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Editorial

We welcome our readers to Volume 18 of the African Statistical Journal (ASJ). The Journal's mission since its inception remains the same: to serve as a forum and common platform, to share ideas on statistical development in Africa and to stimulate discussion and dialogue on key emerging issues. We reach out not only to statisticians inside and outside the continent, but to all stakeholders who are working to secure a prosperous, equitable, and sustainable future for the African citizenry.

The first article of this volume is entitled *"The Reliability of Africa's National Accounts Statistics."* Its findings form part of AfDB's ongoing statistical capacity building program, which started in 2004 to assist Regional Member Countries (RMCs) to develop sustainable statistical systems. The results are based on a second survey executed by the African Development Bank to assess economic statistics and practices across the continent with a focus on the methods and practices used to compile national accounts. The two surveys undertaken in 2013 examined each country's level of compliance with international norms, definitions, standardization of concepts, recommendations and guidelines—in particular its adherence to the System of National Accounts (SNA). The second survey confirmed that African national accounts were comparable in their reliability to those of the rest of the world. This finding was reaffirmed by the robustness of the results of ICP-Africa 2011, which is aligned to SNA requirements. The results of the survey should therefore instill confidence and transparency in the quality of GDP data produced by the national statistical systems in Africa, assessed against international norms. The findings from the surveys came into the public domain and formed the main focus of our special edition on economic statistics in the ASJ, Volume 17.

The second article *"Measuring Progress toward Attainment of the Health-related Millennium Development Goals in Cameroon"* shifts the discussion from how to measure African economies in terms of their GDP, to measuring progress in health-related areas, specifically for three Millennium Development Goals—MDG4 (Reducing under-5 child mortality ratio), MDG5 (Improving maternal health) and MDG6 (Combatting HIV, malaria and other diseases). The paper proposes a composite index, namely the Health-related Millennium Development Goals Composite Index (HMCI), as a tool for evaluation and monitoring purposes. Now that the MDGs' sunset date of 2015 has arrived, it is clear that Cameroon still has some way to go before all three health-related MDGs can be achieved. Nonetheless, between 2004 and 2011, progress toward attainment of these three MDGs improved from 58.2 percent to 68.5 percent. The paper posits that this result could have been improved if health-related public expenditure were

better tracked in terms of quality and quantity, and if health facilities were built and equipped all over the country. However, the government made good on its commitment to align its development strategy to the MDGs, which it has since adopted as the overarching national development policy and strategy-guiding framework.

The third article entitled "*Impact of Smoking on Food Expenditure among Tanzanian Households"* employs data from the Household Budget Survey for the period 2007/8 in Tanzania, using a nationally representative sample of 10,464 households. The article examines the relationship between per capita cigarette smoking and per capita total (food plus cigarette/tobacco) expenditure. It establishes that for every cigarette consumed, per capita food expenditure decreased by 67.7 Tanzanian shillings. On average, expenditure on cigarettes and tobacco represents 7.7 percent of total food plus cigarette and tobacco expenditure—a significant amount. About 10.8 percent of smokers spend more than 12 percent of their food expenditure on cigarettes and tobacco. Moreover, urban residents tend to spend more than their rural counterparts. People who smoke and belong to high-income groups (interaction effect) tend to spend less on food. People who are less educated, who are rural dwellers with a large household size—that is, poor people—tend to spend less on food.

The fourth and final article, entitled *"Prior Academic Attainment as a Predictor of Undergraduate Level Achievement: A Panel Data Analysis,"* is based on an enquiry of all enrollees at the School of Statistics and Planning, Makerere University, for the period 2007–2009. Unlike other studies, which rely principally on cross-sectional data, this investigation used multi-dimensional data—panel data—to investigate this issue further. In addition to confirming prior academic attainment as a contributing factor to variations in academic achievement, the article reveals that 85 percent of the variance in the achievement was due to differentials across students. Thus, measures for assessing the competence of candidates on undergraduate programs should consider variations in: (i) characteristics of enrollees; (ii) the undergraduate programs applied for; and (iii) the academic grades attained in prior studies, particularly grades in the Advanced Level of secondary education.

We hope that you will find this volume of the ASJ both informative and stimulating. We would like to thank the contributors and the reviewers, as well as all those who have made this volume a reality. We encourage the African Statistical Community to continue using the ASJ as an authoritative forum for sharing knowledge, particularly as we enter a new era where

Big Data and the Data Revolution will be driving sustainable development, going forward.

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Éditorial

Nous invitons nos lecteurs à découvrir le volume 18 du Journal africain de statistiques (ASJ). La mission du Journal depuis sa création reste le même: servir de forum et de plate-forme commune, de partager des idées sur le développement statistique en Afrique et à stimuler la discussion et le dialogue sur les questions émergentes clés. Nous faisons appel non seulement pour les statisticiens à l'intérieur et à l'extérieur du continent, mais à tous les intervenants qui travaillent pour assurer un avenir prospère, équitable et durable pour les citoyens de l'Afrique.

Le premier article de ce volume est intitulé *"La fiabilité des statistiques des comptes nationaux de l'Afrique".* Ses conclusions font partie des statistiques programme de renforcement des capacités en cours de la BAD, qui a commencé en 2004 pour aider les pays membres régionaux (PMR) pour développer des systèmes statistiques durables. Les résultats sont basés sur un deuxième sondage réalisé par la Banque africaine de développement pour évaluer les statistiques et les pratiques économiques à travers le continent avec un accent sur les méthodes et les pratiques utilisées pour compiler les comptes nationaux. Les deux enquêtes menées en 2013 ont examiné le niveau de conformité avec les normes internationales, de définitions, de la normalisation des concepts, des recommandations et des lignes directrices de chaque pays – en particulier son adhésion au Système de comptabilité nationale (SCN). La deuxième enquête a confirmé que les comptes nationaux africains étaient comparables dans leur fiabilité à ceux du reste du monde. Cette constatation a été réaffirmée par la robustesse des résultats de PCI-Afrique 2011, qui est aligné sur les exigences du SCN. Les résultats de l'enquête devraient donc inspirer la confiance et la transparence dans la qualité de PIB produite par les systèmes statistiques nationaux en Afrique, évalués par rapport aux normes internationales. Les résultats des enquêtes sont venus dans le domaine public et ont formé l'objectif principal de notre édition spéciale sur les statistiques économiques dans l'ASJ, Volume 17.

Le deuxième article *"Mesurer les progrès vers la réalisation des objectifs du Millénaire pour le développement liés à la santé au Cameroun"* déplace la discussion de la façon de mesurer les économies africaines en termes de leur PIB, à mesurer les progrès accomplis dans les domaines liés à la santé, en particulier pour trois objectifs du Millénaire pour le développement – OMD 4 (Réduction des taux de mortalité des moins de 5 enfants), l'OMD 5 (Améliorer la santé maternelle) et l'OMD 6 (lutte contre le VIH, le paludisme et d'autres maladies). Le document propose un indice composite, à savoir un Indice composite sur les objectifs du Millénaire pour le développement liés à la santé (HMCI), comme un outil d'évaluation et de surveillance. Maintenant que la fin des OMD de 2015 est arrivée, il est clair que le

Cameroun a encore du chemin à parcourir avant que les trois OMD liés à la santé peuvent être atteints. Néanmoins, entre 2004 et 2011, les progrès vers la réalisation de ces trois OMD ont amélioré de 58,2 pour cent à 68,5 pour cent. Le document avance que ce résultat aurait pu être amélioré si les dépenses publiques liées à la santé ont été mieux suivis en termes de qualité et de quantité, et si les établissements de santé ont été construits et équipés de tout le pays. Toutefois, le gouvernement a fait bon sur son engagement à aligner sa stratégie de développement pour la réalisation des OMD, qui a depuis adopté comme politique nationale de développement globale et le cadre de la stratégie de guidage.

Le troisième article intitulé "*L'impacte du tabagisme sur les dépenses alimentaires entre les ménages tanzaniens*" utilise des données de l'Enquête sur le budget des ménages pour la période 2007/8 en Tanzanie, en utilisant un échantillon national représentatif de 10,464 ménages. L'article examine la relation entre les dépenses de cigarettes par personne et les dépenses totales (aliments et cigarettes/tabac) par habitant. Il établit que, pour chaque cigarette consommée, les dépenses alimentaires par habitant ont diminué de 67,7 shillings tanzaniens. En moyenne, les dépenses sur les cigarettes et tabac représentent 7,7 pour cent des dépenses totales sur la nourriture plus la cigarette et tabac – un montant significatif. Environ 10,8 pour cent des fumeurs dépensent plus de 12 pour cent de leurs dépenses alimentaires sur les cigarettes et tabac. En outre, les résidents urbains ont tendance à dépenser plus que leurs homologues ruraux. Les gens qui fument et qui appartiennent à des groupes à revenu élevé (effet d'interaction) ont tendance à dépenser moins pour la nourriture. Les gens qui sont moins instruits, qui sont les ruraux avec une grande taille du ménage – c'est à dire, les personnes pauvres – ont tendance à dépenser moins pour la nourriture.

Le quatrième et dernier article, intitulé *"Scolarité académique antérieure comme un prédicteur de réussite des étudiants du premier cycle universitaire: Une analyse des données de panel"* est basé sur une enquête de tous les inscrits à l'école de la statistique et de la planification, de l'Université de Makerere, pour la période 2007-2009. Contrairement à d'autres études, qui reposent principalement sur des données transversales, cette enquête a utilisé des données multi-dimensionnelle – données de panel – d'enquêter sur cette question. En plus de confirmer les résultats scolaires antérieurs comme un facteur contribuant aux variations de la réussite scolaire, l'article révèle que 85 pour cent de la variance dans la réalisation était due aux différences entre les élèves. Ainsi, des mesures pour évaluer la compétence des candidats sur les programmes de premier cycle devrait tenir compte des variations dans: (i) les caractéristiques des inscrits; (ii) les programmes de premier cycle

demandées; et (iii) les grades académiques atteints dans les études antérieures, en particulier les grades dans le niveau élevé de l'enseignement secondaire.

Nous espérons que vous trouverez ce volume de l'ASJ à la fois instructif et stimulant. Nous tenons à remercier les contributeurs et les examinateurs, ainsi que tous ceux qui ont fait de ce volume une réalité. Nous encourageons la communauté statistique africaine de continuer à utiliser l'ASJ comme un forum faisant autorité pour le partage des connaissances, en particulier quand nous entrons dans une nouvelle ère où les grandes bases des données et la révolution des données seront au volant d'un développement durable à l'avenir.

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1. The Reliability of Africa's National Accounts Statistics

Statistical Capacity Building Division, Statistics Department of the AfDB[1]

Abstract
Recent major revisions by some African countries to their estimates of Gross Domestic Product (GDP) have raised questions about the reliability of Africa's national accounts statistics. In response, the African Development Bank carried out two surveys in 2013 to investigate the sources and methods underlying Africa's GDP estimates. The first survey was conducted in March, to which 44 of the total 54 Regional Member Countries (RMCs) responded; its results were published in June. A more detailed second survey was launched in August 2013. This paper summarizes the findings of the second survey. The survey questionnaire was sent to all 54 RMCs, and all but three responded. Countries were asked about the compilation of GDP at current and constant prices, the establishment and maintenance of statistical business registers, the coverage and measurement of informal activities, and the estimation of imputed rents of owner-occupiers by the User Cost Method. Based on their answers, countries were ranked according to 50 Quality Factors that are likely to affect the overall reliability and usefulness of the national accounts. In general, richer countries have the highest quality score with poorer countries emerging lower in the rankings. However, there are several striking exceptions, which suggests that the quality of a country's national accounts may also be influenced, at least in part, by political decisions and the resources allocated by governments to statistical development. What is clear is that the technical methodologies and general approach of African and OECD countries do not differ greatly. The striking difference is that OECD countries can draw on a rich supply of basic data from administrative sources and surveys; African countries, by contrast, are data-poor. Nonetheless, given the constraints facing many national statistical systems, African countries are managing to compile national accounts commensurate with the resources available to them in terms of accuracy and timeliness. The paper ends with recommendations for improving Africa's national accounts statistics.

Key words: *Gross Domestic Product, Quality Factors, User Cost Method, Supply and Use Tables.*

Résumé
Les révisions majeures récentes de certains pays africains à leurs estimations du produit intérieur brut (PIB) ont soulevées des questions sur la fiabilité des statistiques des comptes nationaux de l'Afrique. En réponse, la Banque africaine de

1. This article was prepared by the Statistical Capacity Building Division of the Statistics Department of the African Development Bank, under the leadership of Oliver J. M. Chinganya.

développement a réalisé deux enquêtes en 2013 pour enquêter sur les sources et les méthodes qui sous-tendent les estimations du PIB de l'Afrique. La première enquête a été menée en mars, à laquelle 44 de l'ensemble des 54 pays membres régionaux (PMR) ont répondu; ces résultats ont été publiés en juin. Une deuxième enquête plus détaillée a été lancée en août 2013. Ce document résume les conclusions de la deuxième enquête. Le questionnaire a été envoyé à tous les 54 PMR, et tous sauf trois ont répondu. On a demandé aux pays des détails sur la compilation du PIB à prix courants et constants, la mise en place et l'entretien des registres statistiques des entreprises, la couverture et l'évaluation des activités informelles, et l'estimation des loyers imputés des propriétaires-occupants par la méthode du coût de l'utilisateur. Basé sur leurs réponses, les pays ont été classés en fonction de 50 facteurs de qualité qui sont susceptibles d'affecter la fiabilité globale et l'utilité des comptes nationaux. En général, les pays riches ont le score le plus élevé de qualité avec les pays les plus pauvres émergents au plus bas dans les classements. Cependant, il existe plusieurs exceptions frappantes, ce qui suggère que la qualité des comptes nationaux d'un pays peut également être influencée, au moins en partie, par des décisions politiques et les ressources allouées par les gouvernements au développement statistique. Ce qui est clair est que les méthodologies techniques et l'approche générale des pays africains et de l'OCDE ne diffèrent pas beaucoup. La différence frappante est que les pays de l'OCDE peuvent compter sur un approvisionnement riche de données de base provenant de sources administratives et des enquêtes; Les pays africains, en revanche, ont des données limitées. Néanmoins, compte tenu des contraintes auxquelles sont confrontées de nombreux systèmes statistiques nationaux, les pays africains parviennent à établir des comptes nationaux par rapport avec les ressources à leur disposition en termes de précision et de rapidité. Le document se termine par des recommandations pour améliorer les statistiques des comptes nationaux de l'Afrique.

Mots clés : *produit intérieur brut, les facteurs de qualité, la méthode du coût d'usage, tableaux des ressources et des emplois.*

1. INTRODUCTION

In March 2013, the African Development Bank (AfDB) carried out a survey to assess the reliability of Africa's national accounts statistics. A questionnaire was sent to its 54 Regional Member Countries (RMCs) to determine the sources and methods underlying their estimates of gross domestic product (GDP). Forty-four countries responded. Their replies were analyzed and the results published in June 2013.[2] That survey is referred to in the paper

2 *Situational Analysis of Economic Statistics in Africa: Focus on National Accounts*, African Development Bank, June 2013.

as the first survey. A second survey, with a more detailed questionnaire, was undertaken shortly after publication of the first survey report. It focused on GDP compilation, statistical business registers, informal activities, and the estimation of rents by the user cost method. The response rate to this second survey was higher, with 51 countries completing the questionnaire; the three non-respondent countries were Eritrea, Libya, and Somalia. The results of the second survey are presented in this paper.

This paper has seven parts. Following this introductory first part, parts 2 to 5 follow the structure of the questionnaire. They analyze the replies from countries regarding their methods of calculating current and constant price GDP from the production side and the expenditure side; how they construct and update their statistical business registers; their coverage and data sources for the informal sector; and their utilization of the user cost method for imputing rents to owner-occupiers. In Part 6, the information provided in the first and second surveys is used to rank countries according to 50 Quality Factors (QFs). Because the Quality Factors are drawn from both surveys, only the 44 countries that completed both questionnaires are ranked. Finally, Part 7 presents some recommendations based on the two surveys for further improvement of national accounts in Africa.

Parts 2, 3, 4 and 5 identify current best practices from a conceptual point of view. They describe the practical solutions that countries have adopted and which come closest to meeting the conceptual ideal. It is important that national accounts compilers have a clear idea of what is supposed to be measured, even if the paucity of basic data means that approximate methods or proxies have to be used. All countries, including the countries that pioneered the compilation of national accounts—namely, the United States, France, the United Kingdom, and the Netherlands—are still refining their estimation procedures and improving their data sources. The 51 African countries reviewed in this paper are in the same situation, although they have further to go as regards the collection of basic data from surveys or administrative sources.

2. METHODS FOR COMPILING GDP(P) AND GDP(E) AT CURRENT AND CONSTANT PRICES

2.1 Introduction

Computers have transformed the calculation of national accounts, and in so doing have superseded the traditional use of spreadsheets such as Excel. Computer software has been developed to help estimate GDP, while

facilitating the use of balanced Supply and Use Tables (SUTs) on a regular basis. In the developing world, African countries have been at the forefront of adopting computerized procedures and SUTs to compile national accounts. In this part of the paper, we review these approaches to compiling national accounts before going on to describe more traditional techniques.

2.2 Computer models for estimating GDP

Twenty-one African countries reported using a computer model to obtain their GDP estimates (see Table 1), although such models vary. Angola uses a system developed by a Brazilian expert; Malawi uses a system from Statistics Norway; and Namibia reported using a computer model, but did not specify its origin. The other 18 countries use ERETES.[3] ERETES is a computer system designed to help national accountants compile the Integrated Sector Accounts (ISA) and SUTs consistent with the United Nations System of National Accounts (SNA). Some less-developed African countries still follow SNA1993, whereas others are transitioning to SNA 2008. It was developed by the French national statistical office (INSEE) and Eurostat, and is currently used by 30 countries globally, 18 of which are in Africa.[4] Algeria, the Comoros Islands, and Mauritius are expected to adopt ERETES in the near future.

Although the objective of ERETES is to generate SUTs and the ISA, it can also be used by countries that have limited data resources. The minimum data requirements are an enterprise survey, a household budget survey, foreign trade statistics, government accounts, balance of payments, and banking statistics. With these data, ERETES can help countries to generate current price estimates of GDP. If price or volume indices are available, constant price estimates of GDP can also be obtained. Information on intermediate consumption and on trade and transport margins is required to produce SUTs. A module designed to estimate informal sector value added requires additional data on the total labor force by type of activity. Thus, the fact that a country reported using ERETES does not necessarily mean that it is using ERETES to estimate both SUTs and ISA; some may be using it to estimate GDP without going any further.

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3 ERETES is the French acronym for ***E**quilibre **R**essources-**E**mplois et **T**ableaux **E**ntrées-**S**orties* (Supply-Use Balances and Input-Output Tables). Spanish and English versions of the ERETES system are available, but there are no Spanish or English versions of the acronym, and "ERETES" is used in all languages.

4 ERETES is jointly owned by Eurostat and the French Foreign Ministry (Ministère des Affaires étrangères français). See http://www.eretes.net/FR/index.htm for further information.

Computer systems for national accounts use the accounting identities of the SNA to confront and adjust data coming from different sources. Data confrontation—i.e. comparing data derived from different sources, especially those of different frequencies, to assess their coherence—and adjustment are essential elements of the compilation of national accounts. In the past, this was done manually, but it is quicker and more accurate to use specially designed computer software. The main advantage of ERETES over other computer systems is that it is supported by a permanent secretariat that can call on a group of multilingual national accountants and IT experts who have more than a decade of experience applying the system in nearly 30 developing countries. ERETES is also regularly updated and improved; for example, a new module is currently being finalized to provide retrospective estimates.

