In Dakar, women from the Sereer ethnic group are overrepresented in domestic work regardless of age group.

"Hidden" Domestic Workers

The classification of kin and domestic workers may still obscure the domestic work of some individuals identified only as a relative. For example, comparing the profiles for nieces, other relatives, and non-relatives with that of girls and women identified as live-in domestic workers raises our awareness of this often-hidden role. In the census data, a household member identified as "niece" often has a profile similar to individuals identified as "other relatives" when it comes to ethnicity, religion, and education level. If some nieces engage in domestic work, the way in which they are recruited and their kindship relation suggests that their living and working conditions are probably very different from others who are openly classified as domestic workers. In Senegal, profiles of non-relatives are very close to profiles of observed domestic workers, with a low education level and a relatively higher proportion of those from the Sereer ethnic group. These findings reinforce the notion that some domestic workers are hidden among the non-relative group.

Statistical Approach

Recent data collection operations in Africa now allow us to understand the characteristics of individuals engaging in domestic work who work where they live. The work highlighted here underlines both the potential of using census data to analyze the different situations of people engaged in domestic work as well as its limitations. Such limitations include the fact that domesticity is recorded through the relationship to the head of household, making it invisible; for instance, a domestic niece will be reported as a niece and not as a domestic.

For the full document, see "Essai de mesure et d'analyse de la présence de domestiques dans les ménages en Afrique subsaharienne."

RESEARCH SUMMARY

Assessing Data Quality for Fertility Measurement in Swaziland (Eswatini)

Garikayi B. Chemhaka, Clifford Odimegwu, Eugene N. Zwane, and Jeremy D. Gumbo, "Is Swaziland Census Data Suitable for Fertility Measurement?" *Genus* 72, no. 4 (2016): 1-13.

Most developing countries have incomplete vital registration systems, making the census the reliable and main source of fertility and mortality measures, particularly for groups that represent a relatively small proportion of the population. When measuring fertility, poor quality data can result in implausible estimates. If these estimates are used in development and program planning, they can lead to inappropriately designed interventions that may even worsen the problems they intend to address. For this reason, it is important to examine the quality of all data—including census data—used to build indicators that will become part of planning processes.

Garikayi B. Chemhaka, Clifford Odimegwu, Eugene N. Zwane, and Jeremy D. Gumbo assessed the quality of data from Swaziland's last four censuses (1976, 1986, 1997, 2007) prior to its 2017 census. To assess the quality of fertility estimates derived from census data, they first examined the censuses' age and sex data for irregularities and inconsistencies.[24] Common quality issues in age-sex and fertility data include omission, duplication, misreporting, and mistiming or misplacement of birth events or age. These issues may be due to respondents' memory lapses, recall problems, or other motives when reporting. Failure to collect data on everyone in the population can also skew responses, particularly if certain types of individuals are more likely to be missed than others.

Age-Sex Data

The classic sex ratio, defined as the number of males for every 100 females, is one simple measure of evaluating age-sex data. The overall sex ratio largely depends on the population age distribution and deviation from 100 (the sex ratio where the number of men equals the number of women). Such deviations should be accounted for by changes in the population such as migration and mortality. The sex ratio at birth is generally 105, though it may be as low as 100 in some African populations. To verify consistency of a population's sex composition, compare the sex ratio across censuses from two different time periods.

The age ratio—estimated as the population in an age group divided by the average of populations in the two adjacent age groups—is another means used to assess misreporting of age. Selective under-enumeration, over-enumeration, misclassification of age, or a combination of these factors can produce deviation of the age ratio from 100.

Age heaping, or the preference to report ages that end in a specific number such as 0 or 5 (for example, reporting age 30 instead of age 29 or 32) can be detected using one of several standard demographic tools used to assess the strength of the tendency to inaccurately report age.

> *It is important to examine the quality of all data—including census data—used to build indicators that will become part of the planning process.*

Fertility Data

Several standard fertility measures rely on census data for recent births and children ever born to women ages 15 to 49. It is possible to assess the quality of fertility data in a census by performing consistency checks on the data regarding age-sex distribution, average parities (total number of live births per woman ages 15 to 49), and the extent to which age-specific fertility rates conform to expected fertility patterns.

