

**Measuring Development Progress in Africa: the
Denominator problem**

by

Roy Carr-Hill

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Roy Carr-Hill

Institute of Education

University of London

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1. INTRODUCTION

The United Nations Development Programme (UNDP) (2013) has recently produced estimates showing substantial progress towards the Millennium Development Goals (MDGs) by 2015. Their estimates are based on a combination of official statistics and household surveys and there is no recognition of the problem of undercounting of the population and especially of the poorest groups (Carr-Hill, 2013). The aim of this paper is to produce estimates of the ‘progress’ between 1990 and 2010 (the latest year of data availability for many indicators) corrected for these undercounts for Sub-Saharan Africa.

First, in the remainder of this introduction, we provide a rapid overview of the general problem of undercounts and identify the sub-groups most likely to be missing; in the second section we make estimates for the size of each of these sub-groups in 1990 and 2010; and in the final section, we draw conclusions and make recommendations.

(a) Censuses are not censuses

It is well recognized that censuses face problems of complete enumeration. Groups of adults have been excluded from censuses in some countries for political or practical reasons (Buettner and Garland, 2008). One population sub-group which is very often excluded from national censuses in developing countries is seasonal and temporary internal migrants or other highly mobile economic groups (Deshingkar, 2006), especially when they are not on official household lists. In addition, in many developing countries, the census enumerators are often police or other government officials who tend to use security based national identity cards or family registration cards to validate the citizenship status of those they are enumerating. Their incentive is to confirm their own registration work and to catch anyone who has escaped their net.

In developed countries, there is an increasing reliance on data linkage through, for example, linking the tax system with an identity card or number that citizens are required to have by law. In most middle and low income countries, however, vital registration systems have never been fully functioning (Powell, 1981; Chan, Kazatchkine, Lob-Levyt, Obaid, Schweizer et al., 2010; Vlahov, Agarwal, Buckley, Caiaffa, et al., 2011), and there has been a similar decline in donor interest in censuses and vital registration systems (Setel, Macfarlane, Szreter, Mikkelsen, Prabhat et al., 2007), as evidenced by the demise of the International Institute for Vital Registration and Statistics, and an increasing reliance on household surveys.

The main sources are often internationally standardized surveys with reasonably large sample sizes (see Table 1) and, although now many of these surveys are funded at least in part by national governments, there is, in fact, very little variation in either content or methodology to respond to national circumstances¹.

Table 1 Major International Social Surveys: Sample Size, Sponsor, Focus and Coverage

	Sample Size	Sponsor	Focus	Coverage
Demographic and Health Surveys (DHS)	5,000 – 30,000 households	Macro International funded by USAID	Health, Fertility, Infant and Child Mortality, HIV/ STD, Domestic Violence	90 countries (200 surveys), c. every years
Labour Force Surveys (LFS)	‘Relatively large-scale’	ILO or national statistical offices	Employment	Countries (200+ surveys), c. biennial
Living Standards Measurement Surveys (LSMS)	2,000-5,000 households	World Bank	Consumption and Expenditure, Household Activities	34 countries (100 surveys), c. every years
Multiple Indicator Cluster Survey (MICS)	5,000 – 20,000 households	UNICEF	Children and Women: Education, Maternal and Infant Health	60 countries (200 surveys), c. every years

Sources: information from main website pages of DHS, LFS, LSMS, MICS

There is the obvious ‘throwing the baby out with the bathwater’ problem with this move away from censuses to relying on surveys because drawing a sample for a survey depends on having a sampling frame in the first place which is frequently based on the census. Clearly any problem with the census, if used as the sampling frame for a national survey, will lead to that sampling frame being biased.

There is an emerging consensus as to what constitutes good census practice (see Appendix 1) and clear adoption of these UN guidelines would at least make interpretation and comparison easier. At the same time, the quality of censuses in developing countries has probably improved between 2000 and 2010, with many more countries carrying out censuses and technological innovation in mapping, enumeration and data capture (UNSD, 2010). However, although the guidelines are clear in principle, there can still be problems in enumeration in practice for the basic *concept of housekeeping* (e.g., poor servants in rich households), with counting *mobile populations* (who are not easily traceable) and with counting *de facto* rather than *de jure* populations (where there are disputes over nationality), those internally displaced either as a result of civil war or because of environmental change (e.g., floods, nuclear accidents) that has made their

homes uninhabitable. Homelessness is particularly difficult: the basic problem is that “who we define as homeless determines how we count them”. (Peressini, McDonald & Hulchanski, 2010, p.1).

The problems with counting institutional populations (care homes, (some) factory barracks, hospitals, the military, prisons, refugee camps, religious orders and school dormitories) are entirely different: we know where they are (in most cases) but they are not individually identified and there is still considerable variation over how some of the institutional population groups should be included in the population count (Wagner, 2008), whether as special census blocks or special households.

Careful reporting of censuses, as per the UN guidelines, will acknowledge how well these groups have been enumerated and most categories - including the military and prisoners - are included in estimated census population counts of developed countries but not in the census reports of many developing countries. Further, in developing countries, according to the UN Population Division (Buettner & Garland, 2008), children are *systematically undercounted*.

(b) Using official census statistics to assess poverty levels

There is a huge literature on how to measure poverty on an international comparative basisⁱⁱ spanning several decades (OECD, 1975; McGranahan, Richard-Proust, Sovani & Subramanian, 1972; ILO, 1976) and several disciplines. However, in this context – the measurement of development progress over time - for better or for worse, a crude cash measure (US\$1 or US\$2 a day) - has been adopted by most international organisations as the flagship measure, even though it makes little allowance for non-food needs which are mostly monetised in urban but not in rural areas (Mitlin & Satterwaite, 2012).

The census documents for the large-population countries in Sub Saharan Africa have been examined for any commentary about difficulties or problems encountered. In fact, such internal commentary is rare and an extensive web search was carried out for other commentary. The sparse results of these efforts are included in Table 2. It is clear that many of the censuses have encountered severe difficulties in implementation, and that some either left out some groups by design, or have been forced to omit certain areas or groups.

Table 2: Known Omissions /Difficulties and Undercounts officially acknowledged in Large Country Censuses in Sub-Saharan Africa

	Omissions	Difficulties	Estimate of Undercount
Kenya	Under-representation of North-	Carrying out census in slums; other	n.a.

	Eastern Kenya	interests (famine/hunger, drought, resettlement); insecurity , enumeration of pastoralists	
Nigeria	Under-representation of minority ethnic and religious groups	2006: national census was met with protests, boycotts, charges of fraud, and at least 15 deaths. ¹ Thousands of enumerators walked off the job because they hadn't been paid, and many people said they had not been counted. ²	n.a.
South Africa	Undercount estimation based on Post Enumeration Survey	High walled area, migration, new settlement	14.6%

Sources: *Kenya*: Kenyan National Bureau of the Census; Opoiyo (2010); also see Maron (2010). *Nigeria*: Lalasz (2006). *South Africa*: SANews.gov.za, 30th October 2012.

(c) Using household surveys to assess poverty

The additional problems with using household surveys to assess the *absolute level* of poverty or of any related characteristic is that, in contrast to the view of Munoz & Scott (2004), they are an inappropriate instrument for obtaining information about the poorest of the poor, especially in developing countries. This is because household surveys, with rare exceptions, typically omit *by design*:

1. those not in households because they are homeless;
2. those who are in institutions, including refugee camps; and
3. mobile, nomadic or pastoralist populations.