The fact that a country reports using ERETES—or some other computer system—does not guarantee that its national accounts are comprehensive and reliable. That depends on the reliability and range of source data available. However, use of a computer system such as ERETES ensures that available data are being exploited in the most efficient way possible. Many countries using ERETES employ short-cut procedures to estimate GDP for the most recent period before the more reliable ERETES-based estimates become available. The Democratic Republic of the Congo, for example, explained that estimates for the latest years were extrapolated from ERETES-based estimates for 2005 and 2006. This is an extreme case; ERETES-based GDP estimates are usually only one or two years behind the current year.

2.3 Supply and Use Tables (SUTs)

The SUT equates the supply of goods and services from domestic production and imports with their uses for intermediate consumption or final use—government and household consumption, capital formation, and exports. The rows of the SUT indicate products, while the columns show the various industries that use them. SUTs have proved an excellent mechanism for ensuring that GDP estimates from the production side—GDP(P)—and the expenditure side—GDP(E)—are consistent. Furthermore, the process of balancing supply and use means that the estimates of both are more reliable. Of the countries not using ERETES or a similar system, eight reported that they base their GDP estimates on annual SUTs (see Table 1). However, the SUT usually becomes available only after some delay, and often the latest published estimates are not based on the SUT and will be revised when the SUT has been compiled. The first AfDB survey report showed that the SUT for 2011 was available in Senegal and South Africa, but in the other countries the most recent SUT pertained to 2010 or earlier.

Table 1 lists the countries that use either a computer model or SUT. The 22 countries using neither are shown in the third column. The remainder of Part 2 focuses on the methods used by these 22 countries to estimate GDP at current and constant prices.

Table 1. Countries basing estimates on computer model or Supply and Use Table (SUT)

Computer model	Supply and Use Table (SUT)	Not currently using computer model or SUT
Angola	Algeria	Botswana
Benin	Cabo Verde	Comoros Islands
Burkina Faso	Guinea	Djibouti
Burundi	Guinea Bissau	Egypt
Cameroon	Madagascar	Ethiopia
Central African Republic	Mozambique	Gambia
Chad	Senegal	Ghana
Congo Republic	South Africa	Kenya
Côte d'Ivoire		Lesotho
Congo, Dem. Rep.		Liberia
Equatorial Guinea		Mauritius
Gabon		Nigeria
Malawi		Rwanda
Mali		Seychelles
Mauritania		Sierra Leone
Morocco		Sudan
Namibia		South Sudan
Niger		Swaziland
São Tomé and Príncipe		Tanzania
Togo		Uganda
Tunisia		Zambia
		Zimbabwe

2.4 GDP(P) at current prices

Three countries—Botswana, Djibouti, and Mauritius—reported that their estimates of GDP(P) at current prices are obtained directly using data for the current year; this is the preferred method. The Comoros Islands obtain current price estimates indirectly by deflating constant price estimates.

Other countries reported that they use direct methods for some activities and indirect methods for others. For example, value added in agriculture may be estimated at constant prices by extrapolating the previous year's estimate using an output indicator; current price value added is then obtained by inflating the constant price estimate by the price increase. On the other hand, for manufacturing, most countries use direct information on output and intermediate consumption.

2.5 GDP (E) at current prices

Household Final Consumption Expenditure (HFCE) is the largest expenditure component of GDP, often accounting for 60 percent or more of the total. Nearly two-thirds of countries (33) reported that they base their estimates on a household expenditure survey, although typically these surveys are conducted only once every five years or even less frequently. For years between benchmarks, HFCE may be extrapolated, often by the population growth rate and the consumer price index, or derived as a residual. HFCE is derived as a residual by deducting government expenditure, capital formation, and net exports from GDP(P). Residual estimates of this kind include errors and omissions, and often net change in inventories. Seven countries (the Gambia, Rwanda, Sierra Leone, South Sudan, Swaziland, Tanzania, and Zimbabwe) estimate HFCE as a residual for years between benchmarks for which expenditure data are not available from household surveys.

Fourteen countries reported that they use the commodity flow method to estimate the building and construction component of Gross Fixed Capital Formation (GFCF) (see Table 2). The commodity flow method involves first estimating the supply, from domestic production and imports, of the main building materials such as bricks, cement, sand, aggregate, reinforcing rods, roofing material, window glass, etc. Mark-ups are added to cover the value of less important building materials, product taxes, trade and transport margins, hire of building equipment, labor costs, operating surplus, and other overhead costs. Information collected for the 2011 round of the International Comparison Program suggests that, on average, materials make up about 40 percent of the total costs of completed building and construction projects. Mark-ups, therefore, account for at least 60 percent of total costs. Government public works departments are usually able to supply some information on mark-ups; other sources may be trade associations or quantity surveyors. However, mark-ups vary over time, and in any given year, they depend on the mix between different types of buildings and civil engineering projects. The commodity flow method, therefore, provides only an approximate measure of total building and construction.

The commodity flow method is used to estimate total building and construction. All countries have at least information on building and construction expenditures from government accounts and usually also from published enterprise accounts or enterprise surveys. Comoros Islands, Djibouti, the Gambia, Kenya, and Lesotho only have information from government accounts and so can estimate total building and construction by commodity flow, and the subtotal—government building and construction—from government accounts. Other countries can also show expenditures on building and construction by enterprises that publish accounts or are covered in enterprise surveys.

Fourteen countries also use commodity flow to estimate the machinery and equipment component of GFCF (see Table 2). Most African countries import virtually all their machinery and equipment, so the external trade statistics provide an estimate of the supply of machinery and equipment at c.i.f. values. The mark-ups in this case include customs duties and other product taxes, port handling charges, trade and transport margins, and installation and running-in costs to ensure that fixed equipment is ready for use in production. Again, there are many uncertainties in the estimation of mark-ups, and commodity flow can provide only an approximate estimate of total expenditure on machinery and equipment. The Gambia, Rwanda, and Uganda estimate only total expenditure on machinery and equipment by the commodity flow method; the other 11 countries show at least the government component, and usually, expenditures by enterprises as well.

Commodity flow uses the same basic technique as that employed in constructing SUTs—namely, the reconciliation of supply with uses. However, in the SUT, the assumptions about mark-ups are subject to more controls. For example, the assumptions about trade and transport margins on building materials have to be consistent with estimated total trade and transport margins, and the assumptions about customs duties and product taxes have to be consistent with the totals of these taxes collected by government. Although estimates derived from the commodity flow method may be weak because of uncertainties about mark-ups, they have the advantage of being comprehensive in that they can capture GFCF by small informal enterprises which are generally omitted from enterprise surveys. Countries that rely exclusively on information from enterprise surveys and government accounts risk omitting GFCF by small informal producers. Table 2 shows which countries use commodity flow for one or the other of the two GFCF components. It pertains only to the countries not using computer models or SUT. Countries that do use computer models and SUTs are also using the commodity flow method, but in a framework that provides more checks and controls.

Table 2. Methods used to estimate GFCF (excluding countries using a computer model or SUT) for the two components Building & Construction and Machinery & Equipment

Building and Construction		Machinery and Equipment	
Commodity flow	**Government accounts and enterprise survey or accounts**	**Commodity flow**	**Government accounts and enterprise survey or accounts**
Comoros Islands	Botswana	Comoros Islands	Botswana
Djibouti	Egypt	Djibouti	Egypt
Ethiopia	Seychelles	Ethiopia	Seychelles
Gambia	Sierra Leone	Gambia	Sierra Leone
Ghana	South Sudan	Ghana	South Sudan
Kenya	Sudan	Kenya	Swaziland
Lesotho	Swaziland	Lesotho	Tanzania
Liberia	Zimbabwe	Liberia	Zimbabwe
Mauritius		Mauritius	
Nigeria		Nigeria	
Rwanda		Rwanda	
Tanzania		Sudan	
Uganda		Uganda	
Zambia		Zambia	

Change in inventories is a difficult component of GDP(E) for the national accounts compiler. Larger enterprises can be asked about the opening and closing stocks of their main outputs and goods for intermediate consumption, although the reported values may need to be adjusted for holding gains. Information on food and other strategic stocks held by government or public bodies may also be available, but it is almost impossible to collect information on change in inventories held by small retailers and informal producers. Food stocks held by small-holder farmers are rarely measured, although there may be information on changes in livestock herds.

Seventeen countries derive the change in inventories as a residual—that is, as the difference between GDP(P) and the sum of final consumption expenditure, GFCF, and net exports. Derived in this way, change in inventories will also include all statistical discrepancies, which may often be larger than the actual changes in inventories. The other 34 countries reported that they

make explicit estimates for changes in inventories—that is, they are shown separately from the statistical discrepancy (if any).

Countries that compile a SUT, whether or not using ERETES, must make an explicit estimate for changes in inventories, because the supply of each commodity has to be assigned to a specific use—intermediate consumption, final consumption expenditure, GFCF, net exports, or change in inventories. In practice, for some commodities, the SUT compiler will use the change in inventories as a residual category and assign to it any value-positive or negative that is left over when the other uses of the total supply have been identified. Although it may, therefore, be derived as a residual for commodities about which no specific information is available, the fact that it is being done at a detailed commodity level means that it will usually be more accurate than when the change in inventories is derived as a single-figure residual at the GDP level.

Countries that do not base their GDP estimates on a SUT may also make an explicit estimate of the change in inventories, but some of these countries explained that they were incomplete. Ethiopia and Lesotho, for example, include only livestock in changes in inventories.

2.6 GDP(P) at constant prices

GDP(P) at constant prices can be obtained either by deflating GDP(P) in current prices or by extrapolating the estimate for an earlier year using some kind of volume indicator. Both methods may be applied in a number of ways.

Double deflation is the method recommended in the SNA. Output and intermediate consumption are each deflated by their relevant price indices, and constant price value added is obtained as the difference. The price indices used to deflate output should measure changes in the basic or the producers' prices of outputs, and the price indices used to deflate intermediate consumption should measure the purchasers' prices of inputs. Double deflation requires countries to collect a wide range of prices relating to both outputs and inputs and is best carried out within the SUT framework. Eight countries reported that they derive their constant price GDP(P) from a SUT—Cabo Verde, Guinea, Guinea-Bissau, Madagascar, Malawi, Mozambique, Senegal, and South Africa. Countries using ERETES will also use double deflation if they employ the system to generate SUT at constant prices.

Single deflation is widely used by countries that lack information on prices of intermediate inputs. Current price value added is deflated by a price index relating to gross output. Single deflation assumes that the prices

of intermediate inputs change in the same way as the prices of outputs. Most of the 22 countries not using either a computer model or a SUT are likely to be using single deflation for at least some kinds of activities. They include Botswana, Djibouti, Ethiopia, Ghana, Kenya, Lesotho, Nigeria, Rwanda, Sierra Leone, Sudan, Swaziland, Tanzania, Zambia, and Zimbabwe.

Table 3. Percentage of countries using deflation, extrapolation by employment and extrapolation by output indicators by economic activity

Economic activity	Deflation	Employ-ment	Output indicators
Agriculture (excluding forestry and fishing)	68.8	14.6	77.1
Mining and quarrying	62.5	10.4	75.0
Manufacturing	77.1	14.6	70.8
Electricity, gas and water	70.8	18.8	77.1
Building and construction	70.8	22.9	66.7
Passenger transport	72.9	22.9	72.9
Freight transport	66.7	14.6	75.0
Retail and wholesale trade	64.6	20.8	64.6
Communications	75.0	16.7	68.8
Business services	70.8	16.7	52.1
Personal services	64.6	27.1	47.9
Public administration and defense	58.3	37.5	50.0

Extrapolation of the estimate for an earlier year is most commonly made using a volume indicator of output. Tons of grain, numbers of livestock slaughtered, kilowatts of electricity generated, ton-miles of rail freight, and passenger-miles are common examples. These indicators are applied to the value added of the base year or of the previous year. This assumes a constant relationship between the volume of inputs used and outputs produced.

Value added of an earlier year is sometimes extrapolated using changes in the numbers employed. This is most often done for labor-intensive activities such as personal services and public administration.

Five countries reported that they only use deflation methods for the 12 kinds of activity listed in Table 3: Burundi, Cabo Verde, Comoros Islands,

Democratic Republic of Congo, and South Africa. Eight countries reported using extrapolation methods: Chad, Congo, Gabon, Madagascar, Mali, Mozambique, São Tomé and Príncipe, and Uganda. The 38 other countries use both deflation and extrapolation.

Table 3 shows the percentages of countries using deflation, extrapolation by employment, and extrapolation by output indicators.

- More than 70 percent of countries use deflation for manufacturing, passenger transport, and communications;
- More than 20 percent of countries use extrapolation by numbers employed for public administration and defense, personal services, retail and wholesale trade, building and construction, and passenger transport;
- More than 70 percent of countries use extrapolation based on output indicators for agriculture, mining and quarrying, electricity, gas and water, and both passenger transport and freight transport.

2.7 GDP(E) at constant prices

Table 4 shows the percentages of countries using various methods to obtain constant price GDP(E). The percentages exceed 100 percent because more than one method may be used for particular items within each expenditure component.

- Deflation of current price estimates is the most common method used for all components. Consumer price indices (CPIs) are now being compiled by all 51 countries, and the CPI is used to deflate HFCE. GFCF in the form of building and construction and machinery and equipment should be deflated using specific price indices, but several countries do not collect prices relevant to the components of GFCF. In this case, the all-items CPI is generally used for deflation. Deflation of government consumption expenditure is typically carried out using indices of government wages. When these are not available, the all-items CPI is often used.
- Other methods for HFCE are usually extrapolation of an earlier year's estimate using an index of the volume of imports of consumer goods. Other methods for building and construction and for machinery and equipment are also usually extrapolation by the volume of imported building materials and machinery and equipment.

Table 4. Methods used to estimate GDP(E) at constant prices by expenditure component

Expenditure component	%
Household Final Consumption Expenditure (HFCE)	
Deflation of current price estimate	88.4
Extrapolate earlier year using population growth	41.9
Other method	23.3
Government Final Consumption Expenditure (GFCE)	
Deflation of current price estimate	86.0
Extrapolate earlier year using growth of government employment	20.9
Other method	4.7
Building and Construction as part of GFCF	
Deflation of current price estimate	90.7
Other method	14.0
Machinery and Equipment as part of GFCF	
Deflation of current price estimate	95.3
Other method	9.3
Change in inventories	
Deflation of current price estimate	83.7
Other method	9.3

2.8 Statistical discrepancy

If GDP is estimated independently from the production and expenditure sides, there will almost always be a difference between the two independent estimates, which is conventionally described as the *statistical discrepancy*. There will be no statistical discrepancy, however, if the two estimates of GDP are derived via a SUT, or if the change in inventories or HFCE is derived as residuals. The statistical discrepancy is usually presented in the estimates of GDP(E), which is considered to be less reliable than the estimate of GDP(P). Twenty of the 51 countries show a statistical discrepancy, 18 of which show it as a component of GDP(E).

2.9 Conclusions

More than half of African countries use either SUTs or computer models such as ERETES to underpin their GDP estimates. The word "underpin" is used advisedly, because the latest GDP estimates are often based on rapid extrapolation methods, and these estimates may be substantially revised when the definitive estimates become available. Nevertheless, it is clear

that Africa is at least on a par with other developing regions in exploiting computer technology for compiling national accounts. Computer models and SUTs do not guarantee accuracy, but they do ensure that the available data are being efficiently exploited.

OECD countries have been compiling national accounts for more than 50 years, and their GDP estimates are subject to constant appraisal and criticism from policymakers, independent researchers, and economists. Because their national accounts can be taken as reasonably accurate, it is informative to compare African national accounts with those of OECD countries. Two points stand out:

i. The sources and methods used by African countries are similar to those of OECD countries. They use similar techniques such as deflation and extrapolation to obtain constant price estimates and similar statistical sources such as administrative data from customs authorities and government accounts and surveys of households and enterprises. Thus, the technical methodologies and general approach of African and OECD countries do not differ greatly.

ii. The striking difference is that OECD countries can draw on a rich supply of basic data from administrative sources and surveys; African countries, by contrast, are data-poor. Most OECD countries produce household budget data on an annual, or even quarterly, basis. In Africa, household budget surveys are carried out every five years at best. OECD countries have comprehensive annual business surveys with key statistics being supplied every quarter or even monthly, whereas in Africa, an economic census is seen as a major operation to be undertaken, at best, every four or five years. Although agriculture in OECD countries employs few workers and contributes little to GDP, it is closely monitored because farming is heavily subsidized, and detailed information is available on incomes and intermediate inputs. In Africa, where agriculture provides employment for many and may generate up to 30 percent of GDP, agricultural surveys are rare.

In short, African national accountants cannot be criticized for failures on the technical, methodological side. The problem with African GDP estimates is that they have weak empirical foundations. African national accountants are innovative and enterprising in exploiting the available data and use the latest computer technology in doing so; however, that does not make up for the paucity of basic source data, in particular, data from surveys of households, enterprises and agriculture. Such surveys are so infrequent that when new

results become available, the rough estimates that had to be made since the previous survey must be substantially revised. These major revisions cast doubt on the validity of the entire GDP enterprise. In this context, some findings from the first survey are worth repeating here. At the start of 2013, out of 44 countries:

- 21 were using enterprise/business survey statistics that were at least four years out of date;
- 20 were using household expenditure data that were at least four years out of date;
- 12 were using informal sector survey statistics that were at least four years out of date;
- 11 were using agricultural survey statistics that were at least four years out of date;
- 10 were using household labor force statistics that were at least four years out of date.

3. STATISTICAL BUSINESS REGISTERS

3.1 Introduction

A well-maintained Statistical Business Register (SBR) is essential for carrying out the enterprise surveys that provide one of the key inputs for the national accounts. Developing or improving SBRs is one of the goals of five-year National Strategies for Statistics (NSSs) in most African countries. Recognizing the importance of SBRs, the Statistical Capacity Building Division of the Statistics Department of the AfDB has conducted a series of workshops and consultations on SBRs in Africa and has recently published its new "Guidelines for Building Statistical Business Registers in Africa". In the survey, the term SBR was understood by respondents to mean any form of register of enterprises/ businesses/ establishments used for statistical purposes, regardless of its quality and usage. It may or may not provide the required coverage and it may or may not be well-maintained. Therefore, the findings may not necessarily reflect the context and spirit in which the new "Guidelines for Building Statistical Business Registers in Africa" have been developed.

An SBR cannot cover every enterprise in a country. As defined by the SNA, enterprises include unincorporated business of all kinds, even including owner-occupiers who are treated as unincorporated entrepreneurs selling dwelling services to themselves and their families. In addition, enterprises include a vast range of small, informal businesses such as street traders, mobile food vendors, shoe-cleaners, repair services, tailoring, and so on. It

is not possible in practice to keep track of all informal enterprises of this kind, many of which may be in business for only a few months. The SBR is therefore confined to larger, formal enterprises. These are usually enterprises that have a fixed address, pay taxes, and hold some kind of official license or permit to do business. Although formal enterprises of this kind may account for only a small fraction of the total number of enterprise in a country, they usually account for most of total value added. Without proper records of the addresses, size, and kinds of activity of these formal enterprises, it is not possible to correctly measure a country's GDP.

The information in the SBR varies from country to country, but at a minimum will include address and contact information, kind of activity, or main products produced or sold. Ideally, the SBR also contains information on legal form, number of separate establishments, value of sales or output, and number employed in a recent year. Information on the size of enterprises (as measured by output or employment) is required to design sample surveys. Those in the largest size category will usually all be selected with certainty, while those in smaller size categories can be selected with decreasing probabilities.

3.2 Sources for SBRs in Africa

Table 5 shows the sources used to establish and maintain SBRs in Africa. The percentages exceed 100 percent because most countries use several of the sources listed.