Average parities for women should increase with age. Insufficient increase from one age group to the next or a decline may signal data problems. For example, if women ages 40 to 45 and ages 45 to 49 have fewer total births than women ages 35 to 39, one would suspect reporting issues or misassignment of age unless there is reason to suppose fertility has been increasing.

How data for childless women are processed when creating data sets can also affect estimates. These women are sometimes recorded as having "unknown" or "not stated" parity, excluding them from calculations of average parity when they should be counted in the denominator.

Quality of Swaziland (Eswatini) Censuses 1976-2007

For censuses 1976, 1986, and 1997, the pattern of age reporting suggests age heaping on ages that end in 0 and 5. One demographic tool, Whipple's modified index, shows that people have a preference to report ages that end in 0, 5, or 8 and an aversion to reporting ages ending in 1 and 7—regardless of their actual age. This type of age heaping was not identified for the 2007 census.[25]

Sex ratios under 100 for children less than a year old in all four censuses indicate possible underreporting of births. For the age group 20 to 35, the censuses report sex ratios substantially below 100, which could be a sign of more male deaths from HIV/AIDS, high male labor migration, or lower sex ratio at birth.

In all four censuses, age ratios below 100 for women ages 30 to 49 suggest they have been undercounted or misclassified. Initial examination of the age pattern of fertility in these censuses points to underreporting of fertility or age reporting errors for fertility data in all censuses. These anomalies appear to be attributable to declining fertility over time as evidenced by similarity in the age distribution of fertility in both adjusted and unadjusted census data, and a comparison of the fertility rates between 1976 and 2007 showing lower fertility at each age over the three decades.

In the 2007 census, the similarity in the age-specific fertility rates of age groups 20 to 24, 25 to 29, 30 to 34, and 35 to 39 is unexpected because in most African countries and in Swaziland's prior three censuses, fertility peaks at ages 20 to 29. Two possible factors may explain the data: underreporting of births for young women in this age group and delayed childbearing for older women.

For assessment of the censuses, where more than 2% of the parities reported were recorded as "unknown" or "not stated," the authors made adjustments. Average parity was estimated with and without these adjustments for each census. The results show only slight differences between the two estimates and declining parities at each age over time, indicating decreasing fertility rates.

Summary Assessment

In the three decades from 1976 to 2007, the quality of age data in Swaziland's censuses improved. The assessment shows a consistent irregular pattern of age ratios and sex ratios in single years of ages in all four censuses, reflecting age misreporting often due to understating or overstating ages. Age heaping or digit preferences appear less frequently in later censuses and may be attributable to increased literacy, improved education, or changes in data collection procedures.

The analysis of age and sex distributions indicates irregularities in age structure in all four censuses. Irregularities in age distribution are reflected in the sex ratios. For young adults, it may be attributable to net out-migration. Based on the demographic indices that measure degree of age heaping and adjustments testing the implication of missing data, the extent of age reporting errors in these census data is moderate. Therefore, acceptable quality fertility estimates may be derived from these data.

For the full document, see "Is Swaziland Census Data Suitable for Fertility Measurement?"

Conclusion: Countries Must Invest in Analysis to Gain the Benefits From Census Data

All census data have the potential to generate knowledge to support the design and implementation of economic and social development policies. To ensure census results can be used in policymaking and program planning, the data must be of sufficient quality and undergo thorough analysis.

As this Bulletin notes, the production costs of a census are substantial, particularly for low- and middle-income countries. The examples highlighted from Ethiopia and Malawi illustrate how technological progress—particularly the increasingly high performance of computers and the development of electronic collection technologies—offers opportunities to share and reduce costs. It also offers the possibility of improved data storage capacity and practices.

Analysis of the enormous mass of census data remains a major challenge for many countries. The examples presented in this report illustrate the value of investing time and expertise in a thorough analysis of census results, which can then be applied to a range of issues affecting the population, including child mortality (Burkina Faso), people living with disabilities (Senegal), access to surgery (Nigeria), access to electricity (Eswatini), measurements of poverty and education (Mali) and domestic work (Mali and Senegal), and the evaluation of the quality of census data for measuring fertility (Eswatini).