In addition, *in practice*, because they are difficult to reach, household surveys will typically under-represent:

4. those in fragile, disjointed or multiple occupancy households (because of the difficulty of identifying them),
5. those in urban slums (because of the difficulty of identifying and interviewing), and
6. may omit certain areas of a country deemed to pose a security risk.

If one wanted an empirical - as distinct from a theoretical - definition of the ‘poorest of the poor’, the above collection of six population sub-groups could hardly be bettered. But there is – rather strangely – little recognition of the problems that arise when relying on surveys: for example, Atkinson and Marlier (2010) in their book on measuring social inclusion dismiss the problem in half a page. The issue is particularly important for children who are the focus of many of the MDGs.

A comprehensive search was carried out of the meta-documentation of the four main standardised household surveys - the Demographic and Health Surveys (DHS), the International Labour Office/Labour Force Surveys (LFS), the Living Standard

Measurement Surveys (LSMS) and the Multiple Indicator Cluster Surveys (MICS) - and a sample of country surveys. None of the meta-documents, including those from the LSMS (Grosh & Glewwe, 1998; Scott et.al., 2005) or the DHS (Vaessen, Thiam & Le, 2005) - which is the most professional and most concerned with quality, justifying its relatively small sample sizes specifically because of its attention to non-sampling errors - had anything to say about the coverage of the homeless, institutional populations, the mobile and/or any special arrangements to cover slum areasⁱⁱⁱ.

(d) Comparing the intended coverage of censuses and household surveys

Population censuses are, of course, themselves surveys of a kind, and, as we have illustrated above, have faced many of the same problems in the past: but a modern politically independent Census will intend to include the mobile (because they refer to those present in the household on a specific day or night), will cover those in institutions, will attempt to cover those in urban slums and in less secure areas exhaustively, will (if necessary) carry out special counts of the homeless, and will attempt to estimate the numbers of pastoralists, with varying degrees of success (Misra & Malhotra, 1982). In other words, a Census can potentially solve many of the problems of omitted populations, but this is not possible for household surveys.

The extent to which household survey estimates can underestimate poverty-related characteristics is illustrated for Vietnam, a country where the biennial household survey is considered to be one of the best designed and implemented (Pincus & Sender, 2008, p.110); the problem would be much larger in other countries^{iv}. In each socio-economic region, the comparison of the 2009 Census with the average scores for the 2008 and 2010 Vietnam Household Living Standards Survey (VHLSS) shows that the proportions reporting no qualifications are higher, the proportions reporting improved water are lower, and the proportions reporting agricultural, forestry and fisheries are higher (and much higher in Red River Delta) except for the South East. The differences for agricultural, forestry and fisheries might be related to the temporary residence problems described by Pincus and Sender (2008) but the different results for the other two characteristics are probably more simply related to the greater practical difficulties of carrying out sample surveys - as compared to censuses - in rural areas.

Table 3: Comparison of Survey and Census results in Vietnam 2009

	Population 15+ with No Qualifications		Improve Water		Proportion working in agriculture, forestry and fisheries	
	Census, Table 7.8	VHLSS, Table 2.2	Census, Table A10	MICS, Table WS.1	Census, Table A8	VHLSS, Table 3.3
Entire Country	86.7	85.1	86.7	92.0	51.9	47.7

Northern Midland and Mountains	86.7	86.0	61.5	80.7	75.0	68.7
Red River Delta	80.6	77.7	98.3	99.0	45.8	29.8
North and South Central Coast	87.8	86.8	89.7	89.8	58.5	56.2
Central Highlands	90.2	88.9	78.5	86.1	73.4	69.5
Southeast	84.2	82.3	97.1	98.4	18.5	20.7
Mekong Delta	93.4	92.3	77.9	93.1	56.9	52.1

Sources: Vietnam Population and Housing 2009 Census Findings; Vietnam Household Living Standards Surveys 2008 and 2010; Vietnam Multiple Indicator Cluster Survey 2001

Nevertheless, although modern quality censuses recognize that they have to include these groups in the population counts, census officials, because of the difficulty of enumeration, even in developed countries, are often reduced (as we have documented) to making estimates of their size and location, so that the members of those groups are often not included in the available sampling frames for household surveys. This poses additional design problems for sample surveys; and, in developing countries, these marginalised groups may not be included at all, even in the estimated population counts.

The important consequence of this lack of recognition of the additional problems with the design and implementation of household sample surveys, particularly, although not exclusively, in developing countries, is that no systematic attempt has been made to estimate the size and distribution of the population groups ‘missing’ from the sampling frames of national household surveys, in addition to those who might be missing from the census. For obvious reasons, it is difficult to estimate numbers in these groups. The following sub-sections document what is known or has been estimated.

2. HOW MANY ARE POTENTIALLY ‘MISSING’ FROM POPULATION COUNTS AND FROM SAMPLING FRAMES OF HOUSEHOLD SURVEYS?

There are several groups that may be excluded from censuses which are not considered below because they are not necessarily the poorest: those caught up in civil wars may not always be the poorest; economic and environmental migrants may include the more ambitious (Myers, 1997) and therefore not the poorest. In addition, enumeration conventions (excluding temporary immigrants or non-nationals in censuses) leave out major groups who may not be the worst off. The focus here is on groups for which there are credible sources, and that *are* normally among the poorest.

Detailed justification of each of the following categories is given in Carr-Hill (2013).

(a) Homeless

Rather obviously, household surveys will omit nearly all homeless and many street children. Estimating numbers is fraught with difficulties.

Adults: UNCHS (2003) estimated the number of homeless people worldwide to be between 100 million and one billion, depending on how we count them and the definition used; essentially a distinction between those without any roof at all over their heads (the smaller estimate of 100 million) who will almost certainly be omitted from all household surveys, and the much larger numbers in informal – usually illegal – squatter settlements with no security of tenure and at risk of immediate eviction. But there are no comparable estimates over time

Children: SOS Villages (accessed 01-04-13) estimates that there are 53.1 million orphans in Sub-Saharan Africa, many of whom will be living on the streets. Many of these would be counted in conventional censuses and carefully designed household surveys where informal settlements are included if the children live with their families but work on the streets. But, equally, many will not be included. But again there are no comparable estimates over time.

(b) Institutionalised Populations

Household surveys, by definition, omit from their sampling frame those in institutions: care homes, (some) factory barracks, hospitals, the military, prisons, refugee camps, religious orders and school dormitories. Even where the intention is to extend the coverage to some or all of these institutions, the census sampling frames may not cover them either because there was no attempt to enumerate them, or because, as in the examples in the previous section, aggregate numbers and not names were collected. It would therefore require an additional special survey exercise to construct the sampling frame and this will only happen on a country-specific basis.

(i) *Hospitals and Care Homes*

Those in hospitals will on average be poorer because morbidity is associated with poverty (e.g., Lopez, 2002). Hospital populations will, typically, be included in population censuses, but they are not included in the sampling frames of household surveys. There are estimated to be about 20 million hospital beds worldwide, concentrated in developed countries^v, and the estimates for Sub Saharan Africa are for an increase from 1.2 to 1.3 million beds which, given the high and increasing levels of overcrowding, probably represents an increase from between 1.5 and 1.8 million missing in 1990 to between 2.3 and 2.6 million missing in 2010 from household surveys in Sub Saharan Africa.