- Information from the tax authorities is used by over 75 percent of countries. These may be enterprises registered for value added, sales or income taxes.
- Other sources often consist of a social security administration. This is common for francophone countries, notably, Algeria, Cabo Verde, Togo, and Tunisia. As their other sources, Congo and Côte d'Ivoire reported the *Déclaration statistique et fiscale* (Statistical and Tax Declaration). This is a system developed by the French INSEE, whereby all enterprises registered for tax purposes are assigned a single registration number that is used by the tax authorities and the statistical office. Senegal, Mauritius, and Liberia described their "other sources" as a company registrar at the national or local authority level.
- More than half the countries also use membership lists of trade associations or chambers of commerce.
- Fewer countries use telephone directories or advertisements in the press or in trade journals. Such sources are mainly used as occasional checks on the completeness of the SBR and are not the main source of the SBR.

Table 5. Main sources used to establish statistical business registers; responses from survey

What is the source for your business register? (Tick all sources that apply)	%
Information from tax authorities (enterprises paying VAT or income tax)	77.1
Membership lists from trade associations or chambers of commerce	56.3
Telephone directories (yellow pages)	20.8
Advertisements in press or trade journals	12.5
Other	60.4

3.3 Single or multiple sources?

Fifteen countries use only a single source for their SBR, most often the tax authority or the social security administration. Use of multiple sources raises the risk of duplication if an enterprise has more than one address or more than one name, or if it changes its address or name. If a source such as the list of VAT payers is known to be comprehensive and up-to-date, use of that source alone is generally the best practice. However, if all available sources are thought to be deficient in some way, the use of multiple sources as crosschecks is clearly to be recommended. In addition, a single source is not likely to provide all the information ideally required for an SBR.[5]

Table 6 shows the numbers of sources used. Most countries use two or three, one of which is usually the tax authority or social security administration. Nine countries reported using four or five of the sources listed in Table 5.

5 The problem of using multiple sources is illustrated by the following example. Statistics South Africa's business register, referred to as the Business Sampling Frame (BSF), was designed to be based on value added tax (VAT) data. In 2006, SSA attempted to improve coverage by adding enterprises based on income tax (IT) returns. Because the VAT and IT systems do not share a common identification system, and because the routines that match records based on name and address information cannot achieve perfect results, a large number of duplicate enterprises were created in the BSF. As a result, the decision was made to revert to the production of frames from enterprises based on VAT records, with IT records simply being used to provide supplementary information.

Table 6. Number of sources used for statistical business register by country

No Information	One source	Two or three sources	Four or five sources
Comoros Islands	Benin	Angola	Algeria
Malawi	Congo Republic	Burkina Faso	Botswana
Namibia	Côte d'Ivoire	Burundi	Chad
	Egypt	Cameroon	Djibouti
	Equatorial Guinea	Cabo Verde	Gambia
	Liberia	Central African Republic	Kenya
	Madagascar	Congo Dem. Rep.	Lesotho
	Mozambique	Ethiopia	Swaziland
	Morocco	Gabon	Togo
	São Tomé and Príncipe	Ghana	
	South Africa	Guinea	
	South Sudan	Guinea-Bissau	
	Sudan	Mali	
	Senegal	Mauritania	
	Tanzania	Mauritius	
		Niger	
		Nigeria	
		Rwanda	
		Seychelles	
		Sierra Leone	
		Tunisia	
		Uganda	
		Zambia	
		Zimbabwe	

3.4 Types of enterprises in the statistical business register

All SBRs cover private corporate enterprises, and 90 percent also include private unincorporated enterprises. These are enterprises that are included with the household sector in the SNA, but that are large enough to be included in a tax register or affiliated to social security. Non-profit institutions

include religious organizations and the schools and clinics which they often support. These are found in most African countries, but nearly 40 percent of countries do not include them in their SBR.

Table 7. Types of enterprises covered by statistical business register

What kinds of enterprises are covered?	%
Private corporate enterprises	100.0
Private unincorporated enterprises	89.8
State-owned enterprises	93.9
Non-profit institutions	61.2

3.5 Updating the statistical business register

Table 8 shows how often SBRs are updated. Fifty-three percent of countries update their SBR annually, 14 percent more frequently, and 16 percent less frequently. A quarter of countries update their SBR whenever new information becomes available, which is usually when business or enterprise surveys provide information on changes to contact information, type of economic activity, numbers employed, value of sales or output, etc. Four countries reported that they do not regularly update their SBR: Central African Republic, Democratic Republic of the Congo, South Sudan, and Zambia. These countries may, of course, delete enterprises from their SBR when they cease replying to surveys, but they have apparently not yet established a regular procedure for updating the SBR.

Table 8. Frequency of statistical business register updating

How often is the business register updated?	%
Monthly	10.2
Quarterly	4.1
Yearly	53.1
Every two or more years	16.3
Whenever new information becomes available	24.5
Not regularly updated	8.2

In many European and North American countries, statistical offices conduct regular business register surveys. Questionnaires are sent to all enterprises on the SBR to determine: if they are still operating; if the nature of the business has changed; the latest information on numbers employed, sales and turnover; and changes in contact information. Sixteen countries reported

that they regularly carry out a survey of this kind: Algeria, Benin, Burundi, Cameroon, Ethiopia, Gabon, Kenya, Malawi, Morocco, Mozambique, Niger, Nigeria, Sierra Leone, Tanzania, Tunisia, and Zimbabwe.

3.6 Conclusions

If the SBR is defective—because it includes enterprises that are no longer trading, excludes newly created enterprises, or contains incorrect data on enterprise size or kind of activity—it will not provide a proper frame for censuses or sample surveys of enterprises. The survey strongly suggests that many countries have problems maintaining a comprehensive up-to-date SBR. The main issues revealed by the survey are:

- Fifteen countries rely on a single source for their SBR. While it is good practice to use a single source as the main pillar for the SBR, other sources should also be used to cross-check and supplement the SBR. In addition, no single source is likely to contain all the enterprise information that should be included in the SBR.
- The SBR should be reviewed and updated on a regular basis (at least annually). One-third of the 51 countries do not do this, probably because they do not have enough skilled staff. In OECD countries, several staff members may be assigned to SBR maintenance. While this is not practical for most African countries, at least one senior statistician should be charged with the review and updating of the SBR.
- The coverage of the SBR is deficient in several countries. The SBR should not be confined to corporate enterprises, but should also include large unincorporated enterprises and non-profit institutions serving households.
- The best practice is to conduct an annual survey of all enterprises on the SBR to determine: if they are still operating; if the nature of the business has changed; the latest information on numbers employed, sales and turnover; and changes in contact information. Only 15 countries currently carry out such surveys.

The AfDB's guidelines on SBRs will help countries to meet these challenges. For many countries, new staff will have to be recruited for this work or existing staff will have to be reassigned. Developing and maintaining the SBR is a priority for many countries.

4. INFORMAL ACTIVITIES

4.1 Introduction

Informal economic activities are widespread throughout Africa, as indeed they are in much of Asia and Latin America. In these regions, most of the non-agricultural population survives by running small family businesses or one-person enterprises that provide goods and services, such as selling fruit and vegetables on the street, building and repairing dwellings, selling meals and drinks from fixed locations or from mobile carts, recycling waste paper and plastics, transporting goods and passengers by motorized vehicles or pedal power, shining shoes, repairing bicycles and mopeds, and hairdressing or beauty treatments. Although the value added generated by enterprises engaged in any one of these activities may be quite small, their total value added constitutes a substantial part of total GDP. Statistics presented below show that informal activities of this kind contribute 20 to 30 percent to the GDP of many African countries.

The SNA 2008 was the first version of the SNA to include a chapter discussing informal/non-observed/underground activities in the GDP.[6] This led some observers to conclude that such activities were not to be covered in GDP, according to previous versions of the SNA. This is wrong—previous versions did not distinguish between informal and formal production, but make it clear that all types of production are to be included, regardless of whether they take place in large corporate enterprises that keep full written accounts, in small family businesses, or in one-person enterprises that may keep no records of incomes and outlays. With a few exceptions, African countries now try to include these activities in their GDP estimates, although there are many difficulties in ensuring full coverage. Better measurement of the informal sector has emerged as a key issue for national accounts experts in all developing countries.

4.2 Coverage of informal activities

Table 9 shows the percentage of the 51 countries that try to cover 17 common types of informal activities in their GDP estimates. Of course, covering them does not mean that they are being accurately measured. However, the high percentages for almost all the activities listed show that national accountants in Africa are aware of the requirement to cover informal activities and are trying, often with limited resources, to comply with the SNA definition of economic activities.

6 Chapter 25 of the *System of National Accounts, 2008*.

Table 9. Percentage of countries that include informal activities in their GDP estimates

Does your GDP from the production side include value-added in these kinds of activities when they are carried out by small informal family businesses or by unincorporated enterprises?	**%**
Hairdressing and beauty treatments	88
Preparing and selling food and drinks from fixed location	86
Building, including repairs to dwellings	84
Passenger transport by taxis, mini-buses, mammy-wagons, rickshaws, motor-bikes	82
Repairing bicycles, scooters, and motor cars	82
Repairing household equipment	82
Tailoring, altering or repairing clothing	80
Repairing shoes	80
Kiosks and small shops	78
Preparing and selling food and drinks from mobile carts	76
Goods transport by motorized vehicles, animal-drawn carts, by bicycle or on foot	75
Weaving textiles, rugs, and carpets	75
Shoe cleaning	75
Street markets	73
Laundering	73
Recycling waste (paper, plastics, bottles, metal, etc.)	59
Fortune telling	41
Other activities	37

In addition to the 17 activities specified in Table 9, 19 countries reported that they also cover some other activities. These included slaughtering sheep and goats (Algeria), manufacturing jewelry, leather goods, and traditional medicines (Senegal), hunting, mining gravel and sand, illegal brewing and distilling (Togo), and boat transport (Equatorial Guinea).

Comoros Islands, Guinea-Bissau, Madagascar, South Sudan, and Sudan reported that they do not currently make estimates for any of these informal activities, although Madagascar explained that it will do so in its forthcoming revised estimates. Six or fewer of the listed activities are included in GDP in:

- *Tanzania*: only building, including repairs to dwellings.

- *Seychelles*: only hairdressing and beauty treatments and preparing and selling food and drinks from a fixed location or from mobile carts.
- *Djibouti*: only hairdressing and beauty treatments; passenger transport by taxis, mini-buses, mammy-wagons, rickshaws, motor-bikes; preparing and selling food and drinks from a fixed location; and repairing bicycles, scooters, and motor cars.
- *Equatorial Guinea*: building, including repairs to dwellings; passenger transport by taxis, mini-buses, mammy-wagons, rickshaws, motor-bikes; preparing and selling food and drinks from a fixed location or from mobile carts; hairdressing and beauty treatments; and, under other activities, boat transport.

Other countries that include ten or fewer of the activities are: Malawi (7), São Tomé and Príncipe (9), and Congo (10).

Seychelles is one of the richer African countries, and the two informal activities it covers may account for almost all informal value added. Nonetheless, it seems clear that the GDPs of all the other aforementioned countries are being underestimated, possibly by a large extent.

4.3 Data sources for the informal sector

Table 10 shows the data sources used by the 51 countries. The top panel lists sources aimed specifically at the informal sector. The bottom panel refers to other surveys that may also provide information on informal employment or value added.

Table 10. Data sources for informal activities

Since 2000, have you carried out any surveys of the following focused on employment or value added in the informal/non-observed economy?	**%**
Multi-phase 1-2 survey?	33
Multi-phase 1-2-3 survey?	29
Some other kind of informal sector survey?	12
Is the survey carried out each year?	4

Do you collect information on informal/non-observed employment or value added in any of these surveys?	**%**
Household income and expenditure survey	73
Household labor force survey	67
Living Standards Measurement Survey (World Bank)	29
Enterprise survey	43
Other surveys	14

Multi-phase surveys use a household survey—usually a labor force survey—to identify the owners of informal enterprises (first phase) who are interviewed in a separate survey about the income and expenditures of the informal enterprise (second phase). A 1-2 multi-phase survey stops there, whereas a multi-phase 1-2-3 survey collects additional information from owners of informal enterprises about their total household income and expenditures (third phase). There is now a broad consensus that multi-phase surveys are among the best ways of collecting information on the informal sector, and African countries have led the way in developing such surveys.[7] Since 2000, 30 countries have carried out at least one multi-phase survey of the informal sector, and two—Gabon and Niger—have carried out 1-2 and 1-2-3 surveys.

Three points should be noted:

- The results of these surveys have not always been used for the national accounts. The questionnaire only established that a particular type of survey had been carried out.
- Some of these surveys were limited to one or two regions in a country, or sometimes, the capital city. The questionnaire did not ask about the geographical coverage of the surveys.
- Although the questionnaire provided guidelines on what was meant by multi-phase and 1-2 or 1-2-3 surveys, some respondents may not have understood these distinctions in the way intended.

7 Following Africa's lead, multi-phase surveys have been conducted under UNESCAP sponsorship in Sri Lanka, Mongolia, the Philippines, St. Thomas, and the West Bank of Palestine, and under the sponsorship of the Asian Development Bank in Bangladesh and Armenia. Recently, multi-phase surveys have also been carried out in Viet Nam and in several Latin American countries.

Table 11. Countries that conducted one or more surveys of the informal sector since 2000 by type of survey

Multi-phase 1-2 survey	Multi-phase 1-2-3 survey	Other informal sector survey	No informal sector survey
Benin	Burundi	Benin	Algeria
Botswana	Chad	Burkina Faso	Angola
Cameroon	Congo Dem. Rep.	Mauritania	Central African Republic
Cabo Verde	Côte d'Ivoire	Niger	Comoros Islands
Congo Republic	Gabon	Namibia	Djibouti
Ethiopia	Madagascar		Egypt
Gabon	Mali		Equatorial Guinea
Gambia	Morocco		Guinea Bissau
Ghana	Niger		Lesotho
Guinea	Nigeria		Liberia
Kenya	Senegal		Malawi
Mozambique	Sierra Leone		Mauritius
Niger	Togo		Rwanda
São Tomé and Príncipe	Zambia		Seychelles
South Africa	Zimbabwe		South Sudan
Swaziland			Sudan
Tunisia			Tanzania
			Uganda

Countries that do not have surveys that specifically target the informal sector use information collected from other, more general surveys (lower panel of Table 10). Chief among these are household income and expenditure surveys (73 percent of countries) and labor force surveys (67 percent of countries). Other surveys include a Demographic and Health Survey (Swaziland), the Enquête congolaise auprès des ménages (Congo Republic), Enquête sur le niveau de vie des ménages (Côte d'Ivoire), the Small Medium and Micro Enterprise Survey (Nigeria), the 2001 Population Census (Equatorial Guinea), and the Multi-purpose Household Survey (Mauritius).

The Mauritius survey is one of the very few conducted annually. Only Sierra Leone and Tunisia reported that they carry out multi-phase surveys

every year; almost all the other survey sources, such as household income and expenditure surveys or labor force surveys, are carried out, at best, every five years.

4.4 Size of informal sector

Informal sector value added as a percentage of GDP is shown in Table 12. These percentages exclude informal value added from production of crops and livestock for own consumption, imputed rents of owner-occupiers, and own construction of dwellings and other buildings. They refer to the value added of the kinds of informal activities listed in Table 9.

Table 12. Informal value added (excluding agriculture and imputed rents) as a percentage of GDP

% of GDP	Countries
Do not know	Algeria, Central African Republic, Comoros Islands, Djibouti, Guinea Bissau, Mauritania, Morocco, Mozambique, South Sudan, Sudan, Togo, Uganda, Zambia
Less than 5%	Botswana, Cabo Verde, Equatorial Guinea, Malawi, Namibia, São Tomé and Príncipe, Seychelles
5 to 9%	Mali, Mauritius, South Africa, Swaziland
10 to 14%	Egypt, Ghana, Tunisia
15 to 19%	Angola, Burkina Faso, Chad, Congo Republic, Kenya, Lesotho, Madagascar, Sierra Leone, Zimbabwe
20 to 24%	Congo Dem. Rep., Ethiopia, Liberia, Niger
25 to 29%	Cameroon, Rwanda
30 to 34%	Burundi, Gabon, Tanzania
35 to 39%	Benin, Guinea, Senegal
40% or more	Côte d'Ivoire

Countries where informal value added appears surprisingly low are Botswana, Equatorial Guinea, Malawi, Mali, Namibia, Nigeria, São Tomé and Príncipe, and Swaziland.

4.5 Conclusions

African statisticians are well aware of the need to include value added by informal/non-observed enterprises in their GDP. Four countries, however, reported that they do not yet include the informal sector in their GDP estimates. When these countries eventually start doing so, their GDP levels can be expected to rise by 20 percent or more.

It is clear that many of the countries that try to cover informal activities are underestimating the contribution of the informal sector to total GDP. Again, sizable increases in GDP levels can be expected as these countries improve their coverage of the informal sector.

Multi-phase surveys are the preferred method of measuring the output and value added of the informal sector. Since 2000, 30 countries have conducted at least one multi-phase survey of the informal sector. For these countries, it is safe to assume that informal sector activities are reasonably well represented in the GDP estimates, although coverage will deteriorate if the surveys are not repeated at regular intervals.

5. RENTS FOR DWELLINGS: USER COST METHOD

5.1 Introduction

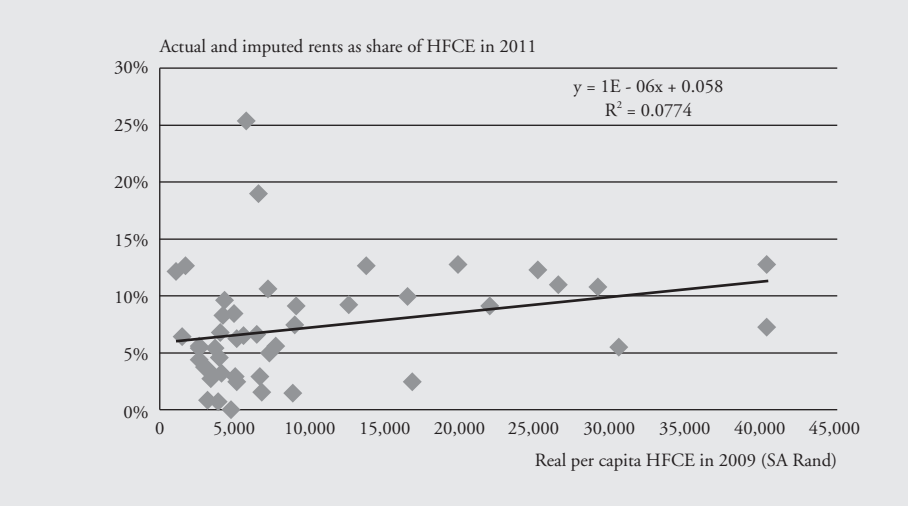
All versions of the SNA require that the value of housing services be included in GDP, regardless of whether they are explicitly purchased in the form of rents paid to the owner or are implicitly paid by homeowners to themselves—acting as both providers and consumers of housing services. Rents for dwellings may, if correctly estimated, account for 5 to 10 percent of GDP; it is important, therefore, to get it right.

The SNA suggests that rents be imputed to owner-occupiers using rents actually paid for similar dwellings. The first survey report showed that this is the method most commonly used by African countries. The problem is to find dwellings that are actually being rented. This is particularly problematic in rural areas, where dwellings are often constructed by their owners from locally available materials such as bamboo, wattle and daub, and palm fronds and are almost never rented. When no actual rents are available, many countries ask the owners to estimate what they think they would have to pay to rent their dwelling, or what they would charge in rent for someone else to live in it. The first survey report showed that this is the second most common method used, but unfortunately owners' rent estimates are notoriously unreliable.

Figure 1 shows the relationship between real per capita HFCE and the share of actual and imputed rents in HFCE. It is well established that as households become richer and their per capita HFCE rises, they tend to devote a greater share of their income to accommodation. Consequently, the rent shares should be positively correlated with per capita HFCE. In practice, the correlation for the 49 African countries in Chart 1 is very weak: only 7

percent of the variation in rents can be explained by per capita HFCE. Some poorer countries that are low on the expenditure scale appear to be devoting around a fifth of their household expenditures to rents, while in some richer countries, rents account for less than 7 percent of HFCE. These results are implausible and are due to the difficulties countries have in accurately estimating rents, and, in particular, in imputing rents for owner-occupiers.