As countries across Africa engage in and complete the 2020 census round, they should commit not just to enumeration but to the storage, analysis, and effective use of census data. Censuses provide data on a national territory, providing government planners as well as civil society with basic demographic, social, and economic information on the smallest administrative units as well as rare sociodemographic and economic phenomena. Specific analyses that use data from several censuses in the same country allow analysts, policymakers, and others to highlight major societal changes across decades, providing them with opportunities to better understand the past and present and plan effectively for the future.

References

1 Marcoux, Richard and Mamadou Kani Konaté, "Africa and the Francophonie of Tomorrow: An Attempt to Measure the Population of the Francophonie From Now to 2060," *African Population Studies* 25, no 2 (2012): 215-25.

2 Richard Marcoux, Laurent Richard, and Mamadou Kani Konaté, "Digital Preservation of Demographic Heritage: Population Censuses and Experiences in Mali and the Democratic Republic of the Congo," *Conference Proceedings: The Memory of the World in the Digital Age: Digitization and Preservation* (UNESCO, 2013): 672-84.

3 Tukufu Zuberi and Martin W. Bangha, "The History and Future of African Census Analysis Project (ACAP)," in Bruno Schoumaker et al., *Les systèmes d'information en démographie et en sciences sociales : Nouvelles questions, nouveaux outils : Actes de la Chaire Quetelet 2006* (London: Presses universitaires de Louvain, 2012): 47-70.

4 African Development Bank Group (AfDB), African Union Commission (AUC), and United Nations Economic Commission for Africa (ECA), *African Statistical Yearbook 2019* (Addis Ababa: AfDB, AUC, ECA, n.d.): 126; United Nations Economic and Social Council, *2020 Round of Population and Housing Censuses in Africa*, E/EC A/STATCO M/7/10, Sept. 15, 2020; United Nations Statistics Division (UNSD), "Impact of COVID-19 on 2020 Round Population and Housing Censuses," data as of April 17, 2021.

5 International Program of Laboratories for Population Statistics, *Proceedings of the Sixth International POPLAB Conference: Civil Registration and Vital Statistics: The Hague/ Voorburg*, 21-24 June 1976 (Chapel Hill, NC: International Program of Laboratories for Population Statistics, Dept. of Biostatistics, School of Public Health, Carolina Population Center, University of North Carolina at Chapel Hill, 1976).

6 United Nations Economic Commission for Africa, *Making Everyone Visible: Why Improving Civil Registration and Vital Statistics Systems in Africa Is Important*, n.d.

7 UNSD, *United Nations Principles and Recommendations for Population and Housing Censuses*, Revision 2, Series M, no. 67/Rev.2 (New York: UNSD, 2008).

8 Srdjan Mrkić, "The 2020 Round of Population and Housing Censuses: An Overview," *Statistical Journal of the IAOS* 36, no. 1 (2020): 35-42.

9 United Nations Department of Economic and Social Affairs (UN DESA), Statistics Division, *2010 World Population and Housing Census Programme, Post Enumeration Surveys: Operational Guidelines* (New York: UN DESA, 2010).

10 Chuks J. Mba, "Examining the Accuracy of Age-Sex Data: An Evaluation of Recent Sub-Saharan African Population Censuses," in *Continuity and Change in Sub-Saharan African Demography*, ed. Clifford O. Odimegwu and John Kekovole (New York: Routledge, 2014).

11 Etienne Van De Walle, *African Households: Censuses and Surveys* (London: Routledge, 2006); and Richard Marcoux, Tukufu Zuberi, and Martin Bangha (2005), « Les recensements en Afrique francophone : les enjeux d'un patrimoine menacé », 4e *Colloque francophone sur les sondages*, Québec, Canada, May 24-27, 2005.

12 Françoise Gubry and François Moriconi-Ebrard, « Transformer un gisement en ressources : la valorisation des données de recensement, une mission du CEPED », *Les 7es Journées scientifiques du Réseau Démographie de l'AUF*, sur le thème « Mémoires & démographie Regards croisés au Sud et au Nord », June 19-22, 2007.

13 Erik Vickstrom, "Computer-Assisted Personal Interviewing as a Census Data Processing Solution in Africa: Observed Opportunities and Challenges." Presented at the Africa International Conference, Paris-Aubervilliers, Campus Condorcet, France, October 16-18, 2019.