(ii) *Prison*

Those in prisons in developed countries will usually be poorer (Smith, Grimshaw, Romeo & Knapp, 2007; Clarke, 2012). In developing countries, the Thai Prime Minister acknowledged that “90 percent of convicts in prisons are poor people” (Thai Foreign Office, 2003). Walmsley (2003) estimates the total prison population of the world is estimated at about 9.8 million, mostly as pre-trial detainees (remand prisoners) or as sentenced prisoners. The numbers in Sub-Saharan Africa were about 700,000 in 2008 but no earlier figures could be found.

(iii) *Refugees*

Refugees will not be routinely counted in annual national population censuses in developing countries because they are not considered as part of any nation’s population^{vi} - nor are they included in the sampling frames of any household survey - so they cannot, of course, make any contribution to survey-based estimates. However, the United Nations High Commissioner for Refugees (2010) has published figures annually on numbers of registered refugees, internally displaced persons and stateless persons^{vii}. The overall totals for Sub-Saharan Africa were 6.5 million in 1993 (UNHCR, 1994) and 10.2 million in 2010 (UNHCR, 2010); but these figures do not include illegal immigrants.

(c) Nomadic and pastoralist groups by world region

Censuses and surveys very rarely include gypsies and nomadic/pastoralist populations who have much less access to services; and, whilst it is difficult to assess their income and wealth, and there clearly are some who are rich-in-kind (or asset rich), the majority are usually poor in all senses. There is no reliable information available on the number of nomadic pastoralists, including sea-faring mobile communities (Garcia & de Leiva Moreno, 2003) worldwide. Over twenty-five years ago it was estimated that there were around 17.3 million pastoralists in Africa, 3.4 million in the Middle East and South Asia and no more than 2 million in Central Asia, a total of 22.7 million (Sandford, 1983). More recent estimates, for most countries - with a few exceptions such as Iran and Mongolia - are much larger, and when added up, the overall total at about 66 million is about triple the earlier estimate. In particular, in the Horn of Africa (excluding Somalia), the recent estimate was of about 24.2 million, i.e. a 72% increase over Sandford’s estimate for the *whole* of Africa over the last 25 years.

The only internationally comparable source is that compiled by the International Livestock Research Institute (see Thornton, Kruska, Henninger, Kristjanson, Reid et al., 2002), based partly on livestock numbers, and these are also much larger. The latter estimates have been used because they are consistent across countries; and although there

are some substantial discrepancies in specific countries^{viii}, overall, the more recent estimates are in line with the Thornton-based estimates. For Sub-Saharan Africa, Thornton's estimate was 61.9 million in 2000 and 147.4 million by 2050. By interpolation, we estimate that there were 48.5 million in 1990 and 79 million in 2010. Given that many of those included in those estimates will be mostly sedentary agro-pastoralists who would be counted both by censuses and household surveys, low values of 1 in 10 and 1 in 5 are used to estimate the numbers who will probably be missing from the sampling frames of household surveys. The estimated numbers missing were between 4.9 and 9.7 million in 1990 and between 7.9 and 15.8 million in 2010.

(d) Difficult to reach

(i) *Fragile and disjointed households*

The task of the census enumerator or survey interviewer is made much more difficult when the household structure is ambiguous so that either identifying the household head and/or counting the numbers in the household are ambiguous. These will include elderly household heads with young children, grandparent households (Kalipeni, Craddock, Oppong & Ghosh, 2004, p. 277), large households with unrelated fostered or orphaned children attached (Foster, 2002), child headed households (Richter & Desmond, 2008), and single-parent, mother or father headed households (Zimba & Tembo, 2007). Whilst those groups will usually be included in a census and often a survey, those in other types of living arrangements such as cluster foster care, where a group of children is cared for formally or informally by neighbouring adult households (Gallinetti & Sloth-Nielsen, 2010); children in subservient, exploited or abusive fostering relationships; itinerant, displaced or homeless children (Barnett & Whiteside, 2006, p.203); neglected, displaced children in groups or gangs (Hunter & Fall, 1998) will all often be excluded from both censuses and household surveys. This is particularly an issue in many countries in Sub-Saharan Africa because new forms of household are developing as a response to the impact of HIV/AIDS. Despite the large number of studies, no systematic way of identifying these different types of household and then counting them has been agreed.

(ii) *Urban slums*

Those in slums will be among the poorest in any country (Montgomery, 2009). UN Habitat (2003a) defines a slum household as consisting of:

“.. one or a group of individuals living under the same roof in an urban area, lacking one or more of the following five amenities: (1) durable housing (a permanent structure providing protection from extreme climatic conditions); (2) sufficient living area (no more than three people sharing a room); (3) access to improved water (water that is sufficient, affordable and can be obtained without extreme effort); and (4) access to improved sanitation facilities (a private toilet, or a public one shared with a reasonable number of people ...” (p.47).

Accurate statistics are difficult to come by, because poor and slum populations are often deliberately and sometimes massively undercounted by officials (Davis, 2006).

The most recent estimates from UN Habitat (2011) are that there are more than a billion living in urban slums in developing countries; the same figure has been repeated since 2003, whilst urban populations have increased from 2.1 to 2.5 billion, with no obvious signs of *extensive* urban redevelopment (providing 400 million new homes?) to cater for the growth in urban populations; in any case, the poorest urban populations are often simply not included in data gathering:

“Data collection and analysis on urban slums encounters a critical problem. Information is rarely disaggregated according to intra-urban location or socio-economic criteria. Thus, slum populations and the poorest squatters are statistically identical to middle class and wealthy urban dwellers. *Worse, the poorest urban populations are often not included at all in data gathering.*” (*emphasis added*) (UN Habitat, 2003b, Box 7, p.48).

The issue of sub-groups of slum populations missed by household surveys is often therefore completely ignored (see also Montgomery, 2009). Agarwal (2011, p.14) shows how official statistics for India “do not include unaccounted for and unrecognized informal settlements and people residing in poor quality housing in inner city areas on construction sites, in urban fringes and on pavements” (see also Sabry, 2010). Some censuses – such as those in Bangladesh and India - have made special efforts to comprehensively cover those in slums, but this is not typical and, as we explain below (section 4(c)), does not solve the household survey problem.

The few surveys that have been conducted in those slums show sharp gradients of participation in formal education with income quintiles within urban populations (UN Habitat, 2003a). Detailed analysis cannot be carried out for the large scale surveys because slums are not differentiated from other urban areas. Vlahov, Agarwal, Buckley, Caiaffa, Corvalan et al., (2011) discuss at length the limitations of national sample surveys in providing the detail needed by each district or urban locality for planning development interventions.

It is clear that – apart from the slum populations in European and North American cities – a substantial minority of households in the slum areas of developing country cities are uncounted in many censuses (and therefore not included in the UN Habitat database referred to above). Moreover, even where they are counted in censuses, many would (because of interviewer reluctance) in practice, be excluded from the achieved samples of household surveys. For Sub-Saharan Africa, the estimated numbers living in urban slums was 123 million in 1990 and 200 million in 2010. We make two estimates of the numbers who are possibly missing based on *arbitrary* but probably conservative

estimates, that 1 in 10 or 1 in 5 of the urban slum populations are uncounted. Those estimates suggest that there were between 12.3 and 24.6 million missing in 1990 which had increased to between 20 and 40 million in 2010.