Figure 1. Correlation between real per capita HFCF and share of HFCE on actual and imputed rents



Note: As the rent shares refer to 2011, it would be better to have used per capita HFCE for 2011, but this was not available at the time of writing. However, it is unlikely that the results in Figure 1 *would have been much altered if data for 2011 had been used.*

5.2 User Cost Method

In the absence of a well-developed rental market covering all types of dwellings in the housing stock, the SNA recommendation to impute rents to owner-occupiers using rents actually paid for similar dwellings cannot be followed. The preferred alternative is to impute rents by the user cost method. This method requires the national accounts experts to simulate rents by adding up the various costs owners would need to take into account if they were renting their dwelling to a third party:

a. *Costs of repair and maintenance*. These cover only current repairs such as repainting, maintenance of plumbing and electrical systems, and repairs to roofs or windows. Major renovations that extend the life of

the dwelling are regarded as capital outlays and should be excluded. Information on the costs of current repairs is usually available from household expenditure or budget surveys.

b. *(+) Insurance*. Insurance is compulsory when dwellings are purchased using bank credit, but in practice, very few dwellings in Africa are insured, so in many countries, this cost may be zero or negligible.

c. *(+) Property taxes*. Information on property taxes is usually available from government accounts although, like insurance, it will be small in most countries.

d. *(+) Consumption of fixed capital*. This is the decline in market value of dwellings through wear and tear and expected obsolescence. It is often estimated as a fixed percentage of the market value of the dwelling.

e. *(+) Operating surplus.* The operating surplus is the income foregone when the owner invests in a dwelling rather than in some other asset. For dwellings that have been partly or entirely constructed by the owner and family, income foregone is a nebulous concept, and in the African context, operating surplus may only be relevant for modern dwellings in urban areas.

f. *(-) Owner's expected capital gain.* Owners of dwellings usually expect that the nominal value of their property will rise in value at least as fast as the overall rate of inflation. The holding gain is conventionally measured as the rise in the overall CPI times the current value of the housing stock. It is assumed that owners of dwellings will regard this as a sort of negative cost, allowing them to set the rent lower than would otherwise be the case. This item is, therefore, subtracted from the sum of items a) to e).

The problem with the user cost method is that it requires an estimate of the capital stock in order to calculate the last three costs: d), e) and f). This is almost certainly why few African countries apply it and continue to use unsatisfactory methods for estimating rents in the national accounts.

Seventeen countries reported that they apply user cost for estimating rents for dwellings (see Table 13). Countries were asked to specify the costs that were included in their user cost estimate. Nine of the 17 include only a few of the costs enumerated above. These are shown as implementing a partial version of the user cost method:

- Rwanda takes account of only repair costs, property taxes, and insurance;
- Benin takes account of only repair costs and property taxes;
- Burundi, Central African Republic, Congo Republic, Nigeria, Tanzania, and Uganda assume rents are equal to repair costs alone; and
- Djibouti assumes rents are equal to property taxes alone.

The eight countries shown as applying the full version of the user cost method take account of at least repair costs plus either consumption of fixed capital or operating surplus. (For OECD countries that apply the user cost method, consumption of fixed capital and operating surplus are always the largest components.)

Table 13. Countries that apply the user cost method for rents of dwellings

Country	Urban dwellings	Rural dwellings
Full Version		
Algeria	X	X
Chad	X	X
Ethiopia	X	X
Ghana	X	X
Guinea	X	X
Mozambique	X	
Sierra Leone	X	X
Zimbabwe	X	X
Partial Version		
Benin	X	X
Burundi	X	
Central African Republic	X	
Congo	X	
Djibouti	X	
Nigeria	X	X
Rwanda	X	X
Tanzania	X	X
Uganda	X	X

5.3 Conclusion

Estimating rents is particularly difficult in Africa because so many dwellings are owner-occupied, and the recommended SNA procedure for imputing rents for owner-occupiers cannot easily be applied. In many countries, rents may be paid only for modern dwellings in a few urban areas, and these rents clearly cannot be used to impute rents for traditional dwellings that are often constructed by their owners using locally collected materials.

When actual rents for similar dwellings are not available, the correct procedure is to impute rents by the user cost method. Only 17 African countries currently impute rents by user cost, and of these, nine take account of only a few of the costs that should be estimated if the method is applied correctly.

The principal difficulty with the user cost method is that it requires an estimate of the market value of the stock of dwellings. This can be obtained by the Perpetual Inventory Method (PIM), but this requires data on prices and investment over long periods, which are not available in many countries. However, although the PIM is the recommended method for estimating capital stocks, other short-cut methods can be used to make an approximate estimate of the stock of dwellings.

If rents were estimated by user cost, even if the value of the dwelling stock has to be obtained by approximate short-cut methods, this would bring a major improvement to the accuracy of GDP estimates in Africa.

6. COUNTRY RANKINGS

6.1 Quality rankings

The ranking of 44 countries according to fifty Quality Factors (QFs) is shown in Table 14. The QFs are taken from both the first survey and the second survey, so the ranking is confined to countries that participated in both surveys.

The QFs are practices and estimation procedures that are likely to enhance the overall quality of a country's national accounts statistics. They include factors such as how well the informal sector is covered in GDP; the range of survey data available and how up-to-date they are; the coverage and maintenance of the SBR; the estimation of rents by user cost; and the availability of price statistics. Each QF has a weight of 1 to 3 depending on its importance as a factor in the overall quality of a country's national accounts. The weighting system is inevitably subjective and reflects the author's opinions. Others with the same or more expertise in the matter would probably assign different weights to some of the QFs. However, the countries were also ranked with each QF assigned the same weight. This made little difference to the rankings, and countries moved at most only two places up or down in rank. The 50 QFs and the weights given to each are in Annex 1.

The rankings are based on the replies to both the first and second surveys. It is assumed that countries have completed the questionnaires accurately, but in surveys of this kind it is not possible to probe all the relevant quality aspects. For example, two countries may have both carried out multi-phase surveys of the informal sector since 2007, so both will get the same score. However, one of the countries may have surveyed many households in every part of the country, while the other may have taken a much smaller sample confined to a few urban areas. Or again, two countries may report that they update their SBR at least once per year, and so both get the same score. But, of course, one may do it more assiduously than the other.

Because these underlying quality differences are not taken into account, the rankings in Table 14 must be seen as very approximate. Instead of focusing on the differences between individual countries, the ranking can best be used to assign countries to quality strata. In Table 14, four strata are denoted. The highest quality stratum contains 14 countries (Ethiopia to Benin) that all scored over 50 percent out of the 50 QFs; the upper-middle quality stratum contains 11 countries (Egypt to Swaziland) with scores of 40 to 49 percent; the lower-middle quality stratum contains 13 countries (Namibia to Mauritania) that scored 30 to 39 percent; the lowest quality stratum contains six countries (Seychelles to Equatorial Guinea) with scores below 30 percent.

In the report on the first survey, 44 countries were ranked using 71 unweighted variables based on the replies to the survey's questionnaire. For most countries, the rankings of the first survey do not differ greatly from those in Table 14, with countries changing rank by four or fewer places. However, larger changes in rank due to use of QFs from both surveys occurred in several cases. When QFs from the second survey are also taken into account, Burkina Faso, Egypt, Malawi, and Seychelles moved down by more than ten places, compared with their rankings in the first stage report, whereas Congo Republic, Guinea-Bissau, and Nigeria improved their ranking by more than ten places.

Table 14. Countries ranked by 50 Quality Factors

Country	Second survey Rank by 50 Quality Factors	First survey Rank by 71 quality variables	Number of places up (+) or down (-)
Ethiopia	1	6	+5
Zimbabwe	2	1	-1
Niger	3	5	+2
Mauritius	4	2	-2
Algeria	5	9	+4
Mozambique	6	8	+2
South Africa	7	3	-4
Morocco	8	11	+3
Guinea	9	35	+24
Tunisia	10	12	+2
Chad	11	18	+7
Ghana	12	17	+5
Mali	13	20	+7
Benin	14	14	-
Egypt	15	4	-11
Kenya	16	13	-3
Congo Republic	17	36	+19
Cabo Verde	18	7	-11
Botswana	19	10	-9
Cameroon	20	22	+2
Zambia	21	15	-6
Senegal	22	19	-3
Nigeria	23	39	+16
Tanzania	24	16	-8
Swaziland	25	27	+2
Namibia	26	26	-
Lesotho	27	25	-2
Rwanda	28	28	-
Uganda	29	31	+2
Togo	30	29	-1

Country	Second survey Rank by 50 Quality Factors	First survey Rank by 71 quality variables	Number of places up (+) or down (-)
Malawi	31	21	-10
Madagascar	32	40	+8
Dem. Rep. of the Congo	33	38	+5
Central African Republic	34	30	-4
São Tomé and Príncipe	35	37	+2
Côte d'Ivoire	36	34	-2
Burkina Faso	37	23	-14
Mauritania	38	33	-5
Seychelles	39	24	-15
Djibouti	40	41	+1
Sudan	41	32	-9
Guinea-Bissau	42	42	-
Comoros Islands	43	43	-
Equatorial Guinea	44	44	-

6.2 Ten large countries

Most of the 54 countries in Africa are quite small in GDP terms. The latest round of the International Comparison Program showed that 11 countries account for just over 80 percent of the continent's total GDP in real terms—meaning that price level differences between countries have been removed by purchasing power parities. Because of particular interest in these large countries, Table 15 summarizes some of the strengths and weaknesses of their GDP estimates that have resulted in their rankings as shown above. Angola, which in 2011 had the seventh largest GDP, participated in only the second survey, and so could not be included in either Table 14 or Table 15.

The countries are listed in order of their quality ranking in Table 14. Six are in the highest quality stratum; Egypt, Kenya and Nigeria are in the upper-middle quality stratum; Sudan is in the lowest quality stratum.

Table 15. Ten large countries: GDP strengths and weaknesses

Country (rank)	Strengths	Weaknesses
Ethiopia (1)	1) Latest published GDP data for 2012 2) Base year for constant price is 2007 or later 3) Good coverage of non-monetary transactions 4) Household Expenditure and Income Survey (HEIS), enterprises, agriculture, and informal surveys since 2007 5) Good coverage and maintenance of SBR 5) Full user cost for urban and rural dwellings	1) No GDP(E) at constant prices 2) Government CFC not calculated 3) No LFS since 2007
Algeria (5)	1) GDP based on annual SUT 2) HEIS, LFS, and enterprises surveys since 2007 3) Wide range of price statistics 4) Several sources for SBR 5) Full user cost for urban and rural dwellings	1) Latest published GDP data for 2011 2) No informal sector survey since 2007 3) No agriculture survey/ census since 2007 4) Base year for constant price estimates earlier than 2007
South Africa (7)	1) GDP based on annual SUT 2) HEIS, LFS, enterprises, agriculture, and informal sector surveys since 2007 3) Good coverage of informal activities 4) At least one multi-phase informal sector survey since 2000 5) Good coverage and maintenance of SBR	1) Base year for constant price estimates earlier than 2007 2) Government CFC not calculated 3) User cost not used for rents of dwellings
Morocco (8)	1) Good coverage of non-monetary transactions 2) HEIS, LFS, and enterprise surveys since 2007 3) Good coverage of informal sector and at least one multi-phase survey of informal sector since 2000 4) Regular business register surveys	1) Except for current price GDP(P), latest data refer to 2011 2) FISIM not allocated to consumers 3) No agriculture of Informal sector survey since 2007 4) User cost not used for rents of dwellings

Country (rank)	Strengths	Weaknesses
Tunisia (10)	1) GDP based on ERETES 2) Good coverage of non-monetary transactions 3) HEIS, LFS, enterprises, and informal sector surveys since 2007 4) Regular business register surveys	1) Latest year for GDP is 2011 2) No agriculture survey/ census since 2007 3) User cost not used for rents of dwellings
Ghana (12)	1) Current and constant price GDP available for 2012 2) Good range of price statistics 3) Full user cost used for urban and rural dwellings	1) No HEIS, LFS, enterprise, agriculture, or informal sector surveys since 2007 2) Statistical Business Register not updated at least annually
Egypt (15)	1) HEIS, LFS, enterprise, and agriculture surveys since 2007 2) Good range of price statistics	1) Change in inventories not explicitly estimated 2) No multi-phase survey of informal sector since 2000 3) User cost not used for rents of dwellings
Kenya (16)	1) HEIS survey since 2007 2) Annual enterprise survey 3) Good range of price statistics	1) Current and constant price GDP only available for 2011 2) No LFS, agriculture or informal sector survey since 2007 3) Change in inventories not explicitly estimated 4) User cost not used for rents of dwellings

Country (rank)	Strengths	Weaknesses
Nigeria (23)	1) Multi-phase informal sector survey carried out since 2000 2) Good coverage of SBR and annually updated	1) Current and constant price GDP only available for 2011 2) Government CFC not calculated 3) Crops and livestock for own consumption not included in GDP 4) No LFS, enterprise, agriculture or informal sector survey since 2007 5) Only consumer price statistics 6) User cost not used for rents of dwellings
Sudan (42)	1) Good coverage of non-monetary activities	1) Latest GDP estimates only available for 2010 2) No LFS, enterprise, agriculture or informal sector survey since 2007 3) SBR not regularly updated 4) Informal activities exclude from GDP 5) User cost not used for rents of dwellings

6.3 Conclusions

Quality rankings of the kind used here are approximate and may overstate the quality of national accounts in some countries and understate it in others. However, while individual rankings may be misleading, they can reasonably be used to assign countries to quality groups. The four quality strata presented here provide both a guide for users of African statistics, and it is hoped, a spur to countries in the lower-quality strata to seek further improvements.

It is encouraging that six of the ten largest countries in Africa are in the highest-quality stratum, and two others—Egypt and Kenya—are just below them in the upper middle-quality stratum.

Finally, it is noteworthy that while the richer countries are usually well up in the quality rankings and the poorer countries are lower down, there are several striking exceptions. Being poor does not condemn a country to having bad statistics and being rich does not guarantee that a country will have good ones.

7. RECOMMENDATIONS

These recommendations are based on the analysis of the two surveys. The first survey report contained a number of recommendations. The second survey has confirmed these and added a few more.

7.1 National accounts system and methodology

i. Both SUTs and computerized compilation systems such as ERETES ensure that available data are used efficiently. Countries not currently using either method should consider doing so.
ii. Countries should implement *at least these features of the SNA 1993/2008:*

    a. mineral prospecting treated as capital formation
    b. software treated as capital formation
    c. government defense expenditures treated as capital formation
    d. allocation of FISIM to consuming sectors

iii. Rents should be imputed for *owner-occupied dwellings* in both rural and urban areas.
iv. Rents should be imputed by the *user cost method* if actual rents for similar dwellings are not available.
v. Imputations should be made for value added and final expenditures for *at least these non-monetary transactions*:

    a. production of crops and livestock for own consumption
    b. construction of dwellings for own use
    c. net increase in herds of cattle, pigs, sheep and goats

iv. *Base years for constant price estimates* should be updated every year.

7.2 Surveys

i. *Industry/business surveys* covering enterprises included in the SBR should be conducted annually. These will usually be mail enquiries with full coverage of larger enterprises and samples of smaller enterprises.
ii. *Household labor force surveys* should be carried out at least every five years and should include questions about employment in the informal sector.
iii. *Informal sector surveys* should be carried out every five years. Ideally, these should be multi-phase 1-2 or 1-2-3 surveys.
iv. *Household income/expenditure surveys* should be conducted at least every five years.
v. *Agricultural surveys* should be conducted every five years and should include crop-cutting and area measurement.
vi. *Population censuses* should be carried out every 10 years.

7.3 Prices

i. In addition to prices of consumer goods and services, *producer prices* should be collected for major crops, livestock products, minerals, and manufacturing output.
ii. *Unit value indices for imports and exports* should be compiled from customs documents. If this is not possible, c.i.f. prices for major imports and f.o.b. prices for major exports should be collected directly from importers and exporters.

7.4 Statistical Business Registers

i. SBRs should be *reviewed regularly* for additions and deletions.
ii. One source should be used as the main pillar—usually a tax or social security register—but other sources should be used to *check completeness* and *supply additional detail.*

ANNEX 1. FIFTY QUALITY FACTORS AND WEIGHTS USED TO RANK COUNTRIES

	Quality Factors	Weight
	GDP ESTIMATES	
1	Estimates of GDP(P) obtained by a national accounting model such as ERETES	3
2	Estimates of GDP(P) are based on an annual supply and use table	3
3	Latest year for GDP(P) at current prices is 2011	1
4	Latest year for GDP(P) at current prices is 2012	2
5	Latest year for GDP(P) at constant prices is 2011	1
6	Latest year for GDP(P) at constant prices is 2012	2
7	Latest year for GDP(E) at current prices is 2011	2
8	Latest year for GDP(E) at current prices is 2012	3
9	Latest year for GDP(E) at constant prices is 2011	2
10	Latest year for GDP(E) at constant prices is 2012	3
11	Base year for constant prices is 2007 or later	2
12	Expenditure on software by producers treated as capital formation	1
13	FISIM allocated to consumers	1
14	Data on NPISH in GDP	1
15	Consumption of fixed capital included in final consumption expenditure of government	1
16	Own-produced crops and livestock included in household consumption expenditure	2
17	Estimates for own-construction of dwellings included in GDP	1
18	Household expenditure and income survey estimated from a HEIS	1
19	Surveys of enterprises collects data on building and construction outlays	1
20	Commodity flow methods used for building and construction	1
21	Surveys of enterprises collects data on purchases of machinery and equipment	1
22	Commodity flow methods used for machinery and equipment	1
23	Change in inventories explicitly estimated	2

	Quality Factors	Weight
	SURVEYS	
24	Household income expenditure survey (HEIS) carried out every year	2
25	Latest year for HEIS is 2007 or later	2
26	Industry/enterprise/business survey carried out every year	2
27	Latest year for industry/enterprise/business survey is 2007 or later	2
28	Household labor force survey (HLFS) carried out every year	2
29	Latest year for HLFS is 2007 or later	2
30	Agricultural survey or census carried out every year	2
31	Latest year for agricultural survey or census is 2007 or later	2
32	Survey of the informal sector carried out every year	2
33	Latest year for survey of the informal sector is 2007 or later	2
34	Latest population census was 2007 or later	2
	INFORMAL SECTOR	
35	At least 10 of the specified informal activities are covered in GDP	3
36	Multi-phase informal sector survey carried out since 2000	3
37	Multi-phase informal sector survey carried out each year	2
38	At least two other sources used for informal sector	2
	PRICE DATA	
39	Monthly CPI	1
40	Producer prices are collected	2
41	Prices of construction materials are collected	1
42	Data on wages of construction workers are collected	1
	STATISTICAL BUSINESS REGISER	
44	Two or more sources used for SBR	1
45	SBR includes private unincorporated enterprises	1
46	SBR includes non-profit institutions	1
47	SBR updated at least yearly	2
48	A business register survey is regularly carried out	2
	USER COST FOR RENTS OF DWELLINGS	
49	Full user cost used for urban dwellings	3
50	Full user cost used for rural dwellings	3

2. Measuring Progress toward Attainment of the Health-related Millennium Development Goals in Cameroon

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Abstract

The aim of this paper is to propose a composite index, namely the Health-related Millennium Development Goals Composite Index (HCMI), to measure a country's progress toward achieving the three health-related Millennium Development Goals (MDGs) [i.e. Reduce under-5 child mortality (MDG_4), Improve maternal health (MDG_5), Combat HIV, malaria and other diseases (MDG_6)]. Since the adoption of MDGs in 2000, the Cameroonian authorities have engaged in various strategies to accelerate their attainment—both for the MDGs in general (via the PRSP, GESP)[4] and the health-related MDGs in particular (HSSP, EPI, HMTEF).[5] In this endeavor, it is necessary for the government, development partners, the civil society and other stakeholders to have at their disposal a reliable and efficient tool for evaluating and monitoring progress. The HMCI is proposed in this paper as such a tool, thanks to the so-called "fuzzy set" approach. Using data from the two most recent Demographic and Health Surveys (DHS 2004 and DHS-MICS 2011)[6] covering the whole national territory, our results show that the HMCI has risen to 0.6853 in 2011 from 0.582 in 2004. The greatest strides have been reached on MDG_4 (reducing under-5 child mortality) at the national level (HMCI=0.297 in 2004 and 0.322 in 2011) and the Adamawa region ranks highest in progress accomplished (HCMI=0.104 in 2004 and 0.054 in 2011). The Far-North and East regions of the countries have shown the weakest progress. Cameroon is some way from achieving the health-related MDGs with respect to the 2015

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4 Poverty Reduction Strategy Paper in 2003 (PRSP) and the Growth and Employment Strategy Paper (GESP) since 2009.