14 UNSD, *Report on the Results of the UNSD Survey on 2020 Round Population and Housing Censuses*, March 2020

15 Mauro Bruno et al., "Census Metadata Driven Data Collection Monitoring: The Ethiopian Experience," *Statistical Journal of the IAOS* 36, no. 1 (2020): 67-76.

16 Mercy Kanyuka et al., "Malawi Population and Housing Census Technological Trajectory: Unpacking 2018 Experience," *Statistical Journal of the IAOS* 36, no. 1 (2020): 57-65.

17 Hervé Bassinga and Abdramane B. Soura, « Inégalités provinciales de mortalité des enfants de moins de cinq ans au Burkina Faso à partir de deux recensements : description et recherche de corrélats. » Presented at Colloque Démostaf, Paris, France, October 16-18, 2019.

18 Hervé Bassinga and Bassiahi Abdramane Soura, "Decrease in Infant and Child Mortality in Burkina Faso Between 1996 and 2006: An Explanatory Analysis Using the Decomposition Method at the Provincial Level," *Revue Espace, Territoires, Sociétés et Santé* 3 no. 6 (2020): 147-66.

19 Arlette Simo Fotso, Ibrahima Diouf, and Géraldine Duthé, "Concentration spatiale du handicap au fil des âges au Sénégal," *Demography of Africa*, working paper no. 12, March 2021.

20 Sabrina Juran et al., "Geospatial Mapping of Access to Timely Essential Surgery in Sub-Saharan Africa," *BMJ Global Health* 3, no. 4 (2018): e000875.

21 Wisdom M. Dlamini and Lindiwe C. Dlamini, "Spatial Assessment and Monitoring of Household Electricity Access and Use Using Nighttime Lights and Ancillary Spatial Data: A Case of Eswatini," *African Geographical Review* (2021).

22 Amadou Noumbissi and Jean-Paul Sanderson, "Pauvreté et comportements démographiques au Cameroun," in F. Gendreau (ed.), Crises, pauvreté et changements démographiques dans les pays du Sud. (Paris: ESTEM, 1998): 149-63 ; Jean-François Kobiané, « Essai de construction d'un profil de pauvreté des ménages à Ouagadougou à partir des caractéristiques de l'habitat, » Crises, pauvreté et changements démographiques dans les pays du Sud (Paris: AUPELF-UREF, Éditions ESTEM, 1998): 117-31 ; Kobiané, « Habitat et biens d'équipement comme indicateurs de niveau de vie des ménages: bilan méthodologique et application à l'analyse de la relation pauvreté scolarisation, » Union for African Population Studies (2004) ; Bruno Schoumaker, « Indicateurs de niveau de vie et mesure de la relation entre pauvreté et fécondité: L'exemple de l'Afrique du Sud, » *Population* 54, no. 6 (1999) : 963-92 ; Deon Filmer and Lant H. Pritchett, "The Effect of Household Wealth on Educational Attainment: Evidence From 35 Countries," *Population and Development Review* 25, no. 1 (1999): 85-120; Filmer and Pritchett, "Estimating Wealth Effect Without Expenditure Data—or Tears: An Application to Educational Enrollments in States in India," *Demography* 38, no. 1 (2001): 115-32; and Mark R. Montgomery, Michele Gragnolati, Kathleen A. Burke, and Edmundo Paredes, "Measuring Living Standards With Proxy Variables," *Demography* 37, no. 2 (2000): 155-74.

23 Marc Pilon et al., "Essai de mesure et d'analyse de la présence de domestiques dans les ménages en Afrique subsaharienne," *Politique africaine* 2 no. 154 (2019): 121-43.

24 Garikayi B. Chemhaka et al., "Is Swaziland Census Data Suitable for Fertility Measurement?" *Genus* 72, no. 4 (2016): 1-13.

25 Reported data for 2007 could have been adjusted differently from earlier data. Raw data for 1976 and 1986 were not available, so the pattern of age reporting is unknown.