(iii) Insecure or isolated areas

Given the security situation – or simply difficulty of transport - in many countries, it can often be difficult for the implementing institutions to carry out a fully representative survey or census. This will obviously be specific to context and country (e.g., North East Kenya, West Nepal, etc.). In a six-country study of nomads in the Horn of Africa (Carr-Hill et al., 2005), several areas were omitted from the surveys in Eritrea, Ethiopia and Kenya for security reasons. A recent study of pastoralist households in Somalia (Carr-Hill, 2012a) has been severely limited by security issues for the Somalian interviewers.

3. OVERALL ESTIMATES, DISCUSSION AND CONCLUSIONS

(a) Official Story about Poverty and Progress

According to the UNDP, there have been substantial improvements between 1990 and 2010 in Sub-Saharan Africa. Poverty – defined as percentage of people living on less than \$1.25 a day (2005 PPP) - has declined from 56.5% to 47.5% and the proportions with access to improved water and sanitation facilities has improved dramatically, especially in rural areas (see Table 4). But they have ignored the missing populations.

Table 4: Proportion of population using an improved drinking water source (MDG Indicator 7.8) or an improved sanitation facility: (MDG Indicator 7.9)

	1990			2010		
	Total	Urban	Rural	Total	Urban	Rural
Percentage of population using an improved drinking water source						
SSA	49	83	36	61	83	49
Percentage of population using an improved sanitation facility						
SS	26	43	19	30	43	23

Source:

(b) Absolute Numbers Missing

For Sub-Saharan Africa^{ix}, the totals in the sub-sections above add up to between 25.9 and 43.3 million in 1990 and between 41.1 and 69.4 million in 2010 (Table 5). Moreover, the estimates do not include the homeless, those in fragile or disjointed households or those in areas where there are security risks. It could be argued that the homeless would mostly

be from urban slums so that there would be double counting (and if, as some have argued, the original UNICEF estimate of street children is a massive over-estimate, the numbers look plausible), but the other two categories (large, but of unknown size) are definitely additional and have definitely increased (at least doubled?) between 1990 and 2010 especially in Sub-Saharan Africa. Estimates of between 45 and 50 million in 1990 and between 80 and 90 million in 2010 are not unrealistic.

Table 5 Estimates of Population Groups Missing from Sampling Frames of Household Surveys in sub-Saharan Africa

		1990		2010	
		Minimum	Maximum		
Pastoralists		4.9	9.7	7.9	15.9
Institutionalised	Refugees	6.5	6.5	10.2	10.2
	Hospitals	1.5	1.8	2.3	2.6
	Prisons	0.7	0.7	0.7	0.7
Slum Populations		12.3	24.6	20.0	40.0
Total		25.9	43.3	41.1	69.4

These figures are to be compared to the estimated population of Sub Saharan Africa of 519.5 million in 1990 and 867.3 million in 2010; in 1990, the estimate of 45-50 million represent 8.5%-9.5% undercounts, but in 2010, the estimates of 80-90 million represent a 9.5 – 10.5% undercount. Even the latter might be judged acceptable overall, given the known deficiencies in African statistical systems (references to other papers in the conference!); but as a 42.5-45% undercount in 1990 rising to a 47.5-52.5% undercount of the poorest wealth quintile, is scandalous and it makes a mockery of monitoring development progress because neither the baseline nor the current estimates are secure. Estimates of absolute levels of poverty in different years – and, specifically the estimates for 1990 which are the baseline for MDGs - have to be revised.

(b) Impact of Missing Numbers on estimates of Poverty and Progress

The numbers officially in poverty were 289.7 million in 1990 and 415.9 million in 2010. Making the reasonable assumption that all those missing would also be in poverty, the corrected figures, using the higher estimates, are 339.7 million and 505.9 million. Using the higher estimates in the estimates above, the corrected population figures are similarly inflated to 569.5 million and 957.3 million, so that the percentages in poverty are 59.6%

and 52.8%, a 7% fall - from a higher baseline - rather than a 9% fall according to the official story.

Looking at an indicator that is broken down urban and rural such as the percentages using improved drinking water, we know that all the missing pastoralists are rural and we assume that all the refugees are rural with all the remainder being urban. In 1990, this translates to about 20 million missing rural and 30 million missing urban; in 2010 about 35 million missing rural and 55 missing urban.

Table 6: Official Numbers using Improved drinking water, Revised Numbers and Percentages

	1990			2010		
	Total	Urban	Rural	Total	Urban	Rural
Official and Corrected Numbers	251.2	121.7	131.8	534.1	268.5	270.5
Corrected Population Figures	562.7	176.6	386.1	965.6	388.5	587.1
Corrected Percentages	44.6	68.9	34.1	55.8	69.1	46.1

The impact of the missing populations is substantial: there has been an improvement but at a much lower level in both urban and rural areas.

4. DISCUSSION OF FINDINGS AND EXISTING PROPOSED SOLUTIONS

Instead the argument here is that it is urgent to understand the extent and nature of the denominator biases both for planning and research on inequalities: whilst this is relevant in developed countries (Carr-Hill, 2012b), it is especially important for assessing development progress (e.g., towards the MDGs) in developing countries.

Although there are technical procedures for improving census counts of special groups, these do not solve the sampling frame problems of household surveys which are the major source of poverty estimates in many developing countries. In developing countries, both problems remain: first, of counting in the census; and second, if one wants to carry out a survey, identifying the location and size of different segments of the population.

(a) Counting displaced and illegal groups

It is easy to count the numbers of formal refugees - even if they are not included in national censuses – because UNHCR manages the camps or national governments keep records of those who have been granted, or are applying for, asylum. It is much more difficult to count ‘informal’ refugees; but perhaps preliminary estimates of immigrants at least into Northern countries can be made from the trends in the numbers applying for asylum in different countries (as a measure of attractiveness) or, sadly, from the trends in

the numbers caught trying to immigrate illegally into those countries. But those procedures would not work for South-South illegal migration because those countries do not generally keep those types of records.

In several countries, there are large internal migrant sub-groups, who are omitted for quasi-political reasons: for example, scheduled castes and tribes in India (Gill, 2007); and, in addition, there are other groups that are often left out such as gypsies, homeless and illegal servants in rich households.

(b) Counting and sampling nomads and pastoralists

This is one of the most difficult groups to count simply because they are moving. However, in many cases, the men, women and youth move but the grandmothers and children stay behind, so that there would be possibilities of counting the household populations in their tented settlements, so long as one can identify those settlements (Mayer et al., 2009). Reasonable samples of pastoralists have also been obtained through livestock censuses, for example through combining local level surveys with remote sensing (Galvin et.al., 2001). Documenting change in their human population, however, remains, on the whole, elusive and will remain so - whether through censuses or surveys - whilst at least some of nomadic/ pastoralist groups remain permanently mobile.

(c) Counting urban slum populations

It is clear, that a substantial minority of slum populations are simply uncounted even in the censuses. The numbers missed by typical household surveys will be much larger. But the chaotic nature of some large urban slums makes it difficult to follow a systematic procedure whether counting for a census or constructing a sampling frame for a survey.