5 Health Sector Strategy Policy (HSSP) in 2001, the Expanded Programme on Immunization (EPI) and the Health Medium Term Expenditure Framework (HMTEF).

6 Demographic and Health Survey (DHS in 2004) and the Demographic and Health Survey, coupled with the Multiple Indicators Cluster Survey (DHS-MICS in 2011).

deadline. More efforts are still needed in Cameroon in terms of disease control programs and tackling child mortality and maternal mortality ratios. Policy recommendations are put forward in terms of both qualitative and quantitative measures. These include: improving public expenditures related to health and basic infrastructures (potable water, electricity), ensuring adequate equipment of health facilities, and making available at low cost essential medicines, vaccines and consumables, as well as laboratory tests at all levels of the health system.

***Keys words**: Millennium Summit, human development, fuzzy set, developing countries.*

***JEL Classification**: C1, C4, D, H, I.*

Résumé

L'objectif de cet article est de proposer un indice composite, l'Indice Composite des OMD-Santé (ICOS), pour mesurer les progrès accomplis vers l'atteinte des Objectifs du Millénaire pour le Développement (OMD) liés à la santé [Réduire la mortalité des enfants de moins de 5 ans (OMD_4), Améliorer la santé maternelle (OMD_5), Combattre le VIH/SIDA, le paludisme et d'autres maladies (OMD_6)]. Les autorités camerounaises ont depuis l'adoption des OMD en 2000 mis en place des stratégies pour les atteindre en général (DSRP et DSCE)[7] et les OMD liés à la santé en particulier (SNS, PEV, CDMT)[8]. Il est donc nécessaire pour le Gouvernement, ses partenaires au développement et la société civile de disposer d'un outil d'évaluation des efforts fournis pour atteindre les OMD. Le HMCI est construit à cet effet à l'aide de la théorie des ensembles flous. A partir des données des dernières Enquêtes de Démographie et de Santé (EDS 2004 et EDS-MICS 2011)[9] réalisées sur toute l'étendue du territoire camerounais, les résultats de cette étude révèlent une valeur de notre indice HMCI de 0,582 en 2004 et de 0,6853 en 2011. L'OMD 4 est le plus avancé (HMCI=0,297 en 2004 et HCMI=0,322 en 2011) au niveau national l'Adamaoua est la région la plus avancée (HCMI=0,104 en 2004 et 0,054 en 2011). L'Extrême-nord et l'Est sont les régions présentant le plus de retard pour l'atteinte des OMD. Le Cameroun est donc loin d'atteindre les OMD relatifs à la santé à l'horizon 2015. En effet, en matière de maladie, mortalité infantile et santé maternelle, des efforts restent à fournir au Cameroun. Les recommandations de politique économique se déclinent en l'amélioration qualitative et quantitative des

7 Document de Stratégie pour la Réduction de la Pauvreté (DSRP) en 2003 et Document de Stratégie pour la Croissance et l'Emploi (DSCE) en 2009.

8 Stratégie Nationale de Santé (SNS) en 2001, Programme Elargi de Vaccination (PEV), Cadre de Dépenses à Moyen Terme (CDMT).

9 Enquête de Démographie et de Santé (EDS en 2004) et Enquête de Démographie et Santé couplée à l'Enquête par Grappes à Indicateurs Multiples (EDS-MICS en 2011).

dépenses publiques de santé, des infrastructures de base dans les centres de santé, les équipements sanitaires adéquats et rendre disponible et à moindre coûts les médicaments essentiels, les vaccins, les consommables médicaux et les tests de laboratoire à tous les niveaux de la pyramide sanitaire.

Mots clés: *OMD, sommet du millénaire, développement humain, Ensemble flou, pays en développement.*

Classification JEL*: C1, C4, D, H, I.*

1. INTRODUCTION

As articulated in the Millennium Declaration of September 2000 (UN, 2000), the Millennium Development Goals (MDGs) are based on fundamental values such as freedom, equity, democracy, governance, the rule of law, respect for human rights, peace, and security. Cameroon is one the 189 countries committed to the achievement of MDGs. The commitment of the Cameroonian Government can be appreciated through the adoption in 2001 of the Health Sector Strategy Paper (HSSP) which aimed, among other things, to halve the mortality of vulnerable populations (namely children aged 0 to 5 years) by 2020, against diphtheria, whooping cough, tetanus, yellow fever, smallpox, hepatitis, polio, and measles.

Many of the strategic objectives of the Cameroonian Ministry of Public Health with respect to the Growth and Employment Strategy Paper (GESP)[10] had already been defined in the Health Sector Strategy Paper *(*HSSP), which covered the period 2001–2015. The objectives are: to reduce maternal mortality by up to 3/4 (75 percent); reduce under-5 mortality rate by up to 2/3 (67 percent); reduce the burden of diseases among the most vulnerable populations; bring 80 percent of the 178 existing health districts to the consolidation phase; and to bring 100 percent of health facilities both at the regional and national levels to play their respective roles as far as Strategic Technical Support and Guidance on Health are concerned. These objectives are to be realized across two major axes, the first being the axis of Beneficiaries and the second, the axis of Health System Strengthening. The two axes are divided into four domains of intervention. The first axis (Beneficiaries) comprises the two domains of (i) maternal health, adolescent and child health, and (ii) fighting diseases and health promotion, while the second axis (Health System Strengthening) consists of (iii) improving health district services and (iv) capacity building of health facilities.

10 Republic of Cameroon, 2009.

The eight MDGs are captured through 21 targets and 60 socioeconomic indicators for monitoring progress. However, an analysis of each of these becomes difficult to follow, even when only the health-related MDGs (MDG4, MDG5, and MDG6, that is 6 targets and 19 indicators) are taken into consideration. How then can we fully measure progress in the march toward reducing child mortality, improving maternal health, and combatting HIV/AIDS, malaria, and other diseases? In this study, we propose building a composite index to measure progress, which we call the Health-related Millennium Development Goals Composite Index (HMCI). Such an index represents a crucial tool for monitoring and evaluating progress toward attainment of the current MDGs, as well as those beyond the 2015 deadline. Our composite index (HMCI) behaves like a mean, while it respects the usual properties of statistical indices. It is easy to implement and will facilitate economic policy decisions toward attainment of the MDGs, as well as highlighting the efforts needed on the part of the general population, government, and international community. The global development debate that surrounds the Millennium Development Goals and the post-2015 sustainable development agenda provides the rationale for the current study, which targets developing countries like Cameroon. It is especially pertinent since the MDGs are inextricably linked to sustainable development policies, equity, equality, and social protection.

2. METHOD

As far as the analytical framework is concerned, our paper focuses on the fuzzy set theory. Since its inception in 1965 by Professor Lotfi Zadeh, the theory of fuzzy set has advanced in a variety of ways and in many disciplines. Mathematical development has advanced to a very high standard and is still forthcoming today. Hence, this study proposes a Health-related Millennium Development Goal Composite Index (HMCI) to measure progress in the march toward achieving the health-related MDGs. The MDGs have the overarching objective of poverty alleviation, using numerical targets with specific completion years for its many dimensions, including: lack of or insufficient income, malnutrition, disease, homelessness, social exclusion, gender inequality, education, and environmental sustainability. These objectives are also linked to universal human rights: the right of everyone to health, education, housing and security, as stated in the 1990 Universal Declaration of Human Rights and in the 2000 Millennium Declaration. This poses the question: what will Cameroon look like in 2015 or beyond if the MDGs are achieved? Many people will surely be lifted out of extreme poverty, thousands will be spared from hunger, and maternal and child health will be significantly improved. In this paper, our particular interest

is on the health-related MDGs, namely reducing child mortality, improving maternal health, and combating HIV, malaria, and other diseases.

To build our HMCI, we employ the fuzzy set approach (De Cooman, 2005; Meeden, 2005) and the methodology of the composite poverty index (Feubi Pamen *et al.*, 2013) which usually defines a poverty threshold for each primary poverty indicator. We then proceed with an aggregation of different indicators for each individual of the population (equivalent to a composite indicator) and subsequently produce an aggregation on the entire population of the composite indicator obtained to give a general measure of poverty.

The calculation of the HMCI that we propose is made along two opticals––a regional optics and an objective optics. The first approach consists of calculating regional indices that are then aggregated at the national level. The second approach focuses on national indicators of each of the three health-related MDGs (MDGs 4, 5, and 6). For both approaches, the level of progress for each MDG is assessed through indicators measured both at the regional level (region optics or regional viewpoint) and the national level (objective optics). There are two types of indicators:

- The *positive indicators* that measure realities having a desirable socioeconomic impact. In this case, the objective is to maximize (or increase) the value of the indicators.
- The *negative indicators* that measure realities with an undesirable socioeconomic impact. In such situation, the objective is to minimize (decrease) the value of indicators.

Therefore, the level of achievement for a positive MDG indicator in a given region of Cameroon is the ratio of the value of this indicator in the region relative to its value at national level (respectively the ratio between the targeted value adopted at the national level and the value of the indicator at the regional level). If the value of a positive indicator (respectively the negative indicator) is greater (or less) than the target, then the level of achievement of the indicator is 1. Conversely, if the value of negative indicator is less than the target, then the level of achievement of the indicator is 0.

Thus, let $R = (r_1, r_2 \ldots \ldots \ldots, r_i, \ldots \ldots, r_{12})$ be the set of the 12 regions of Cameroon (Yaoundé, Douala, Adamawa, Centre, East, Far-North, Littoral, North, North-West, South-West, South and West) and $MDG = (MDG_4, MDG_5, MDG_6)$ be the set of the three health-related MDGs. Each MDG, $MDG_k = (i_1^k, i_2^k \ldots \ldots \ldots, i_j^k, \ldots \ldots, i_{nk}^k)$ consists of n_k indicators. The level reached by the indicator in the region is defined as follows:

If j is a positive indicator, $x_{ij} = \begin{cases} 1 & if\ \varphi_{ij} \geq \varphi_j^{MDG} \\ \frac{\varphi_{ij}}{\varphi_j^{MDG}} & if\ 0 \leq \varphi_{ij} \leq \varphi_j^{MDG} \end{cases}$

If j is a negative indicator, $x_{ij} = \begin{cases} 1 & if\ \varphi_{ij} \leq \varphi_j^{MDG} \\ \frac{\varphi_j^{MDG}}{\varphi_{ij}} & if\ \varphi_j^{MDG} < \varphi_{ij} \end{cases}$

With φ_{ij} representing the value of the indicator j in the region i and φ_j^{MDG} its target at the national level. Let us assume some properties for x_{ij} :

$x_{ij} = 1$ if in the region i the indicator j reaches at least the level of the national target, $0 \leq x_{ij} \leq 1$ if in the region i the indicator j did not reach the national target.

For computation of our HMCI for each region, and the level of achievement of MDGs for each objective taken into consideration in this study, we propose the following approach.

Let $P = (P_1, P_2 \ldots \ldots \ldots, P_i, \ldots \ldots, P_{12})$ be the set that each component P_i represents the number of inhabitants in the region r_i. Also let $p = (p_1, p_2 \ldots \ldots \ldots, p_i, \ldots \ldots, p_{12})$ be the set which each component $p_i = \frac{P_i}{\sum_{i=1}^{i=12} P_i}$ represents the relative number of inhabitants in the region r_i. The formalization of our methodology is illustrated in the following table:

Table 1: Formulation of the HMCI based on the regional and individual MDG approach

Region	MDG_4	MDG_5	MDG_6	**Totals**
r_1	$\bar{X}_{11}$	$\bar{X}_{12}$	$\bar{X}_{13}$	$\bar{X}_{1}$
r_2	$\bar{X}_{21}$	$\bar{X}_{22}$	$\bar{X}_{23}$	$\bar{X}_{2}$
.....	.....	.....	.....	.....
r_i	$\bar{X}_{i1}$	$\bar{X}_{i2}$	$\bar{X}_{i3}$	$\bar{X}_{3}$
.....	.....	.....	.....	.....
r_{11}	$\bar{X}_{11,1}$	$\bar{X}_{11,2}$	$\bar{X}_{11,3}$	$\bar{X}_{11}$
r_{12}	$\bar{X}_{12,1}$	$\bar{X}_{12,2}$	$\bar{X}_{12,3}$	$\bar{X}_{12}$
Totals	$\bar{X}_{.1}$	$\bar{X}_{.2}$	$\bar{X}_{.3}$	$\bar{X}_{..}$

Source: Authors' formulation.

With $\forall\ (i,k) \in (1, 2, \ldots \ldots, 12)$ x $(4, 5, 6)$, $\bar{X}_{ik}$ corresponding to the level of the MDG_k in the region r_i. Specifically, the HMCI composite index for the region i is obtained by summing up $\bar{X}_i$ in the last column of Table 1. It is the weighted average of indicators for region i. The weight w_j^k corresponds to the i_j^k indicator of the Millennium Development Goal's MDG_k and is given by: $w_j^k = \frac{1}{3} \times \frac{1}{n_k} = \frac{1}{3n_k}$

In this relationship, 1/3 is the weight of each of the three health-related MDGs, $1/n_k$ is the weight of the i_j^k indicator among the total n_k indicators of the MDG_k.

In addition, the calculation of our HMCI at the national level corresponds to the sum $\bar{X}_{.k}$ of the last row of Table 1. It is the average of regional index of the MDG_k, weighted by the population of each of the 12 regions of Cameroon concerned in this current study.

The calculation of the global index of the level of achievement of our three health-related MDGs for the i region is facilitated by the following formulation:

$$\bar{X}_{i.} = \sum_{k=1}^{3} \bar{X}_{ik} = \sum_{k=1}^{3} \sum_{j=1}^{n_k} x_{ij} w_j^k$$

It corresponds to the synthetic indicator for this given region and has the following properties:

-$\bar{X}_{i.} = 1$ if all targets are achieved in the region r_i,

-$\bar{X}_{i.} \approx 0$ if all targets are far from being achieved in the region r_i

-$0 < \bar{X}_{i.} < 1$ if in the region r_i, targets are particularly achieved or certainly are on the way to being achieved but not all.

The calculation of the global index to measure the level of achievement of each of the three health-related MDGs is made using the following formula:

$$\bar{X}_{.k} = \frac{\sum_{i=1}^{i=12} p_i \bar{X}_{ik}}{\sum_{i=1}^{i=12} p_i} = \frac{\sum_{i=1}^{i=12} p_i \ \sum_{j=1}^{j=n_k} x_{ij} w_j^k}{\sum_{i=1}^{i=12} p_i}$$

Let us recall that the calculation of our global index to measure the level of achievement of our three MDGs follows two optics or approaches, a regional optic and an objective approach. As far as the first approach is concerned, this global index is the average of the regional indices, weighted by the population of each of the 12 regions of Cameroon. This index has the following formulation:

$$\bar{X}_{..} = \sum_{i=1}^{i=12} p_i \bar{X}_{i.} = \sum_{i=1}^{i=12} \sum_{k=1}^{k=3} p_i \bar{X}_{ik}$$

From the objective point of view, the global index of achievement of our three health-related MDGs corresponds to the simple average of the level of achievement of each of the three health-related MDGs, uniformly weighted, taken into consideration in our study. This global index is expressed by the following relationship:

$$\bar{X}_{..} = \sum_{k=1}^{3} \bar{X}_{.k}$$

The global index from each of those two approaches is equal to the other and corresponds to $\bar{X}_{..}$ in Table 1.

Let us now focus on the contributions of each of the 12 regions of Cameroon and the contribution of each of the three health-related MDGs at the national level. From the computation of the global index of MDG achievement, we deduce Relative Contributions as far as both the regional optic (RC_{ri}) and the objective optic (RC_{MDG_k}) are concerned.

More specifically, the Relative Contribution (RC_{ri}) of each region at the national level of achievement is the ratio between the weighted regional global index and the national global index of MDGs achievement. Formally, we have

$$RC_{r_i} = \frac{p_i \bar{X}_{i.}}{\bar{X}_{..}}$$

From the objective point of view, the Relative Contribution of each of our three health-related MDGs (RC_{MDG_k}) at the national level is the ratio between the global index of MDGs achievement for each MDG and the global index of achievement of the three MDGs at the national level. This share (part) is formalized as follows:

$$RC_{MDG_k} = \frac{\bar{X}_{.j}}{3\bar{X}_{..}}$$

In addition, our HMCI as explained above is a static index that measures the level of achievement of MDGs at a given period of time. Nevertheless, it allows us to capture the progress level of MDGs realization or achievement using a comparative static analysis—that is, to compare its two values at two different dates. Therefore, it is also important to highlight the computation methodology of Dynamic Contribution of each region (DC_{ri}) and the one of each objective (DC_{MDG_k}) to the variation of the national level of achievement as far as health-related MDGs are concerned. Under the regional optic

assumption, the Dynamic Contribution of each region (DC_{ri}) to the variation of the national level of achievement is the ratio between the difference of the share of each region to the national level in 2011 and in 2004, and the difference between the national level of health-related MDGs between 2011 and 2004. It can be formulated as follows:

$$DC_{r_i} = \frac{(p_i\bar{X}_{i.})_{2011} - (p_i\bar{X}_{i.})_{2004}}{(\bar{X}_{..})_{2011} - (\bar{X}_{..})_{2004}}$$

According to the objective approach or optic, the Dynamic Contribution (DC_{ok}) of each objective to the variation of MDGs progress towards achievement is the ratio between the difference between the share of the given objective at the national level, respectively in 2011 and 2004, and the difference of national level of achievement between those two dates. This can be formalized as follows:

$$DC_{MDG_k} = \frac{(w_k\bar{X}_{.k})_{2011} - (w_k\bar{X}_{.k})_{2004}}{(\bar{X}_{..})_{2011} - (\bar{X}_{..})_{2004}}$$

For this present study, variable or primary indicators taken into consideration for the construction of our HMCI are shown in Table 2 below. Our study is based on two household surveys: (i) the 2004 Demographic and Health Survey (DHS III)[11] conducted from February to August 2004 by the National Institute of Statistics (NIS), and (ii) the Demographic and Health Survey coupled with the Multiple Indicators Cluster Survey (DHS-MICS IV),[12] conducted from January to August 2011. These snapshots represent most recent points after the Social Adjustment Program (SAP), for which household demographic and health surveys are available. The DHS III covered all 10 (ten) regions of Cameroon with the two main cities of the countries (Yaoundé and Douala) considered each as single regions. It was conducted in both urban and rural areas using a sample of 10,462 households, 10,656 women aged between 15–49 years old, and 5,280 men aged between 15–59 years old. Of this population sample, 5,227 women aged between 15–49 years old and 5,125 men aged between 15–59 years old were visited as far as HIV/AIDS screening tests were concerned. The data were collected for 22 strata: 10 rural and 12 urban. In particular, Yaoundé (r_1) and Douala (r_2), were considered as separate strata, then each of the ten (10) regions [Adamawa (r_3), Centre without Yaoundé (r_4), East (r_5), Far North (r_6), Littoral without Douala (r_7), North (r_8), North-West (r_9), West (r_{10}), South (r_{11}), and South-West (r_{12})] were divided into three strata: one rural, one urban and one semi-urban.