Appendix

2020 Round of Population and Housing Censuses in Africa

Year Conducted and Accuracy, by Country

UN Age-Sex Index Indicating Bands of Accuracy

Accurate (Under 20) **Moderately Inaccurate** (Between 20 and 40) **Highly Inaccurate** (Over 40)

N/A (No United Nations Age-Sex Accuracy Index estimate available to authors)

Country	2020 Census Round	2010 Census Round	Accuracy
Algeria	2022	2008	N/A
Angola	2024	2014	N/A
Benin	2023	2013	N/A
Botswana	2022	2011	21 (2011)[a]
Burkina Faso	2019	2006	28.6 (2006)[b]; 25.07 (2006)[c]
Burundi	2022	2008	61 (2008)[d]
Cabo Verde	2021	2010	24.77 (2010)[d]
Cameroon	2021	2005	27.9 (2005)[b]
Central African Republic	2023	—	50.3 (2003)[d]
Chad	2023	2009	N/A
Comoros	2017	—	N/A
Congo	2023	2007	N/A
Congo, Dem. Rep.	2023	—	N/A
Côte d'Ivoire	2021	2014	43.6 (2014)[d]
Djibouti	2023	2009	N/A
Egypt	2017	2006	21.8 (2006)[c]

Country	2020 Census Round	2010 Census Round	Accuracy
Equatorial Guinea	2015	—	N/A
Eritrea	—	—	N/A
Eswatini (formerly Swaziland)	2017	2007	26.4 (2007)[d]
Ethiopia	2022	2007	46.9 (2007)[e]
Gabon	2023	2013	N/A
Gambia	2023	2013	76 (1993)[f]
Ghana	2021	2010	26.71 (2010)[g]; 28.8 (2010)[b]
Guinea	2024	2014	66.4 (1996)[h]; 56.37(1996)[c]
Guinea-Bissau	2023	2009	27.8 (2009)[d]
Kenya	2019	2009	22.2 (2009)[h]; 21.68 (2009)[c]
Lesotho	2016	2006	29.5 (2006)[d]
Liberia	2022	2008	39.7 (2008)[d]
Libya	—	2006	N/A
Madagascar	2018	—	N/A
Malawi	2018	2008	30.7 (2008)[h]; 30.73 (2008)[c]
Mali	2022	2009	34.4 (2009)[b]
Mauritania	2023	2013	N/A
Mauritius	2022	2011	12.8 (2011)[d]
Morocco	2024	2014	24.92 (2004)[c]
Mozambique	2017	2007	27.8 (2007)[h]
Namibia	2023	2011	21.9 (2001)[h]
Niger	2023	2012	14.1 (2012)[d]
Nigeria	2023	2006	59.7 (2006)[i]
Rwanda	2022	2012	26.0 (2002)[h]; 27.26 (2002)[c]
São Tomé & Principé	2023	2012	18.3 (2012)[d]
Senegal	2023	2013	39.5 (2002)[h]; 45.3 (2012)[d]

Country	2020 Census Round	2010 Census Round	Accuracy
Seychelles	2021	2010	31.7 (2010)[d]
Sierra Leone	2015	—	47.76 (2004)[c]
Somalia	—	—	N/A
South Africa	2022	2011	17.8 (2011)[j]
South Sudan	—	2008	42.58 (2008)[c]
Sudan	—	2008	59.9 (2008)[h]; 45.27 (2008)[c]
Tanzania	2023	—	31.8 (2002)[h]; 30.5 (2002)[c]
Togo	2022	2010	37.3 (2010)[d]
Tunisia	2024	2014	N/A
Uganda	2023	2014	28.9 (2002)[h]; 41.1 (2002)[c]
Western Sarahara	—	—	N/A
Zambia	2022	2010	27.9 (2010)[k]
Zimbabwe	2022	2012	34.0 (2012)[d]

a. Kenabetsho Bainame and Gobopamang Letamo, "Evaluation of Data Quality of the Botswana 2011 Population and Housing Census," *Botswana Notes and Records* 46 (2014): 26-36.

b. Ages 0 to 74. Elizabeth O. Njoku, David O. Okunlola, and Sunday A. Adedini, "Demographic Assessment and Adjustment of Census Age Distribution in Selected West African Countries," *African Population Studies* 32, no. 3 (2018).

c. Johanna Fajardo-González, Laura Attanasio, and Jasmine Trang Ha, "An Assessment of the Age Reporting in the IPUMS-I Microdata," paper submitted for presentation at the annual meeting of the Population Association of America, 2014.

d. Patrick Gerland, « Evaluation des recensements en Afrique : taux de couverture et qualité des données démographiques de base, » United Nations Department of Economic and Social Affairs, October 2019.