The Bangladesh Bureau of Statistics developed a procedure for constructing a sampling frame for their 2005 census. In the first phase, a basic map was constructed based on satellite images geo-referenced to produce accurate street maps of cities. Suspected slums based on estimated population density and roofing materials were located and delineated on the corrected maps, although a substantial number of slum areas (c.30%) were not identified by the two criteria of density and roofing material. In the second phase, referred to as 'ground truthing', settlements identified as slums were assessed on the ground and the teams checked for slum settlements. After interviewing 3 local residents, they compiled a comprehensive description of general conditions in suspected slum settlements, including estimates of population size^x.

Such procedures should, in principle, produce a reasonably reliable frame for a population census. However, even where satellite imagery is used to identify slum settlements based on settlement densities and building materials, some of the slum

communities can be visually obscured and the need to rely on relatively unknown key informants for estimating slum sizes may itself lead to politically local biases (Schurmann, 2009). These problems were encountered in the Bangladesh census and also when similar procedures were used in the Indonesian and Timor Leste censuses^{xi}. In any case, such procedures are not practicable for standard household surveys.

An alternative approach has been to conduct a survey based on one of the standardized surveys using a sample frame specially designed for informal slum settlements. The African Population and Health Research Centre in Nairobi structured a survey in Kibera and other slum settlements in Nairobi in 2000 so that its findings could be compared to the Demographic and Health Survey (APHRC, 2002). KNBS/UNICEF (2009) carried out a specific survey in Mombasa's informal settlements. However, special surveys like this are just that - special.

(d) Sampling frame problems for surveys

The fundamental problem of a household survey is precisely that it is a household survey and will therefore not cover those who are not in households. Although special surveys could be, and have been, carried out of those who are in fixed institutions, they tend to be expensive, they often involve proxy respondents (NCSR, 2003) and the results tend to be difficult to integrate with those from the corresponding household survey.

For those not in fixed institutions, satellite imagery together with verification on the ground is also possible (as above) but, at the moment, very expensive and will still not solve the problems of identifying the poor. Thus:

- Refugees will not be identified through GPS techniques and are unlikely to declare themselves or want to be interviewed when the interviewer arrives
- Nomads and pastoralists will not be at the GPS location when the interviewer attempts to find them
- A GPS position in an urban slum can be verified on the ground but, given the high level of mobility, this will not provide a satisfactory sampling frame
- If censuses are used as the sampling frame, adjustments for new building or demolitions can have a big impact on small areas, with implications for weighting samples, and the logistics of field work.

Thus, although there are technical solutions to the problem of enumerating or at least counting population sub-groups currently missing from many censuses, the same procedures do not solve the sampling frame problem of household surveys.

(e) Post Enumeration Surveys

The classic method of adjusting for a census undercount involves conducting a sample survey to identify people who were missed by the census and people who were counted twice or counted in the wrong location. It is not clear that these methods have produced valuable corrections to the census count. Examination of the procedures for more recent post-enumeration surveys shows that there has not been any improvement (Stark, 2004) and the US Census Bureau decided not to adjust the 2000 census count (Ronizio, 2007).

(f) International efforts to improve statistical procedures

In 2005, UNStats produced an edited compilation on the problems of household surveys in developing and transition countries. Yausaneh (2005, p.22) recognises that non-coverage of household surveys was a major issue and pointed to the exclusion of homeless people, those in institutions and nomads, because of ‘practical’ difficulties, but did not mention refugees nor many of those in urban slums. He goes on to claim that non-coverage of Primary Sampling Units was a less serious problem than non-coverage of households and of eligible persons but that is not necessarily the cases in slum areas. Lepkowski (2005, p.155) adds that living quarters for seasonal and transitional workers are also very difficult to survey, especially when part-time survey staff are employed in the task of listing housing units.

Lepkowski (2005, p.157) also suggests that the initial housing list can be augmented by interviewers being trained to use a half-open interval procedure in which an interviewer is given a housing list and instructed to identify any additional housing units between the initial target house and the next house on the list. Finally, he emphasises that survey analytical reports ought to give clear definitions of the target population including any exclusions. The frame should be described in sufficient detail to see how non-coverage might arise and even to make an overall assessment of the size of the potential error.

In addition, several leading donor agencies have become concerned about data quality. The International Monetary Fund has developed the General Data Dissemination System (GDSS) and the Special Data Dissemination Standard (SSDS), promoting standardisation of reporting about the quality of statistical data. These initiatives provide countries with (a) a framework for data quality to identify key problem areas; (b) an economic incentive through facilitating access to international capital markets; (c) a common motivation for advancing data quality discussions in private; (d) technical support for evaluation and improvement programmes. Their prescriptions seem to have received more attention in developed countries (e.g., Laliberté, Grünwald & Probst, 2004).

5 RECOMMENDATIONS AND CONCLUSIONS

(a) Recommendations

(i) Carrying out accurate censuses

International organizations should revive the International Institute for Vital Statistics and Registration - see also the recommendations in Vlahov et al., (2011) - to support national census organizations in developing these standard procedures and in developing and testing procedures for counting pastoralists (perhaps based on livestock numbers) and other nomads (gypsies, highly mobile workers, long-distance truck drivers, travellers, etc.).

National census organizations in collaboration with international organizations should:

- Eliminate *de jure* definitions in censuses and adopt a *de facto* approach systematically to ensure that all people resident at the time of the census are enumerated, whether or not they have resided for a certain period, or are temporary residents (e.g., at a hotel) at that address, or have been included in any form of national registration system;
- Adopt consistent and transparent definitions and procedures for counting the houseless and institutional populations whether fixed (care homes, hospitals, prisons, etc.) or mobile (e.g., the army);
- Use satellite imagery and on-the-ground verification for difficult-to-identify settlements such as slums.

(ii) Statistical Solution

In the absence of any simple solution to the sampling frame problem, this author has shown that, with an assumed pattern of desired outcomes by wealth quintile, it is possible to make top-down estimates of the missing populations (Carr-Hill, 2012b). This was based on the observation that, in several of the DHS datasets, the gradient of desired outcomes does not behave as expected. The gradient should be concave in that values of the bottom quintile should be lower than a linear projection from the other four quintiles because, as severity of poverty deepens, then conditions get relatively worse. However, in many cases, the value in the bottom quintile was higher than the linear projection and these datasets are from countries where there are estimated to be large numbers of missing populations. More sophisticated methods should be developed that can take into account the pattern of missing populations in each country.

In countries where there are estimated to be substantial numbers of missing population, it would then be possible to make an internal adjustment to the survey findings based on adjusting the size of the groups in the quintiles in order to reflect the estimated numbers of missing people (presumed all to be in the bottom quintile). The author has tried this on a pilot basis for DHS surveys in two countries where there appeared to be anomalies and it does restore the expected gradient. This might be a possible approach but it is based on a series of statistical assumptions which would have to be thoroughly tested.

(iii) Comparing household surveys with censuses

Instead, an obvious approach would appear to be to compare the household surveys to the census sampling-frames upon which those surveys are based. This could give us an idea of the quantitative extent of this problem, and the estimated undercounts in different strata which could be used to provide a range of post-stratification weights. If these estimates were available for several countries, this would allow for sensitivity analysis of the impact of undercounting across a range of countries. In principle, this is feasible with existing data and marks a clear way forward. For example, if data from a range of countries shows that nomadic peoples get undercounted by 10% to 45%, then any household survey could carry out sensitivity analysis on its conclusions by up-weighting the nomads in its sample in accordance with the extremes of this range. Then, there would be a fruitful research agenda in explaining the variance in undercounting between countries. The problem currently is that, whilst micro data is available from several censuses (IPUMS), there are only a small number of contemporaneous household surveys for large countries (see endnote v).