11 Republic of Cameroon (2005).

12 Republic of Cameroon (2011).

The DHS-MICS IV was also carried out by the NIS in collaboration with the Ministry of Public Health, with the technical assistance of the MEASURE DHS project, funded by the US Agency for International Development (USAID), the ICF Macro foundation, UNFPA, UNICEF, and the World Bank. The sample size of DHS-MICS IV was 15,050 households, of which 14,214 were actually interviewed. The sampling frames of both DHS III and DHS-MICS IV are based on the 1987 General Census of Population and Housing (GCPH) augmented to correct for its age. They are similar in: (i) the partitioning of the various regions, in the sense that the 2011 survey could easily be regrouped to mimic the structure of the 2004 survey and (ii) the sampling techniques used. To select households in semi-urban and rural areas in the two surveys, a three-stage sampling frame was adopted following the sequence: city – primary sampling unit – household. As far as the political and economic capitals (Yaoundé and Douala) are concerned, a two-stage stratified probabilistic sampling was carried out for the selection of households.

These surveys were similar in a number of respects. First, they were of the same duration, namely four months. Second, they covered all 10 (ten) regions of Cameroon. Third, they were conducted in both urban and rural areas using a large sample of households, of which a great number were actually visited. The data were collected for 22 strata: 10 rural and 12 urban. In particular, Yaoundé and Douala were considered as separate strata, then each of the ten (10) regions were divided into three strata: one rural, one urban and one semi-urban.

3. RESULTS

Results of progress toward achievement of health-related MDGs, captured by our Health-related Millennium Development Goal Composite Index (HMCI) for 2004 and 2011 respectively, are presented in the tables below.

Table 2. Health-related Millennium Development Goal Composite Index (HMCI), showing level of achievement at national and regional levels and for each MDG

Region	MDG4	MDG5	MDG6	P_i	$p_i=P_i/P$	HMCI
(a) 2004 DHS III						
Yaoundé	0.297	0.181	0.136	1, 349,065	0.0872	0.046
Douala	0.33	0.182	0.134	1,501,171	0.0970	0.050
Adamawa	0.839	0.142	0.135	691,784	0.0447	0.104
Centre	0.29	0.169	0.127	1,214,064	0.0785	0.045
East	0.231	0.155	0.136	744,947	0.0481	0.037
Far-North	0.248	0.143	0.123	2,745,345	0.1774	0.039
Littoral	0.296	0.18	0.14	754,460	0.0488	0.046
North	0.231	0.141	0.142	1,123,267	0.0726	0.037
North-West	0.307	0.177	0.14	1,782,462	0.1152	0.047
West	0.289	0.181	0.144	1,866,674	0.1206	0.046
South	0.262	0.171	0.142	534,441	0.0345	0.042
South-West	0.172	0.141	0.156	1,164,910	0.0753	0.043
Total	**0.316**	**0.163**	**0.138**	**15,472, 590**	**1.0000**	**0.582**

Region	MDG4	MDG5	MDG6	P_i	$p_i=P_i/P$	HMCI
(b) 2011 DHS-MICS IV						
Yaoundé	0.325	0.175	0.217	2,410,175	0.1365	0.052
Douala	0.309	0.201	0.122	2,191,835	0.1242	0.048
Adamawa	0.333	0.218	0.220	1,336,349	0.0757	0.054
Centre	0.333	0.155	0.202	1,082,537	0.0613	0.0516
East	0.333	0.118	0.205	1,213,180	0.0687	0.049
Far-North	0.333	0.089	0.181	1,787,950	0.1013	0.047
Littoral	0.307	0.174	0.216	1,194,982	0.0677	0.050
North	0.333	0.102	0.221	1,177,181	0.0667	0.0494
North-West	0.292	0.183	0.216	1,114,296	0.0631	0.0490
West	0.322	0.184	0.213	1,325,913	0.0751	0.052
South	0.333	0.154	0.211	1,580,531	0.0895	0.0518
South-West	0.315	0.177	0.223	1,230,453	0.0697	0.0515
Total	**0.322**	**0.162**	**0.137**	**17,645,382**	1.0000	**0.6853**

Source: Authors' formulation based on DHS (2004), GCPH (2005) and DHS-MICS (2011) data.

The population size increased from 15.47 million in 2004 to 17.65 million in 2011. However, the relative weight of each region within the total sample remains within the same range with respect to the others. The increasing population led to harmful implications vis-à-vis MDG5 due to the shortfall between the level of demand and the supply of services or facilities concerning maternal health.

Table 3: Relative and Dynamic Contribution of each region at the national level

Region	Relative Contribution (RC) (%) of each region at national level in 2004	Relative Contribution (RC) (%) of each region at national level in 2011	Dynamic Contribution (DC) (%) of each region between 2004 and 2011
Yaoundé	7.9	8.6	23.1
Douala	8.6	7.9	-7.7
Adamawa	2.4	8.9	153.8
Centre	7.8	8.5	25.4
East	6.4	8.1	46.2
Far-North	6.7	7.8	30.8
Littoral	7.9	8.3	15.4
North	6.4	8.2	47.7
North-West	8.3	8.1	4.6
West	7.9	8.6	23.1
South	7.3	8.6	37.7
South-West	7.4	8.5	32.7

Source: Authors' formulation based on DHS (2004), GCPH (2005) and DHS-MICS (2011) data.

Table 4: Relative and Dynamic Contribution of each goal at the national level

MDG	Relative Contribution (RC) (%) for each goal at national level in 2004	Relative Contribution (RC) (%) for each goal at national level in 2011	Dynamic Contribution (%) of each goal between 2004 and 2011
MDG4	47.0	45.1	4%
MDG5	25.4	22.6	-38%
MDG6	20.9	27.9	185%

Source: Authors' computation with DHS (2004), GCPH (2005) and DHS-MICS (2011) data.

In 2004 the MDG with the highest level of achievement was MDG4 at 31.6 percent, followed by MDG5 at 16.3 percent and MDG6, at 13.8 percent. As far as the regions are concerned, the best-performing was Adamawa (10.4 percent), followed by Douala (5 percent) and North West (4.7 percent). The worst-performing regions for achieving health-related MDGs were East and North (3.7 percent each), followed by Far-North (3.9 percent).

At the national level, the HMCI was up to 58.2 percent in 2004, both in terms of all three health-related MDGs and for all the 12 regions taken together. In terms of the Relative Contribution of MDGs achievement at the national level in 2004, MDG4 had the most important weight of 47 percent followed by the MDG5 (25.4 percent).

Douala (8.6 percent) followed by Yaoundé, West region and the Littoral region (7.94 percent each) made the most important Relative Contribution to the national achievement level of MDGs in 2004. Regions with a low Relative Contribution were Adamawa (2.4 percent), East and North regions (6.4 percent each).

In 2011 the HMCI at the national level (both in terms of MDGs and in terms of regions) had risen to 68.5 percent. The health-related MDG with the highest level of achievement in terms of progress was MDG4 (32.2 percent) and the worst was MDG6 (13.7 percent). The Relative Contribution of these MDGs in 2011 was 45.1 percent (MDG4), 27.9 percent (MDG6) and 22.6 percent (MDG5).

At the regional level in 2011, the most important Relative Contribution was from Adamawa (8.9 percent). The lowest regional contributors were the Far North (7.8 percent) and Douala (7.9 percent). With regard to the dynamic evolution of progress, between 2004 and 2011, MDG6 had the most positive evolution, while at the regional level Adamawa evinced the most positive evolution.

4. DISCUSSION

Between 2004 and 2011, progress toward achievement of the health-related MDGs in Cameroon improved from 58.2 percent to 68.5 percent. However, the country still has a long path ahead to achieve the health-related MDGs with respect to the 2015 sunset date. Greater progress could have been made if health-related public expenditure were better tracked in terms of quality and quantity and if health facilities were built and equipped all over the

country. However, the government did make firm commitments to align its development strategy to the MDGs, which it consequently adopted as the overarching development policy and strategy guiding framework. Measures to create a favorable climate for attainment of the MDGs have been well integrated and harmonized in Cameroon's national development planning framework known as the *Growth and Employment Strategy Paper* (GESP), as reported in the current study.

The *2012 National Millennium Development Goals Tracking Report* puts most MDG targets as on track and achievable, with caveats only in terms of (i) halving poverty by 2015; (ii) achieving gender equality and (ii) improving the maternal mortality ratio, which all require further efforts and resources. Indeed, public expenditures on basic services have doubled twice in recent years but those related to health are increasing only slowly. It should be recalled though that Cameroon started in 2000 from a low base in terms of initial coverage of basic health facility infrastructures. Policy recommendations are thus articulated in terms of: qualitative and quantitative improvements of public expenditures related to health and basic infrastructures (potable water, electricity); the adequate provision of equipment for health facilities; making available and at low cost essential medicines, vaccines and consumables; as well as laboratory tests at all levels of the health system.

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ANNEX 1: MILLENNIUM DEVELOPMENT GOALS INDICATORS

Millennium Development Goal	Indicators
Reduce child mortality (*MDG_4*)	Vaccination coverage for 1 year olds
	Percentage of children aged 12–23 months currently vaccinated against childhood diseases (measles)
	Infant mortality rate (per 1,000 live births)
	Under-5 mortality rate (per 1,000 live births)
Improve maternal health (*MDG_5*)	Maternal mortality rate
	Percentage of women delivered in health facility
	Contraceptive use rate
	Teen pregnancy rate
	Access to antenatal care and coverage
	Access to reproductive health
Combat HIV, malaria, and other diseases (*MDG_6*)	HIV prevalence rate
	Rate of condom use
	Tuberculosis prevalence rate
	Access to HIV/AIDS treatment for all those who need it
	Incidence, prevalence and death rate of malaria
	Access to mosquito net
	Number of treated malaria patients (children)
	Number of treated tuberculosis patients

Source: United Nations Organization (UN) Millennium Declaration (September 2000. Millennium summit).

3. The Impact of Smoking on Food Expenditure among Tanzanian Households[1]

Asmerom Kidane[2], John Mduma[3], Alexis Naho,[4] and Teh-wei Hu[5]

Abstract

This study considers the effect of household tobacco expenditure on food consumption in Tanzania. The study initially hypothesizes that the majority of Tanzanians belong to a low-income group and that any expenditure on cigarettes or tobacco is at the expense of basic necessities, especially food. In order to verify this hypothesis, we first compared various expenditure patterns as well as the household size of non-smokers and smokers. Results of the study indicate that the majority of non-smokers and smokers belong to a low-income group and that the mean total per capita expenditure (proxy for income) of non-smokers is slightly higher than that of smokers. Among smokers, per capita tobacco expenditure represents 7.73 percent of per capita total (food plus tobacco &cigarette) expenditure. A multiple linear regression on the determinants of per capita food expenditure was estimated. For every one stick of cigarette consumed, per capita food expenditure decreases by 67.7 Tanzanian shillings. People who smoke and belong to high-income groups (interaction effect) tend to spend less on food. People who are less educated, who are rural dwellers and with large household size—that is, poor people—tend to spend less on food.

Key words: *smoking, food expenditure, poverty, Tanzania*

Résumé

Cette étude considère l'effet des dépenses des ménages du tabac sur la consommation alimentaire en Tanzanie. L'étude émet l'hypothèse d'abord que la majorité des Tanzaniens appartiennent à un groupe à faible revenu et que toute dépense sur les cigarettes ou du tabac est au détriment des nécessités de base, notamment la nourriture. Afin de vérifier cette hypothèse, nous avons d'abord comparé les différents modèles de dépenses ainsi que la taille des ménages des non-fumeurs et les fumeurs. Les résultats de l'étude indiquent que la majorité des non-fumeurs et les fumeurs appartiennent à un groupe à faible revenu et que les dépenses total moyen par habitant (proxy pour le revenu) des non-fumeurs est légèrement supérieure à celle des fumeurs. Parmi les fumeurs, les dépenses du tabac par habitant représente 7,73 pour cent du dépense totale (aliments, le tabac et la cigarette)

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par habitant. Une régression linéaire multiple sur les déterminants de la dépense alimentaire par habitant a été estimée. Pour chaque cigarette consommée, les dépenses alimentaires par habitant diminuent de 67,7 shillings tanzaniens. Les gens qui fument et qui appartiennent à des groupes à revenu élevé (effet d'interaction) ont tendance à dépenser moins pour la nourriture. Les gens qui sont moins instruits, qui sont les ruraux et avec grande taille du ménage - c'est à dire, les personnes pauvres - ont tendance à dépenser moins pour la nourriture.

Mots clés: *tabagisme, dépenses alimentaires, la pauvreté, la Tanzanie*

1. INTRODUCTION

Tanzania, a country of 50.76 million people (AfDB, 2015), is estimated to have an adult male tobacco-smoking prevalence rate of 27 percent (Kidane *et al.*, 2014). When classified by gender, only 1.8 percent of total smokers are female. Among the youth (10–19 years old), the prevalence rates for males and females are 6.5 percent and 4.4 percent respectively. The adult male prevalence rate increases to 24.8 percent if account is taken of all types of tobacco consumption, including chewing. A pack of cigarettes (sold in Tanzania) costs US$ 1.10 (imported brand) and US$ 0.85 (local brand). To put this into context, the per capita GDP of Tanzania in 2014 was US$ 966 (AfDB, 2015) with a negatively skewed differential between rural and urban households. In other words, Tanzania is ranked as a low-income country with 35 percent of its population officially classified as poor. Compared to similar studies undertaken in other global regions (Rani *et al.*, 2003), the poverty estimate for Tanzania appears to be high.

The aim of this study is to estimate daily expenditure on food and cigarettes and then assess the effect of tobacco consumption on food expenditure. We hypothesize that daily expenditure on tobacco constitutes a significant proportion of food-plus-tobacco expenditure. In other words, expenditure on tobacco is likely to be at the expense of food and other basic necessities. The fact that smoking tends to reduce appetite may help to explain the relatively low expenditure on food. This is more so among the lowest-income households. Comparing household welfare in terms of food expenditure in the absence and presence of tobacco consumption will be a good indicator of the negative effect of tobacco consumption on the welfare of households. This is an important consideration, as in addition to the direct and indirect economic costs of smoking (such as healthcare costs, productivity loss, and the like), the negative welfare effects of smoking on the poor may be significant.

This paper has five parts. Part 2 considers the magnitude and depth of poverty in Tanzania. Explanation of the data sources and the method of analysis constitutes part 3. In part 4 the relation between total food expenditure and total household expenditure (a proxy for total household income), as well as the relation between cigarette expenditure and food expenditure, are discussed. A multiple linear regression on the determinants of per capita food expenditure with particular reference to cigarette consumption is estimated and discussed in part 5. Part 6 forms the concluding part of the study.

2. MAGNITUDE AND DEPTH OF POVERTY IN TANZANIA

For the purposes of this study, the level of food expenditure as a percentage of total expenditure is taken as a measure of welfare. Poverty measure is estimated from household expenditure. There are other indicators of poverty that relate to cigarette consumption (Efroymson, 2001; 2011). The reason for using household expenditure as an indicator of welfare is based on the theory of consumer behavior (Glewwe, 1991). There are two principal measures of poverty, namely income poverty and food poverty. The former defines poverty in broad terms (food plus other expenditure on basic necessities), while the latter is confined to food expenditure. The percentage of people living below the poverty line is thus larger when expenditure on food and other necessities is taken as a measure of poverty. Besides estimating the poverty line (i.e., magnitude), the depth of poverty is also considered. The latter refers to the distribution of poverty profile for those below the poverty line. If most of the poor are clustered immediately below the poverty line, then the depth of poverty is considered less acute. The depth of poverty is said to be significant if most of the poor are significantly lower than the estimated poverty line.

3. DATA SOURCES AND METHODOLOGY

The data used for this study are based on the 2007/2008 Tanzania Household Budget Survey, which is periodically conducted by the National Bureau of Statistics. A national representative sample of 10,464 households (68 percent urban and 32 percent rural) was selected for the purpose. The survey includes information on detailed and itemized household characteristics such as consumption, income, and expenditure. The data set appears to contain extreme outliers at both ends of the values, especially for continuous variables such as expenditure. A decision was therefore made to drop 5 percent of the lowest and highest values in this study. Table 1 presents some selected descriptive statistics of the study population.

Table 1: Selected characteristics of the respondents

Variable	Overall	Urban	Rural
Smokers (%)	16.37	13.9	22.96
With relatively no education (%)	15.53	9.23	29.03
Wage/salary earners (%)	26.95	36.41	6.76
Farmers (%)	39.2	19.67	81.01
Female-headed households (%)	25.61	26.71	23.26
Married (%)	63.85	59.74	72.67
Mean household size*	3.55	3.4	3.88
	(2.15)	(2.09)	(2.26)
Mean age of household head*	42.74	41.3	45.81
	(14.42)	(13.35)	(15.68)
	n = 9,422	**n = 6,425**	**n = 2,997**

Sources: Authors' calculations based on the 2007/2008 Tanzania Household Budget Survey.

Note: *Values in parenthesis are standard deviations.

Table 1 shows that the percentage of smokers is slightly lower than in the official publication, reported in the introduction. Smoking appears to be more prevalent among rural dwellers, married household heads, large size households, and those with little or no education. As expected, the majority of rural respondents are famers, while 36.41 percent of urban dwellers are wage/salary earners. Respondents appear to be relatively old, implying that the youth are underrepresented.

4. THE RELATION BETWEEN VARIOUS EXPENDITURE COMPONENTS

4.1 Total household expenditure, non-smokers vs. smokers

Before estimating per capita food expenditure for both non-smokers and smokers, one needs to compare smokers and non smokers by income group. In many developing countries, total household income is difficult to measure with a high level of accuracy. Total income estimates that are based on surveys show considerable underestimation. Therefore the second best option is to use total expenditure as a proxy for total income. The proxy is justified by the fact that more than 90 percent of household income in African countries is spent (Christiansen and Lei Pan, 2012). Table 2 compares per capita total monthly expenditure and per capita food expenditure between smokers and non-smokers in Tanzania. Table 2

also shows per capita food expenditure as a percentage of per capita total expenditure.

Table 2: Per capita total and per capita food expenditure among non-smokers and smokers (Tanzanian shillings)

Rural/ Urban	Per capita total expenditure		Ratio	Per capita food expenditure		Ratio	Per capita food expen. as % of per capita total expenditure	
	Non-smokers (A)	*Smokers (B)*	*A/B*	*Non-smokers (A)*	*Smokers (B)*	*A/B*	*Non-smok-ers*	*Smok-ers*
Urban	38,058 (19,784)	36,217 (19,656)	1.05	21,264 (11,648)	19,377 (10,914)	1.09	54.7	53.5
+Rural	24,125 (14,177)	24,066 (13,288)	1.001	16,107 (9,703)	15,312 (8,847)	1.05	67.1	63.6
All	33,975 (19,373)	30,796 (18,141)	1.03	19,752 (11,358)	17,563 (10,243)	1.07	58.1	57.1

Source: Authors' calculations based on 2007/2008 Tanzania Household Budget Survey.

*Values in parenthesis are standard deviations.

Table 2 reveals that non-smokers have higher per capita total expenditure than do smokers; in other words, non-smokers earn 3 percent more than smokers. Per capita food expenditure is also 7 percent higher among non-smokers than smokers. One would have expected that the percentage of per capita food expenditure over total expenditure would have been higher for smokers than for non-smokers. However, this does not appear to be the case (perhaps because smoking suppresses the appetite for food). One may safely infer that expenditure on cigarettes among smokers may be at the expense of food.