e. Ages 0 to 80. Selome Bekele, "The Accuracy of Demographic Data in the Ethiopian Censuses," *Eastern Africa Social Science Research Review* 33, no. 1 (2017): 15-38.

f. Chuks J. Mba, "Challenges of Population Census Enumeration in Africa: An Illustration With the Age-Sex Data of the Gambia," *Research Review of the Institute of African Studies* 20, no. 1 (2004): 9-19.

g. Z. M. K. Batse and E. Osei-Tutu, "Evaluation and Adjustment of Age-Sex Data." In 2010 Population and Housing Census, National Analytical Report (Accra: Ghana Statistical Service, 2013): 24-49.

h. Ages 5 to 69. UN-recommended joint score for evaluating quality based on demographic analysis by Chuks J. Mba, "Examining the Accuracy of Age-Sex Data: An Evaluation of Recent Sub-Saharan African Population Censuses," in *Continuity and Change in Sub-Saharan African Demography*, ed. Clifford O. Odimegwu and John Kekovole (New York: Routledge, 2014). <20 is accurate; 20-40 is moderately inaccurate; 40+ is highly inaccurate.

i. Ages 10 to 69. Chinonso Okoro and E. C. Nwogu, "Application of Population Models to the Adjustment of Age and Sex Data From Developing Countries," *Population Review* 58, no. 1 (2019): 1-19.

j. Jeremy Dickson Gumbo, "Undercounting Controversies in South African Censuses," Ph.D. disseration, University of the Witwatersrand, Johannesburg, South Africa, 2016.

k. Ages 5 to 64. Bupe B. Bwalya, Million Phiri, and Cynthia Mwansa, "Digit Preference and Its Implications on Population Projections in Zambia: Evidence From the Census Data," *International Journal of Current Advanced Research* 4 (2015): 92-97.

Sources: United Nations Statistics Division, 2020 World Population and Housing Censuses as of June 28, 2023; and survey of countries in April 2020; and UNECA, 2020 round of population and housing censuses in Africa, Report E/EC A/STATCOM/7/10, Sept. 15, 2020.

About PRB

PRB BOARD OF TRUSTEES

VISIT WWW.PRB.ORG

Our website offers a wealth of resources about our work and products.

FOCUS AREAS
Explore policy-relevant areas where PRB applies much of its data, research, analysis, and communications expertise.

RESOURCES
Access videos with leading experts, multimedia presentations to draw stakeholders into critical development conversations, analytical Population Bulletins, the *Population Handbook* on demography basics, policy training tools, and visual products like interactive infographics.

DATA
Delve into indicators for the United States and around the world, and view data in map, tabular, or trend graph formats.

WORK WITH PRB
Explore ways to partner with us, apply to one of our fellowships, donate to PRB, and learn about careers with us.

MONTHLY NEWSLETTER
Sign up to receive email announcements about new content and PRB-sponsored seminars and briefings.

PRB is 501 (c)(3) not-for-profit organization awarded four stars by Charity Navigator.

POPULATION BULLETIN • **VOL. 78, NO. 1** • 2024

CENSUS ACROSS AFRICA

USING CENSUS DATA FOR POLICY AND PLANNING

Conducting a population and housing census is costly and time consuming, and the information it reveals can generally inform policy formulation, program implementation, and socioeconomic development. To save time and money, national statistics offices across Africa have made significant efforts to improve census-taking and incorporate technological advances in their processes.

This *Population Bulletin* highlights some of these efforts and shares how researchers are using census data to gain a better understanding of demographics and other characteristics. These research summaries spotlight the breadth of activity being undertaken across the continent to ensure census results can be used in policymaking and program planning. They also demonstrate the many opportunities possible from the 2020 census round in African nations, from the promise of new technologies that support data collection and analysis to the prospect of more effective public planning and services.

PRB

1111 19th Street, NW, Ste 400
Washington, D.C., 20036 USA

800-877-9881
prb.org | @PRBdata

UAPS UEPA

UAPS Secretariat
RIPS/ ISSER Building Complex
University of Ghana
Legon- Accra

+233 (0) 50 1355 686
uaps-uepa.org | @UAPS_UEPA

ISSN 0032-468X