(b) Conclusions

Population undercounting means that any social programme risks ignoring the poorest of the poor. This blindness is a public scandal affecting an estimate of between 300 and 350 million of the poorest in developing countries, leading to an over-estimate of progress towards development goals and a substantial under-estimate of inequalities. The estimates of missing populations are acknowledged to be crude estimates; but the impact of missing populations on estimates of progress towards eliminating \$1.25-a-day poverty or improving access to drinking water are substantial.

In the absence of a complete solution, two possible general short- to medium-term approaches have been suggested: one is a top-down statistical approach and the other involves detailed comparison of household surveys with the census in the same country. The latter is probably the most promising, but it is not research that can be carried out generically, but has to be carried out by locally knowledgeable researchers.

The problem should be addressed immediately by international and national organizations, both in terms of promoting more reliable and transparent censuses, and of developing and testing agreed procedures for estimating the impact of missing populations on survey-based estimates of progress towards development goals. There is limited value in having goals *per se* and no point in using resources to monitor them if we do not know where we are or where we started from.

References

- *African Population and Health Research Center (APHRC) (2002). *Population and Health Dynamics in Nairobi's Informal Settlements: Report of the Nairobi Cross-sectional Slums Survey (NCSS) 2000*. Nairobi, Kenya.
- *Agarawal, S. (2011). The state of urban health in India; comparing the poorest quartile to the rest of the urban population in selected states and cities. *Environment and Urbanization*, 23,(1), 13-28.
- *Atkinson A.B., & Marlier E. (2010) *Analysing and Measuring Social Inclusion in a Global Context*. United Nations Secretariat, Department of Economic and Social Affairs
- *Barnett, T. A., & Whiteside, A. (2006). *AIDS in the 21st Century: Disease and Globalisation*. London and New York: Palgrave, Macmillan
- *Buettner, T., & Garland, P. (2008). Preparing population estimates for all countries of the world: Experiences and challenges, *Committee for the Coordination of Statistical Activities*; Rome
- *Carr-Hill, R. A. (2005). *The Education of Nomadic Peoples in East Africa: Synthesis Report: Djibouti, Eritrea, Ethiopia, Kenya, Tanzania and Uganda*, UNESCO-IIEP and African Development Bank
- *Carr-Hill, R. A. (2009). *Mid-Term Evaluation of the EFA Fast Track Initiative. Working Paper 3, Issues in Data and Monitoring and Evaluation*. Cambridge Education, 28 June 2009.
- *Carr-Hill, R.A. (2012a) *Assessment of the Livelihoods, Living Conditions and Welfare of Somali Pastoralists: A Representative Survey Conducted to Provide a Baseline for Programmes in Maroodi Jeex (Wooqoyi Galbeed), Togdheer, South Mudug, Sanaag, Gedo and Galgaduud*. Draft Report for UNICEF Somalia.
- *Carr-Hill, R.A. (2012b). *Non-household populations: implications for measurements of inequality and for resource allocation in the UK*, accepted by Journal of Social Policy
- *Carr-Hill, R.A. (2013). *Missing Millions and Measuring Development Progress*. World Development, 20.
- *Chan, M., Kazatchkine, M., Lob-Levyt, J., Obaid, T., Schweizer, J. et al. (2010). Meeting the Demand for Results and Accountability: A Call for Action on Health Data from Eight Global Health Agencies. *PLoS Med.* 7(1). doi:10.1371/journal.pmed.1000223
- *Davis, M. (2006). *Planet of Slums*, Verso, London and New York, p.26
- *Deshingkar, P. (2006). *Internal migration, poverty and development in Asia*. Institute of Development Studies and Overseas Development Institute
- *Foster, G. (2000). The capacity of the extended family for orphans in Africa, *Psychology, Health & Medicine*, 5, 55–62

- *Gallinetti, J., & Sloth-Nielsen, J. (2010). Cluster foster care: a panacea for the care of children in the era of HIV/AIDS or an MCQ? *Social Work Maatskaplike Werk*, 46(4), October, 486-495.
- *Galvin, K. A., Boone, R. B., Smith, N. M., & Lynn, S. J. (2001). Impacts of climate variability on East African pastoralists: linking social science and remote sensing, *Climate Research*, 19: 161–172.
- *Garcia, S. M., & de Leiva Moreno, I. (2003). Global overview of marine fisheries. in *Responsible Fisheries in the Marine Ecosystem*, Edited by: M. Sinclair & G.
- *Gill, M. S. (2007). Politics of Population Census Data in India. *Economic and Political Weekly*, 20th January, pp.241-249
- *Grosh, M. E., & Glewwe, P. (1998). Data Watch: The World Bank’s Living Standards Measurement Study Household Surveys. *Journal of Economic Perspectives*, 12(1), 187-196.
- *Hunter, S., & Fall, D. (1998). *Orphans and HIV/AIDS in Zambia. An assessment of orphans in the context of children affected by HIV/AIDS*. Report for UNICEF. Lusaka: UNICEF.
- *International Labour Organisation (ILO) (1976). *Employment, Growth and Basic Needs: a One World Problem*. Geneva: ILO; also published commercially as *Employment, Growth and Basic Needs: a One World Problem – the International “Basic Needs Strategy against Chronic Poverty* (New York, Praeger, 1977).
- *Kalipeni, E., Craddock, S., Oppong, J.R., & Ghosh, J. (eds.) (2004). *HIV & AIDS in Africa: Beyond Epidemiology*, Malden, MA: Blackwell Publishing
- *Kenya Bureau of Statistics (KNBS)/UNICEF (2009) *Kenya Coast Province Mombasa – Informal Settlements: Monitoring the situation of women and children. Multiple Indicator Cluster Survey #*.
- *Laliberté, L., Grünewald W., & Probst, L.(2004) *Data quality: A comparison of IMF’s data quality assessment framework (DQAF) and Eurostat’s quality definition*. Eurostat and IMF
- *Lepkowski, J. (2005) Non-observation error in household surveys in developing countries, Chapter VIII in UN, Department of Economic and Social Affairs, Statistics Division, *Household Sample Surveys in Developing and Transition Countries* (pp.149-169), ST/ESA/STAT/SER.F/96
- *Lopez, A. (2002). Mortality and Morbidity Trends and Poverty Reduction, Chapter III in *Selected Papers of the Fifth Asian and Pacific Population Conference* pp.73-90.
- *McGranahan, D.V., Richard-Proust, C., Sovani, N.V., & Subramanian, M. (1972). *Contents and Measurement of Socio-Economic Development*, New York, Praeger for UNRISD.
- * Mason, A., Carr-Hill, R., & Street A. (2008) Establishing the Economics of Engaging Communities in Health Promotion: what is Desirable, what is Feasible? *Critical Public Health*, 18 (3): 285-297.