4.2 Food expenditure as a percentage of total expenditure: smokers vs. non-smokers

The principal aim of this study is to analyze the difference that cigarette smoking makes to food expenditure. However, one has to first estimate and compare food expenditure as a percentage of total expenditure, for both non-smokers and smokers. Table 2 also compares food expenditure as a percentage of total expenditure between smokers and non-smokers.

Both smokers and non-smokers spend more than 54 percent of their total expenditure on food. This suggests that the two groups are relatively poor. The results also suggest that non-smokers spend a slightly higher percentage of their total expenditure on food (58.1 percent) compared to smokers (57.1 percent). A further variable also needs to be considered—that of the rural/urban divide. The results show that in both rural and urban areas, non-smokers spend slightly more on food compared to smokers. The difference appears to be more pronounced among rural dwellers. Given that the total per capita expenditure of smokers is less than that of non-smokers, the former should have earmarked more expenditure on food.

4.3 Food and cigarette expenditure among smokers

Analysis of the relation between food and cigarette expenditure will reveal the magnitude of cigarette smoking, as well as its impact on food expenditure. Table 3 shows the distribution of cigarette expenditure as a percentage of food expenditure among smokers.

Table 3: Cigarette and tobacco expenditure as a percentage of food plus cigarette and tobacco expenditure among smokers

%	Overall	Urban	Rural
<4%	59.47	52.79	67.35
0–08%	19.8	21.16	18.24
08–10%	6.23	6.98	5.35
10–12%	3.65	5.35	1.65
>12%	10.82	13.72	7.41
Total	100	100	100
Mean	7.73	8.57	6.74
Std. Dev	6.44	7.00	5.58

On average, expenditure on cigarettes and tobacco represents 7.73 percent of total food plus cigarette and tobacco expenditure—a significant amount. About 10.8 percent of smokers spend more than 12 percent of their food expenditure on cigarettes and tobacco. Urban residents tend to spend more than their rural counterparts. A related study on the demand for cigarettes in Tanzania reveals that low-income households smoke about 1.48 sticks per day, whereas the corresponding value for the high-income group is 1.31

sticks (Kidane *et al.,* 2014). This suggests that smokers tend to spend less on food because of cigarette-induced low appetite.

5. DETERMINANTS OF PER CAPITA FOOD EXPENDITURE

A more comprehensive picture is obtained when we apply OLS to estimate a multiple regression of per capita food expenditure on several explanatory variables including: per capita cigarettes consumed, per capita total expenditure, and the interaction between the two. Other poverty-related explanatory variables include education, household size, and residence (rural versus urban). The results are presented in Table 4.

Table 4: Determinants of per capita food expenditure[1]

Explanatory variables	Coeff.	Std error	T	P > t	Beta coeff.
Per capita total expenditure	0.501*	0.004	124.9	0.000	0.859
Education	-886.12*	71.413	-12.41	0.000	-0.079
Household size	-97.397*	32.534	-2.99	0.003	-0.019
Residence (0=rural, 1=urban)	-1187.8*	154.111	-7.71	0.000	0.049
Per capita cigarette consumption	-67.706*	31.567	-2.14	0.032	-0.034
Per capita total expenditure and per capita cigarette consumption	-0.002*	0.0005	-2.69	0.007	-0.042
Constant	5663.27*	223.236	25.37	0.000	
N	9422				
R2 (adjusted)	0.675				
F(6,9415)	3261.87				
Prob > F	0.000*				

[1] This result is based on cross-section data. A test for heteroscedasticity and multicollinearity was performed; their effect on the OLS result appear to be minimal. The large sample size contributed to the robustness of the results.

The estimated regression equation appears to have a good fit with all of the explanatory variables as being significant at less than 5 percent. The most important explanatory variable positively affecting per capita food expenditure is per capita total expenditure. There appears to be a significant

negative relation between per capita cigarette smoking and per capita food expenditure. Other variables remaining constant, for every one stick of cigarette consumed, per capita food expenditure is reduced by 67.7 Tanzanian shillings or US$ 0.06. For low-income households in Tanzania, this is a significant amount. On the other hand, higher cigarette consumption and higher per capita total expenditure (the interaction effect) appear to lead to a lower per capita food expenditure. Furthermore, those who are less educated, who live in rural areas, and those with large size households appear to spend less on food. These attributes are characteristics of poor households in Africa. One should note that the relative impact of each of the explanatory variables is showed by the Beta coefficient, which is a standardized value.

6 CONCLUSION AND RECOMMENDATIONS

The negative effects of cigarette consumption on the health and the life of smokers and passive smokers have been widely investigated and the monetary consequences verified and quantified (Hu *et al.*, 2008; Sung *et al.,* 2008; Karki *et al.,* 2003). The economic burden of smoking is usually estimated at a macro level and includes direct health-care expenditures for treating diseases related to smoking. Other macro level estimates include transportation costs to and from health service facilities. On the other hand, the consequences and economic burden of smoking at a micro (household and individual) level do not seem to be given due consideration. This is especially so within the African setting, where poverty is rampant and the minimum daily food requirement is frequently not met. When the macro and micro effects of cigarette smoking are considered simultaneously, the impacts may be devastating. This is especially so in a lower-income country like Tanzania, where the level of poverty is already high and the health delivery system is not equitably distributed. The findings of this study tend to confirm that tobacco smoking is common among the poor households and that household expenditure on tobacco appears to be at the expense of other basic necessities, especially food.

Passing legislation that aims at reducing cigarette smoking and tobacco leaf production will go a long way toward curbing the negative health and welfare effects of cigarette and tobacco consumption. Implementing the WHO Framework on Tobacco would help reduce the impact of cigarette and tobacco smoking on food poverty. Some of the WHO recommendations include imposition of excise tax on cigarettes. Through excise and related taxes, many countries have been able to reduce cigarette smoking

significantly, while at the same time enhancing government revenue. Studies show the effect of a tax increase on reducing cigarette smoking as being more pronounced among the low-income households. Other ways of reducing cigarette smoking include labeling cigarette packages on the negative health consequences of smoking, identifying smoke-free areas and banning tobacco advertisement in the press and other media. On the supply side, an attempt should also be made to discourage farmers from planting tobacco. The latter requires introduction of profitable alternate crops. In Tanzania the gestation period for tobacco (from planting to harvesting and selling) is about nine months. The corresponding gestation period for maize (the main staple diet among Tanzanians) is three to four months. In other words, farmers can grow maize three times a year, while for tobacco it is about once a year. Alternate agricultural activities such as poultry production, cattle, sheep and goat raising and the like may have to be encouraged and financially supported.

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4. Prior Academic Attainment as a Predictor of Undergraduate Level Achievement: A Panel Data Analysis

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Abstract

There is an extensive body of literature highlighting the relevance of students' prior academic attainment for predicting future levels of achievement in undergraduate studies. However, assessment in these studies is based mainly on cross-sectional data. In this article, we use multi-dimensional data—panel data—to investigate this issue further. The data, comprising administrative records of students over a three-year period of undergraduate studies (N =2,305), enables us to model time variant and invariant factors during the course of candidature. The investigations are based on all enrollees of Makerere University, School of Statistics and Planning, during the period 2007–2009. In addition to confirming prior academic attainment as a predictor of undergraduate level achievement, our results revealed that 85 percent of the variance in the achievement was due to differentials across students. Thus, measures for assessing the competence of candidates on undergraduate programs should consider variations in three separate areas, namely: (i) the characteristics of enrollees, (ii) the type of undergraduate programs applied for, and (iii) academic grades attained in prior studies, particularly grades in the Advanced Level of secondary education.

Key words*: academic achievement, undergraduate programs, variance in characteristics, prior studies*

Résumé

Il y a un vaste corps de la littérature à l'appui de la pertinence des résultats scolaires antérieures pour prédire le rendement scolaire des élèves dans leurs efforts académiques ultérieures. Toutefois, l'évaluation de ces études est principalement basée sur des données transversales. Nous utilisons les données multidimensionnelles - données de panel – pour enquêter sur cette question. Les données, comprenant des dossiers administratifs des étudiants sur une période de trois ans d'études de premier cycle (N = 2305), nous permet de modéliser les variants dans le temps et les facteurs invariants au cours de candidature. Les enquêtes sont basées sur tous les étudiants inscrits de l'Université de Makerere, l'école de la statistique et de la planification, pour la période 2007-2009. En plus de confirmer les résultats scolaires antérieures comme un facteur contribuant aux variations de la réussite scolaire, nos résultats ont révélé que 85% de la variance dans la réussite

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scolaire était dû à des différences entre les élèves. Ainsi, des mesures pour évaluer la compétence des candidats sur les programmes de premier cycle devraient tenir compte des variations dans: (i) les caractéristiques de personnes inscrites, (ii) le type de programmes de premier cycle demandé, et (iii) les grades académiques atteints dans les études antérieures, en particulier les grades dans le niveau élevé de l'enseignement secondaire éducation.

***Mots clés**: la réussite scolaire, les programmes de premier cycle, la variance des caractéristiques, des études antérieures.*

1. INTRODUCTION

Students who have excelled academically in the past are regarded as having a greater chance of successful performance in higher-level academic endeavors (Alfan and Othman, 2005; Bariez, 2002; Duff, 2004; Duff, *et al.*, 2004; Kyoshaba, 2009; Wamala and Buyinza, 2013; Wamala *et al.*, 2012). This argument is supported by studies looking at both graduate (e.g., Bariez, 2002; Navarro *et al.*, 2011; Wamala *et al.*, 2012) and undergraduate students (e.g., Hoskins *et al.*, 1997; Duff, 2004; Duff *et al.*, 2004; Alfan and Othman, 2005; Halpern, 2007; Kyoshaba, 2009). This issue of an association between the performance of students who have excelled academically in the past and their subsequent performance at undergraduate level may be applied across disciplines. For example, a number of recent studies have reached the same conclusion with regard to students of accounting and business economics (Duff, 2004; Alfan and Othman, 2005), business management and national statistics (Halpern, 2007; Hoskins *et al.,* 1997), nursing (Navarro *et al.,* 2011) and law (Wamala, 2013), to mention but a few.

In the recent past, there has been a shift in admission requirements for undergraduate programs in Uganda. This has entailed a move away from the traditional reliance on applicants' prior academic attainment towards the use of pre-entry examinations to determine suitability. In Uganda, pre-entry examination to undergraduate programs was first introduced for the degree of Bachelor of Law at the Uganda Christian University (UCU) in 2009. Three years later, the same approach was adopted by Makerere University, one of the oldest and most prestigious institutions of higher learning in Africa. The shift in admission requirements for undergraduate programs is gaining ground among various academic units at the University. It is highly likely that other institutions of higher learning both in the country and the region will adopt the same screening approach. Indeed, using pre-entry examinations to determine the competence of candidates

for admission on bachelor and postgraduate programs may become generally more widespread.

This raises the question: is this a justifiable shift in approach? In light of the wide multidisciplinary variations in the background of candidates on some graduate programs (e.g., MBA), a pre-entry examination requirement could be justified. What is debatable, however, is: (i) whether the outcomes of pre-entry examinations should be used as the sole measure to determine the competence of enrollees on undergraduate programs, and (ii) whether administering pre-entry examinations enhances the quality of educational outcomes at the undergraduate level. With regard to undergraduate studies in Uganda in particular, candidates are usually students who have successfully completed their Ordinary (O-Level) and Advanced (A-Level) levels of secondary education. These enrollees have been subjected to the same national examination by a central educational assessment authority in the country—the Uganda National Examination Board (UNEB). Their A-Level and O-Level outcomes—viz. the Uganda Advanced Certificate of Education (UACE) and Uganda Certificate of Education (UCE)—are to a large extent comparable across all secondary schools in the country.

Thus, the idea of subjecting these candidates to an additional pre-entry examination diminishes—to a great extent—the relevance of prior academic attainment as a determinant of their competence to undertake undergraduate studies. In other words, the argument that students who have excelled academically in the past have a greater chance of successful performance in subsequent academic endeavors is put to the test. Although the literature provides a great deal of evidence in support of this argument, assessment in those studies is based on either cross-sectional or time series data. A limitation of time series data is the ability to investigate student-related factors that are fixed over the course of bachelor's candidature. On the other hand, the use of cross-sectional data is limited in the assessment of factors that vary over time. Furthermore, the argument of whether high academic excellence of students pre-university is likely to equate with success at the undergraduate level remains to be tested across various disciplines and countries in the current era.

Our investigations address the shortfalls to data and methodology identified in prior studies on the subject area. In other words, we use a combination of cross-sectional and time series data—panel data—to provide an ideal approach of modeling time variant and invariant student-related factors during the three-year stipulated period of the bachelor level candidature. Longitudinal data on all student cohorts at Makerere University's School of

Statistics and Planning (SSP) for the academic period 2007–2009 allow us to investigate this issue in a more detailed manner than has been done before.

Admission procedure and undergraduate programs at Makerere University's School of Statistics and Planning (SSP)

The SSP, formerly known as the Institute of Statistics and Applied Economics (ISAE), has since 1969 trained statisticians, planners, applied economists and demographers from a number of English-speaking countries in Africa. These countries include: Botswana, Cameroon, Ethiopia, Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Seychelles, Somalia, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe (SSP, 2013). The SSP offers undergraduate studies in five programs namely, Bachelor of Statistics (BSTA), Bachelor of Science in Actuarial Sciences (BSAS), Bachelor of Population Studies (BPS), Bachelor of Science in Business Statistics (BSBS), and Bachelor of Science in Quantitative Economics (BSQE). The minimum graduation loads for these programs are 147, 128, 113, 116, and 128, respectively. The stipulated period of undergraduate studies at the SSP is three years.

Admission to undergraduate programs at the SSP is based on enrollees' academic attainment or performance in their Advanced and Ordinary Levels of secondary education. Performance of enrollees in their secondary education is summarized by a combined weighted score, which is adopted by the SSP and/or University for admission to the undergraduate programs. According to the 2013/2014 Ministry of Education and Sports (MoES)[4], all subjects studied at A-level are grouped into four categories and weighted in the following manner: 1) the essential subject is assigned a weight of three; 2) the relevant subject(s) carries a weight of two; 3) desirable subjects are assigned a weight of one; and 4) all other subjects are assigned a weight of 0.5. For O-level grades, distinctions 1 and 2 carry a weight of 0.3, while credits 3–6 carry 0.2, "Passes" 7 and 8 carry 0.1, and a "Failure" carries a weight of 0.0. The combined weighted score is obtained by adding the O-level and A-level weights. The best candidate for the program is "the one with the highest combined weight" (MoES, 2013, pp. 11). Table 1 presents a summary of admission requirements for the various undergraduate programs at the SSP.

4 The MoES is responsible for weighting criteria for the five public universities in Uganda.

Table 1: Admission requirements for undergraduate programs at SSP

Program	A-Level Subjects			
	Essential	**Relevant**	**Desirable**	**Others**
BSTA	Math	One best done of Economics or Physics	General Paper, One best done of Chemistry, Geography, Physics, Biology, Economics, Entrepreneurship, or Computer Science	All other
BSQE	Math or Economics	One better-done of or Geography	General Paper, One best done of Chemistry, Biology, Entrepreneurship	All other
BSAS	Math	Two best-done of Economics, Entrepreneurship, Geography or Physics	General Paper, One best done in Chemistry, Biology or Computer Science	All other
BPS *	Two best done of All A-Level subjects	The third best done of all A-Level subjects	General Paper Sub-Math	All other
BSBS*	Math and one best done of Economics, Geography or Physics	One best done of Economics, Geography, Physics, Chemistry or Entrepreneurship	General Paper, Sub-Math, Biology Geography, Physics, Chemistry, and Entrepreneurship	All other

Note: This table is based on Ministry of Education and Sports (MoES) joint admission requirements for all public universities in Uganda.

* Candidates should have at-least a Credit in O-Level Mathematics, with the exception of those who took Principle Mathematics or Subsidiary Mathematics at A-Level.

Theoretical overview

Causative factors of student academic achievement have long been the subject of debate. Walberg in his *Psychological Theory of Educational Productivity* (1980) suggests seven key variables that influence students' academic outcomes. These are: student's ability or prior achievement, motivational factors, age or mental development, quantity and quality of instruction,

classroom climate, and home environment. In a more recent 2002 study, DiPerna, Elliott, and Volpe (2002) categorize these variables into three major groups: (i) student characteristics (ability, motivation, and age), (ii) instructional (quantity and quality), and (iii) psychological environment (classroom climate, home environment, peer group, and exposure to media). In an assessment based on a variety of methods, Wang, Haertel and Walberg (1993) concluded that psychological, instructional, and home environment characteristics have a more significant impact on academic achievement than a student's geographical location (e.g., district).

The investigations in our study are focused on enrollees' prior academic attainment in predicting their academic achievement in bachelor programs. In the assessment, variations in the characteristics of enrollees were controlled for. This is because admission on bachelor programs at the SSP is to a certain extent based on the characteristics of enrollees.

2. DATA AND METHODS

This investigation is based on administrative records of undergraduate students at the SSP in the 2007–2009 enrollment cohorts. The enrollees were registered on the five bachelor programs offered by the SSP. The analysis is, however, based only on those students who graduated on these programs by January 2013. We used data pertaining to 788 students compiled over the three-year stipulated period of bachelor candidature. In the assessment, 2,305 student records were available for the analysis.

The Cumulative Grade Point Average (CGPA) of the enrollees in their first, second, and third academic years of undergraduate studies were adopted as a measure of their academic achievement. Attainment in prior studies was assessed using a combined weighted score (W) adopted by SSP on admission to the undergraduate programs. As earlier stated, the score is based on academic attainment or performance of enrollees in their Advanced level (A-level) and Ordinary level (O-level) stages of secondary education.

The role of prior academic attainment in predicting undergraduate achievement was investigated in this study, while accounting for variations in enrollees' characteristics of sex (S), age (A), enrollment cohort (C), nationality (N), and programs undertaken. Variations in undergraduate programs at the SSP were assessed based on a minimum graduation load (L). In the analysis, a panel data approach based on a Random Effects (RE) model was adopted. A panel represents students' records (e.g., CGPA) over the three

academic years of undergraduate studies. The application of the RE model was founded on the assumption that differences among students have some bearing on their academic achievement. Further, the RE approach allows us to investigate both time variant and invariant student-related factors over the course of bachelor's candidature. The RE model adopted in the investigation is based on the computational formula below.

$$Y_{it} = B_{0i} + B_1 S_i + B_2 A_{it} + B_3 C_i + B_4 L_i + B_5 N_i + B_6 W_i + \varepsilon_{it} + \mu_i \qquad (1a)$$

Where i is student ($i = 1 \ldots n$), t is time – academic year (t = 1,2,3); Y_{it} is CGPA of i student at time t; S_i, C_i, L_i, N_i and W_i are independent variables that vary only by student (i); A_{it} is an independent variable that varies by students and time; B_i are coefficients; μ_i and ε_{it} denote error terms—all fixed and varying omitted variables, respectively.

A unique feature of panel data analysis is the fact that each student (i) has a distinct intercept (B_{0i}). The intercept includes all aspects of unobserved heterogeneity that are fixed over the length of the panel (Arellano, 2003). With regard to the appropriateness of the RE model over OLS, the Breusch-Pagan Lagrange Multiplier (ML) test was carried out. The assessment is based on a null hypothesis that there are no variations across students or panels ($Var(u) = 0$). To demonstrate the two types of variations in the investigations, equation (1a) can be written as follows:

$$\text{CGPA}[\text{Student}, t] = \mathbf{X}\boldsymbol{\beta} + \varepsilon[\text{Student}, t] + \mu[\text{Student}] \qquad (1b)$$

Where

$\mathbf{X}$ = [S, A, C, L, N, W]

3. RESULTS

The results are based on records of undergraduate students over a three-year stipulated period of bachelor's candidature. Table 2 presents a distribution of enrollees by their characteristics of gender, nationality (Ugandan or non-Ugandan), entry scheme, and enrollment cohort. With the exception of age, the rest of the enrollees' characteristics were fixed over the stipulated period of undergraduate studies.

Table 2: Distribution of enrollees' characteristics

Characteristics	Overall		Between	
	N	%	N	%
Gender				
Male	1,234	53.5	422	53.5
Female	1,071	46.5	366	46.5
Total	**2,305**	**100.0**	**788**	**100.0**
Graduation Load[a]				
113	508	22.0	180	22.8
116	528	22.9	176	22.3
128	831	36.1	277	35.2
147	438	19.0	155	19.7
Total	**2,305**	**100.0**	**788**	**100.0**
Enrollment Cohort				
2007	700	30.4	253	32.1
2008	807	35.0	269	34.1
2009	798	34.6	266	33.8
Total	**2,305**	**100.0**	**788**	**100.0**
Nationality				
Non-Ugandan	78	3.4	26	3.3
Ugandan	2,227	96.6	762	96.7
Total	**2,305**	**100.0**	**788**	**100.0**
Entry Scheme				
Government	638	27.7	222	28.2
Private (Day)	899	39.0	305	38.7
Private (Evening)	768	33.3	261	33.1
Total	**2,305**	**100.0**	**788**	**100.0**

[a] Minimum graduation loads

The characteristics of the students can be summarized as follows: predominantly Ugandan by nationality (96.7 percent); slightly more than half were males (53.5 percent). There was no major variation with regard to year of enrollment on the undergraduate programs—the highest proportion (34.1 percent) were enrollees in the 2008 cohort, followed by 33.8 percent in 2009, while the rest were in the 2007 cohort. Pertaining to graduation loads, the highest proportion (35.2 percent) was on a program

with a minimum load of 128, followed by those on a load of 113 (22.8 percent), while the rest had graduation loads of 116 (22.3 percent) and 147 (19.7 percent).

Academic achievement of enrollees

Table 3 presents a summary of the academic achievements of enrollees. As stated earlier, academic achievement was based on the CGPA attained by enrollees in the first, second, and third academic years of their undergraduate studies.

Table 3: Summary of enrollees' academic achievements

Academic Year	Mean	Std. Dev	Min	Max
First	3.40	0.53	2.00	4.75
Second	3.43	0.45	2.37	4.65
Third	3.51	0.41	2.54	4.65
Overall	**3.40**	**0.47**	**2.00**	**4.75**

Note. Academic achievement is based on enrollees' CGPA in the three academic years of undergraduate studies.

The mean CGPA in the various academic years points to a "lower second" class of degree obtained by a considerable number of students.

Predictors of academic achievement

Table 4 presents regression estimates of academic achievement by prior academic attainment of enrollees, based on the RE model. The model accounts for variations in the characteristics of enrollees. The fact that the combined weighted scores on admission to undergraduate programs at SSP are highest among government-sponsored students, followed by day-private students and those on evening programs, implies that the variable is in principle the same as the entry scheme. Thus, the type of entry scheme variable could not be modeled alongside enrollees' individual weighted scores. The latter measure was adopted in the investigations as a measure of enrollees' academic attainment in prior studies. Further, the variable age was intentionally excluded from the analysis, despite the fact that it was significantly associated with academic achievement of the students. The fact that the variable changes over time suggests that it could be assessing something other than age. A preliminary assessment of the model shows that it is a good fit ($p < 0.001$). The model was however investigated further for appropriateness using the aforementioned diagnostic tests.

Table 4: Regression estimates of academic achievement

Independent Variables	Coef.	Std. Err	p-value
Gender			
Male†	.	.	.
Female	-0.072	0.028	0.012
Graduation Load[a]			
113†	.	.	.
116	0.535	0.048	0.000
128	0.326	0.041	0.000
147	0.507	0.044	0.000
Enrollment Cohort			
2007†	.	.	.
2008	0.035	0.036	0.481
2009	0.031	0.035	0.403
Nationality			
Non-Ugandan†	.	.	.
Ugandan	-0.183	0.080	0.022
Weighted Score	0.027	0.003	0.000
Cons.	2.381	0.122	0.000

Note. Estimates are based on a random-effects model; where, $x^2 = 274.5$, $p < 0.001$, Intra-class Correlation (rho) = 0.847; † is reference category

[a] Minimum graduation loads

Regression diagnostics

Table 5 presents an assessment of variation across panels or students using the ML test. The null hypothesis in the investigation is that there are no variances across students, i.e., no panel effects.

Table 5: Testing for random effects

Estimates	Var. [c]	Std. Dev = sqrt(Var.)
CGPA	0.221	0.470
e [a]	0.026	0.162
u [b]	0.147	0.384
$x^2 = 1526.4$, $p = 0.000$		

Note. Assessment is based on the null hypothesis of no variation across panels – Var(u)=0

[a] residuals across students and academic year

[b] residuals across students

[c] Variance

Results of the ML test show evidence of significant differences across students ($p < 0.05$). In fact, the findings according to the intra-class correlation (rho) reveal that about 85 percent of the variance in CGPA is due to differences across panels or students. Thus, an RE model based on a panel data analysis is the ideal approach for modeling the data, rather than a cross-sectional approach using OLS regression.

Summary of findings

According to Table 4, significant variations in the academic achievement of enrollees were noted for variables, namely graduation loads, sex, nationality and weighted score adopted on admission to the undergraduate programs ($p < 0.05$). These results can be summarized as follows:

- Students' CGPA increases with their combined weighted score adopted on admission to a program;
- Enrollees on programs with minimum graduation loads of 116, 127, and 147 had higher CGPA compared to those on a load of 113;
- Males perform better than their female counterparts; and
- International students perform better than the natives (Ugandans).

No significant variation in students' CGPA was noted by year of enrollment on the undergraduate programs ($p > 0.05$).

4. DISCUSSION

In the results, 85 percent of the variation in academic achievement was due to differentials across students. The variations were significantly attributed in this study to differentials in enrollees' prior academic attainment and in their characteristics—namely, age, sex, nationality and program undertaken ($p < 0.05$). Worth noting is the fact that enrollees with outstanding academic attainment in prior studies—demonstrated by high weighted scores adopted on admission to the programs—are admitted on the government entry scheme. Therefore, it would not be surprising to conclude that these government entry scheme enrollees are more competent to undertake undergraduate studies compared to their counterparts on the private scheme. An analysis of the 248 undergraduate students, across disciplines, who obtained first-class degrees in Makerere University's 63rd graduation (Makerere University, 2013) supports this hypothesis. The majority of first-class degrees (67.3 percent) were obtained by students on the government entry scheme.

The results according to the combined weighted score adopted on admission to a program at SSP do not show otherwise. A positive relationship in

the results between enrollees' weighted score and academic achievement at undergraduate level demonstrates the relevance of prior studies in predicting subsequent academic endeavors. The findings in this study add to the literature that posits students' prior academic attainment as a predictor of their undergraduate achievement. The consensus is that successful performance in subsequent academic endeavors is more likely among students who have excelled academically in prior studies (Alfan and Othman, 2005; Bariez, 2002; Duff, 2004; Kyoshaba, 2009; Wamala and Buyinza, 2013; Wamala *et al.*, 2012). Further, this study supports the argument of successful performance of students who have excelled academically in the past across disciplines. Our investigation confirms this finding among students in three broad disciplines, namely, Statistics, Economics, and Population Studies.

Certainly, "the best candidate for each program is the one with the highest combined weight" adopted on admission to a program (MoES, 2013, pp. 11). To this end, this study finds that: (i) the outcomes of secondary education (e.g., UACE and UACE) can with confidence be adopted to ascertain enrollees' competence to undertake undergraduate studies, and (ii) the supposition of a mismatch/non-correlation between prior academic grades and undergraduate-level academic achievement (Makerere University, 2011, p. 1) is not supported.

Regarding undergraduate programs at SSP, the academic achievement was significantly higher among students admitted on the programs with higher minimum graduation loads (147, 128, and 116) compared to those on the BPS program, which has the lowest load of 113. This evidence suggests a need to increase the graduation load on the BPS program to match the criteria for the rest of the undergraduate programs at SSP. However, lower academic achievement of enrollees on the BPS compared to students on other undergraduate programs at SSP is likely to be an issue of admission requirements. Unlike other programs at SSP, admission to the BPS program does not require competence of enrollees in any particular subject taken at the A-Level of secondary education. According to the 2013/2014 Ministry of Education and Sports (MoES) admission criteria, any two best done subjects at A-Level are considered as the essential subjects. This criterion has not changed when compared to entry requirements on the program in the recent years i.e., 2007, 2008, 2009, and 2010. The weighting criterion for BPS is similar to that for enrollees on the Bachelor of Law program at Makerere University (LAW), where pre-entry examinations are adopted as a basis for admission to undergraduate studies. Thus, it is highly likely that a considerable number of enrollees in these programs are admitted on the basis of A-Level subjects that do not positively impact on their academic

achievement. No wonder then that the low academic achievement of BPS students is attributed mainly to shortfalls in competence with regard to quantitative subjects. On the other hand, the low academic achievement on LAW is attributed to shortfalls in communication, compression and analytical skills (Makerere University, 2012, p. 1).

The influence of gender on the academic achievement of students is debatable. Unlike studies based on cross-sectional data (Wamala, 2013; Wamala *et al.*, 2013), our investigation reveals significant gender variations in the academic achievement of undergraduate students. This evidence supports DeBerard and Julka's (2000) study, cited by DeBerard *et al.* (2004), where gender is identified as a predictor of academic achievement of college freshmen. While males are associated with lower GPA in DeBerard and Julka's (2000) study, the findings in our study indicate otherwise. The gender disparity in this study could be an issue of the science disciplines investigated, where males typically excel. It is unsurprising that related studies of primary and secondary students in Uganda reach the same conclusion. A study of Grade Six pupils in a National Assessment of Progress in Education (NAPE) survey reveals better performance of males, particularly in the science disciplines (UNEB, 2011a). A similar assessment based on secondary students in the country arrives at the same conclusion (UNEB, 2011b). Thus, it is highly probable that the influence of gender on academic achievement varies across disciplines.

In sum, the relevance of prior academic attainment in predicting the academic achievement of undergraduate enrollees is unquestionable. However, variations in the characteristics of enrollees, including undergraduate programs undertaken, must also be taken into account.

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Le Journal statistique africain a été établi pour favoriser la compréhension du développement statistique dans la région africaine. Il se concentre sur des questions liées aux statistiques officielles aussi bien que l'application des méthodologies statistiques pour résoudre des problèmes pratiques d'intérêt général pour les statisticiens de métier. L'intérêt particulier est de montrer comment les statistiques peuvent aider à mettre en exergue les problèmes de développement et de politique publique tels que la pauvreté, le genre, l'environnement, l'énergie, le VIH/ SIDA, etc.; le développement de la culture statistique ; la prise en compte des questions de développement régional et national; le développement des capacités statistiques et des systèmes statistiques nationaux efficaces; et le développement des statistiques sectorielles comme les statistiques d'éducation, de santé, des statistiques agricoles, etc.

En plus des universitaires et des statisticiens de métier, le Journal devrait revêtir un grand intérêt pour les institutions de la région, notamment les offices nationaux de statistiques, les banques centrales, les instituts de recherche et les organisations économiques sous-régionaux et les agences internationales de développement.

Le Journal constitue un document de recherche et d'information entre les statisticiens et les utilisateurs de l'information statistique, principalement dans la région africaine. Il publie entre autres: des articles sur le plaidoyer en matière de statistique qui démontrent le rôle essentiel des statistiques dans la société plutôt que la présentation des outils techniques, des articles sur les méthodologies statistiques, avec un accent particulier sur les applications, des articles sur les meilleures pratiques et les leçons tirées de la région, des avis sur des questions d'intérêt général pour la communauté statistique et les utilisateurs de l'information statistique dans la région africaine, des informations et des annonces sur les prochains événements, les conférences, les appels à contribution pour des papiers, et les développements statistiques récents et tout autre aspect susceptible d'intéresser la communauté statistique dans la région.

Les articles, qui n'ont pas besoin de contenir du matériel original, devraient intéresser une grande partie des statisticiens professionnels dans la région.

Tous les manuscrits seront passés en revue et évalués sur le contenu, la langue et la présentation.

Guidelines for manuscript preparation and submission

Submissions
Manuscripts in English or French should be sent by email to **ASJ-Statistics@afdb.org**

Title
The title should be brief and specific. The title page should include the title, the author's name, affiliation and address. The affiliation and address should be given as a footnote on the title page. If the manuscript is co-authored, the same information should be given for the co-author(s).

Abstract, Key Words, and Acknowledgments
A short abstract of about 150 words must be included at the beginning of the manuscript, together with up to 6 key words used in the manuscript. These key words should not repeat words used in the title. Acknowledgments, if any, should inserted as a new section at the end of the paper and before the References.

Sections and Numbering
Major headings in the text should be numbered (e.g. "**1. INTRODUCTION**"). Numbered subheadings (e.g. "**1.1 The establishment of the NSDS**") may be used but thereafter sub-subheadings should be unnumbered. Main body text in the form of paragraphs should not be numbered.

Formatting
Please use minimal formatting as this will facilitate harmonization of all the papers. As your default, keep to "normal" (12 pt. Times New Roman) for main text with a single line space between paragraphs. Do not apply "body text" as an inbuilt style. The levels of heading need to be easily identifiable. We recommend all capitals bold for the first level of heading in the main text (e.g. "**1. INTRODUCTION**"); thereafter bold upper and lower case for subheadings (e.g. "**1.1 The establishment of the NSDS**") and unnumbered bold italic (e.g. "***Creating a culture of cooperation***") thereafter. Please refer to the latest volume of the AJS as a guide.

House Style
The Bank's house style is US rather than British spellings (e.g. "organization" not "organisation"; "program" rather than "programme", "analyze" rather than "analyse" etc.). Use % rather than "percent" or "per cent" and double rather than single quotation marks. Dates should be US style (e.g. December 11, 1985 not 11 December 1985).

Tables and Figures
Tables and figures should be numbered and given a title. These should be referred to in the text by number (e.g. "See Table 1"), not by page or indications such as "below" or "above".

Equations
Any equations in the paper should be numbered. The numbers should be placed to the right of the equation.

References
A list of references should be given at the end of the paper (to precede the Annexes, if included). The references should be arranged alphabetically by surname/name of organization. Where there is more than one publication listed for an author, order these chronologically (starting with the earliest). The references should give the author's name, year of publication, title of the essay/book, name of journal if applicable. Use a, b, c, etc. to separate publications by the same author in the same year. Titles of journals and books should be in italic; titles of working papers and unpublished reports should be set in double quotation marks and not italicized.

Examples:
Fantom, N. and N. Watanabe (2008). "Improving the World Bank's Database of Statistical Capacity," *African Statistical Newsletter*, 2 (3): 21–22.

Herzog, A. R. and L. Dielman (1985). "Age Differences in Response Accuracy for Factual Survey Questions," *Journal of Gerontology*, 40: 350–367.

Kish, L. (1988a). "Multipurpose Sample Designs," *Survey Methodology*, 14 (3): 19–32.

Kish, L. (1988b). "A Taxonomy of Elusive Populations," in *Proceedings of the Annual Meeting of the American Statistical Association*. January 1988.

Parpart, J. L., M. P. Connelly, and V. E. Barriteau (eds.) (2000). *Theoretical Perspectives on Gender and Development*. Ottawa: International Development Research Center.

World Bank (2006). *Statistical Capacity Improvement in IDA Countries – Progress Report*. Washington, DC: The World Bank.

Cross References

In the main body of the article, cross-references should be Harvard-style, e.g. (Kish 1988a; Herzog and Dielman 1985: 351). For cross-references to three or more authors, only the first surname should be given, followed by et al., although the names of all the authors must be provided in the References entry itself. Abbreviations ibid. and op. cit. should be avoided.

Instructions pour la préparation et la soumission de manuscrits

Soumission
Les manuscrits en anglais ou en français doivent être envoyés à : **ASJ-Statistics@afdb.org**

Titre
Le titre devrait être bref et détaillé. La page de titre doit inclure le titre du papier, le nom de l'auteur, l'affiliation et l'adresse. L'affiliation et l'adresse doivent figurer comme note de bas de page. Si le manuscrit est produit par des coauteurs, la même information doit être donnée pour les coauteurs.

Résumé, mots clés et remerciements
Un résumé court d'environ 150 mots doit être inclus au début du manuscrit ainsi qu'environ 6 mots clés utilisés dans le manuscrit. Les mots clés ne doivent pas répéter les mots utilisés dans le titre. Les remerciements, s'il y en a, doivent être insérés à la fin de l'article, avant les références bibliographiques.

Section et numérotation
Les principaux titres doivent être numérotés (par exemple "**1. INTRODUCTION**"). Les sous-titres numérotés (par exemple "**1.1 L'élaboration de SNDS**") peuvent être employés mais par la suite les sous sous-titres ne devraient pas être numérotés. Le corps principal du texte sous forme de paragraphes ne devrait pas être numéroté.

Formatage
Veuillez utiliser le formatage minimal car ceci facilitera l'harmonisation de tous les articles. Garder par défaut le format "normal" (12 pt. Times New Roman) pour le texte principal avec l'espace d'une seule ligne entre les paragraphes. Ne pas appliquer le "corps de texte " en tant que modèle intégré. Les niveaux du titre doivent être facilement identifiables. Nous recommandons les majuscules en gras pour le premier niveau titre dans le texte principal (par exemple "**1. INTRODUCTION**") ; ensuite les lettres minuscules en gras pour les sous-sections (par exemple "**1.1 l'élaboration de la SNDS**") et ensuite l'italique en gras sans numérotation (par exemple "***créant une culture de coopération***"). Veuillez vous référer au dernier volume du JSA comme guide.

Tables and Figures
Les tableaux et les graphiques doivent être numérotés et comporter un titre. Ceux-ci devraient être mentionnés (par exemple "voir Tableau 1") dans le texte par le nombre correspondant, et non par une indication de page ou par d'autres indications telles que "ci-dessous" ou "au-dessus de".

Équations
Toutes les équations dans le papier doivent être numérotées. Les nombres doivent être placés à la droite de l'équation.

Références bibliographiques
Une liste de références doit être fournie à la fin de l'article (avant les annexes, le cas échéant). Les références doivent être classées par ordre alphabétique selon le nom de l'auteur ou de l'organisation. Là où il y'a plus d'une publication listée pour un auteur, elles doivent être classées chronologiquement (en commençant par les plus récents). Les références doivent donner le nom de l'auteur et l'année de publication, le titre du livre, le nom du journal le cas échéant. Utiliser a, b, c, etc. pour séparer les publications du même auteur au cours der la même année. Les titres des journaux et des livres devraient être en italique ; les titres des documents de travail et des rapports non publiés devraient être placés dans de doubles guillemets et ne pas être imprimés en italique.

Exemples :
Fantom, N. and N. Watanabe (2008). "Improving the World Bank's Database of Statistical Capacity," *African Statistical Newsletter*, 2 (3): 21–22.

Herzog, A. R. and L. Dielman (1985). "Age Differences in Response Accuracy for Factual Survey Questions," *Journal of Gerontology*, 40: 350–367.

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World Bank (2006). *Statistical Capacity Improvement in IDA Countries – Progress Report*. Washington DC: The World Bank.

Renvois
Dans le corps principal de l'article, les renvois devraient suivre le modèle de Harvard, par exemple (Kish 1988a ; Herzog et Dielman 1985 : 351). Pour des renvois à trois auteurs ou plus, seulement le premier nom de famille devrait être donné, suivi par et al., bien que les noms de tous les auteurs

doivent être fournis dans la Bibliographie elle-même. Les abréviations ibid. et op. cit. ne devraient pas être employées dans le texte ou dans les notes de bas de page.

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