- *Mayer, A-M., Myatt, M., Aissa, M.A., & Salse, N. (2009). New method for assessing acute malnutrition in nomadic pastoralist populations, taken from *Field Exchange* Issue 35, March, Retrieved November 30th from <http://fex.ennonline.net/35/newmethod.aspx>.
- *Misra P.K., & Malhotra K.C. (ed) (1982) *Nomads in India : proceedings of the National Seminar*. Calcutta: Anthropological Survey of India.
- *Montgomery M. (2009) Urban Poverty and Health in Developing Countries, *Population Bulletin*, 64, 2.
- *Myers, N. (1997). Environmental Refugees, *Population and Environment* 19(2): 167-82
- *National Centre for Social Research (NCSR) (2003) *Health Survey for England*, London: NCSR
- *Peressini, T., McDonald, L., & Hulchanski, D. J. (2010) Towards a Strategy for Counting the Homeless. Chapter 8.3 in D. J Hulchanski, P. Campsie, S. B. I. Chau, S. H. Hwang, & E. Paradids, *Finding Home: Policy Options for addressing homelessness in Canada*. Toronto: Cities Centre, University of Toronto
- *Pincus, J., & Sender, J. (2008). Quantifying Poverty in Viet Nam: Who Counts? *Journal of Vietnamese Studies* 3(1), 108-150.
- *Powell, N. P. (1981). Major obstacles to achieving satisfactory registration of vital events and the compilation of reliable vital statistics. *Technical papers of the International Institute for Vital Registration and Statistics, No 15*. Bethesda MD: International Institute for Vital Registration and Statistics.
- *Richter, L. M., & Desmond, C. (2008). Targeting AIDS orphans and child-headed households? A perspective from national surveys in South Africa, 1995-2005. *AIDS Care. Oct;20* (9), 1019-28.
- *Ronzio, C. (2007). Ambiguity and discord in U.S. Census Data on the undercount, race/ethnicity and SES: Responding to the challenge of complexity, *DataCritica: International Journal of Critical Statistics*, 1 (1).11-18.
- *Sabry, S. (2010). How poverty is underestimated in Greater Cairo, Egypt. *Environment and Urbanization*, 22, (2), 523-541.
- *Sandford, S. (1983). *Management of Pastoral Development In the Third World* , Chichester, UK: John Wiley
- *Schurmann, A. (2009). *Bangladesh Urban Health Survey: Methods and Reproductive Health Results*. International Conference on Urban Health Nairobi, Kenya, 18th-23rd October 2009.
- *Scott, K., Steel, D., & Temesgen, T. (2005) Living Standards Measurement Study Surveys. *Chapter XXIII in Household Sample Surveys in Developing and Transition Countries*. New York: United Nations, Department of Economic and Social Affairs, Statistics Division. 523-556. ESA/STAT/AC.85/23 (ed).
- *Setel, P., Macfarlane, S., Szreter, S., Mikkelsen, L., Prabhat, J., Stout, S., & AbouZahr, C. (on behalf of the Monitoring of Vital Events (MoVE)) (2007). A scandal of

invisibility: making everyone count by counting everyone. *The Lancet*, 370, Issue 9598, 1569 - 1577, 3 November

*Smith, R., Grimshaw, R., Romeo, R., & Knapp, M. (2007). *Poverty and disadvantage among prisoners' families*. York: Joseph Rowntree Foundation

*SOS Villages (accessed 01-04-2013) <http://www.sos-usa.org/about-sos/what-we-do/orphan-statistics/pages/global-orphan-statistics.aspx> Based on A projection from UNICEF (2006) *Africa's Orphaned and Vulnerable Generations: Children Affected by Aids*

*Stark, P.B. (2004) Census Adjustment in M. L. Beck, A. Bryman & T.F. Liao (eds) *Encyclopedia of Social Science Research, Vol. 1*, 112-113.

* Thai Foreign Office, Public Relations Department (2003) Retrieved December 10th 2012 from <http://thailand.prd.go.th/ebook/review/content.php?chapterID=9>

*Thornton, P. K., Kruska, R. L., Henninger, N., Kristjanson, P. M., Reid, R. S., Atieno, E., Odero, A.N., & Ndegwa. T. (2002). *Mapping Poverty and Livestock in the Developing World*. Nairobi: International Livestock Research Institute.

*UNDP (2013) Human Development Report 2013: The Rise of the South: Human Progress in a Diverse World. New York, UNDP.

*UN Centre for Human Settlements (Habitat). (2003). *Global Report on Human Settlements, 2003*. New York: Habitat

*UN Habitat (2003a). *The Challenge of Slums: Global Report on Human Settlements, 2003*. New York: UN.

*UN Habitat (2003b). *Slums of the World: The Face of Urban Poverty in the new Millennium*. New York: UN Habitat.

*UN Habitat (2011). *State of the World's Cities 2010/2011*. New York: UN Habitat

*UNHCR (1994) Populations of Concern to UNHCR: A Statistical Overview. New York. Office of the United Nations High Commissioner for Refugees

*UNHCR (2010). *Statistical Online Population Database*. United Nations High Commissioner for Refugees (UNHCR), Data extracted: 20/12/2010

*UN Statistical Division (2010) *Report on the Results of a Survey on Census Methods used by Countries in the 2010 Census Round*. 2010 World Population and Housing Census Program, Working Paper: UNSD/DSSB/1

*Vaessen, M., Thiam, M., & Le, T. (2005). *The Demographic and Health Surveys. Chapter XXII in Household Sample Surveys in Developing and Transition Countries*. New York: United Nations, Department of Economic and Social Affairs, Statistics Division. 495–522. ESA/STAT/AC.85/23 (ed).

*Vlahov, D., Agarwal, S.R., Buckley, R.M., Caiaffa, W.T., Corvalan, C.F., Ezeh, A.C., Finkelstein, R., Friel, S., Harpham T., & Hossain, M. et al. (2011). "Roundtable on urban living environment research (RUL, *Journal of Urban Health*, 88,(5), 793-857.

*Wagner, P. (2008). Retrieved November 20th from <http://www.prisonersofthecensus.org/news/2008/12/12/threeactions/> Privacy rights

*Walmsley, R. (2003). *World Prison Population List 4th Edition*, Home Office, Research Paper Findings 188

*Yansaneh, I.S. (2005). Overview of sample design issues for household surveys in developing and transition countries. Chapter II in UN, Department of Economic and Social Affairs, Statistics Division, *Household Sample Surveys in developing and Transition Countries*, ST/ESA/STAT/SER.F/96

*Zimba, J., & Tembo, B. (2007). *Women Have to Cope as AIDS, Economic Woes Afflict Zambia*, ISIS International, Monday, 04 June, Retrieved November 30th from http://www.isiswomen.org/index.php?option=com_content&task=view&id=713&Itemid=200

Annex Table 1: Missing Population Groups for Each Country in SSA

Country	Population Estimate (millions)		Hospital Beds per 10,000		Numbers in Military ('000s)		Number of Refugees ('000s)	
	1990	2010	1990	2010	1990	2010	1990	2010
Algeria	25.3	37.4	25.0	17.0	126	317	169	94
Angola	10.3	20.9	12.9	8.0	115	117	408	135
Benin	4.9	9.4	8.3	5	6	7	0.5	7
Botswana	1.3	1.9	15.8	18	6	10.5	1	3
Burkina Faso	9	17.4	3.0	4	10	11	0.35	.5
Burundi	5.6	10.6		19	12	51	268	84
Cameroun	12.1	20.9	25.5	13	23	23	49	104
Cape Verde	0.34	0.5		21	1	1.2		
Central African Rep	2.9	4.6	8.7	10	4	3.1	4.2	21.5
Chad	6	11.8		-	50	34.8	-	338
Comores	0.43	0.8	27.6	-	-	-	-	-
Congo	2.3	4.2	33.5	-	9	12	2.9	133
Cote d'Ivoire	12.5	20.6	8.1	-	15	18.5	272	26
Dem Rep of Congo	36.4	69.1	14.3	-	55	159	416	166
Djibouti	0.5	0.9	26.4	14	4	12.9	77	15
Egypt	56.8	82.3	20.7	17	434	836	2	95
Equatorial Guinea	0.37	0.7		21	1	1.3	-	-
Eritrea	3.1	5.6		7	-	20.1	-	4.8
Ethiopia	48.3	87.0	2.4	63	79	97	773	154
Gabon	0.9	1.6	31.9	63	9	6.7	0.4	9
Gambia	0.9	1.8	6.1	11	2	0.8	781	8
Ghana	14.7	25.5	14.6	9	9	15.5	8	13
Guinea	5.7	11.5	5.5	3	15	19.3	325	14
Guinea-Bissau	1	1.6	14.8	-	12	6.4	3	7.6
Kenya	23.4	43.0	16.5	14	20	29	14	402
Lesotho	1.6	2.2		-	2	2	0.2	-
Liberia	2.1	4.2		8	8	2	-	24
Libya	4.3	6.5	41.7	37	86	76	-	7.9
Madagascar	11.2	21.9	9.4	2	21	21.6	-	-
Malawi	9.3	15.9	15.5	13	7	5.3	926	5.7
Mali	8.6	16.0		1	13	12.1	13.4	13.5
Mauritania	1.9	3.6	6.7	-	17	20.8	60	26.7
Mauritius	1	1.3		34	1	2	-	-
Morocco	24.8	32.6	12.9		195	246	94.3	97.9

Mozambique	13.8	23.7	8.7	11	65	11.2	0.4	4
Namibia	1.4	2.4		-	-	15.2	0.1	7.2
Niger	7.7	16.3		-	5	10.7	0.7	0.3
Nigeria	97.5	170.1	16.7	-	94	162	3.5	8.7
Rwanda	7.1	10.8	16.5	-	6	35	23.6	55.3
Sao Tome and Principe	0.1	0.2		29	1	-	-	-
Senegal	7.2	13.1	7.3	-	18	18.6	58	20.6
Sierra Leone	3.9	6.1		-	5	10.5	125.8	8.3
Seychelles	0.07	0.1		36	-	0.6	-	-
Somalia	6.5	10.1	7.5	2	47	2	460	1.9
South Africa	35.2	51.1		-	85	77.1	-	57.8
South Sudan	6	9.4			-	140	-	-
Sudan	21.1	33.5	10.9	7	65	126.8	1031	178.3
Swaziland	0.8	1.2		21	3	-	42	0.7
Tanzania	25.4	47.7	10.2	7	40	28.4	265	109
Togo	3.6	6.0	15.1	7	8	9.3	3.4	14
Tunisia	8.1	10.8		21	35	47.8	30	89
Uganda	17.6	35.6		5	60	46.8	145	135.8
Zambia	8	13.7		20	16	16.5	138	47.8
Zimbabwe	10.4	12.6	5.1	17	1	0.7	190	4.4

Annex Table 2: Values for MDG Targets in Each African Country

Country	Population Estimate (millions)		Adjusted net enrolment rate primary		Percent Access to Improved Water		Prevalence of HIV Total % of Population Age 15-49	
	1990	2011	1990	2010	1990	2010	1990	2010
Algeria	25.3	37.4	87	97	94	83	-	-
Angola	10.3	20.9	-	85	42	51	0.6	2.1
Benin	4.9	9.4	40	91	57	75	3.2	1.2
Botswana	1.3	1.9	85	87	93	96	6.2	23.7
Burkina Faso	9	17.4	23	58	43	79	3.7	1.2
Burundi	5.6	10.6	-	-	70	72	2.1	1.4
Cameroun	12.1	20.9	71	93	49	77	1	4.7
Cape Verde	0.34	0.5	99	93	-	88	0.8	1
Central African Rep	2.9	4.6	45	60	58	67	8.6	4.9
Chad	6	11.8	-	-	39	51	2.3	3.2
Comores	0.43	0.8	-	-	87	95	0.1	0.1
Congo	2.3	4.2	-	90	-	71	5.1	3.3

Cote d'Ivoire	12.5	20.6	-	-	76	80	5.8	3.2
Dem Rep of Congo	36.4	69.1	57	-	45	45	-	-
Djibouti	0.5	0.9	29	52	78	88	0.6	1.5
Egypt	56.8	82.3	-	93	93	99	0.1	0.1
Equatorial Guinea	0.37	0.7	-	56	-	-	0.9	4.4
Eritrea	3.1	5.6	-	34	43	-	0.2	0.7
Ethiopia	48.3	87.0	-	79	14	44	1.3	1.6
Gabon	0.9	1.6	-	-	-	87	1.2	5.1
Gambia	0.9	1.8	44	69	74	89	0.1	1.4
Ghana	14.7	25.5	-	-	53	86	1	1.5
Guinea	5.7	11.5	26	76	51	74	0.7	1.4
Guinea-Bissau	1	1.6	-	74	36	64	0.3	2.4
Kenya	23.4	43.0	-	84	44	59	2.5	6.2
Lesotho	1.6	2.2	70	73	80	78	0.8	23.2
Liberia	2.1	4.2	-	40	-	73	0.7	1.1
Libya	4.3	6.5	-	-	54	-	-	-
Madagascar	11.2	21.9	69	-	29	46	0.1	0.3
Malawi	9.3	15.9	-	97	41	83	7.8	10.4
Mali	8.6	16.0	-	65	15	22	1.1	1.1
Mauritania	1.9	3.6	-	74	30	50	0.3	1.1
Mauritius	1	1.3	99	93	99	99	0.1	1
Morocco	24.8	32.6	56	94	73	83	0.1	0.2
Mozambique	13.8	23.7	43	92	36	47	0.4	11.3
Namibia	1.4	2.4	79	86	48	78	1.8	13.6
Niger	7.7	16.3	23	58	35	49	0.4	0.8
Nigeria	97.5	170.1	-	57	47	58	0.5	3.7
Rwanda	7.1	10.8	-	98	64	63	5.8	3
Sao Tome and Principe	0.1	0.2	96	98	-	89	0.2	1
Senegal	7.2	13.1	46	78	61	72	0.1	0.7
Sierre Leone	3.9	6.1	-	-	38	55	0.1	1.6
Seychelles	0.07	0.1	-	-	-	-	-	-
Somalia	6.5	10.1	-	-	-	29	0.5	0.7
South Africa	35.2	51.1	89	90	83	91	0.5	17.3
South Sudan	6	9.4	-	-	-	-	-	3.1
Sudan	21.1	33.5	-	-	65	58	0.2	0.4
Swaziland	0.8	1.2	74	85	25	65	3	25.9
Tanzania	25.4	47.7	51	-	55	53	5	5.8
Togo	3.6	6.0	66	-	36	40	1.7	3.5
Tunesia	8.1	10.8	92	99	81	94	0.1	0.1
Uganda	17.6	35.6	-	90	43	72	13.4	7
Zambia	8	13.7	-	92	49	61	13.8	12.7
Zimbabwe	10.4	12.6	-	-	79	80	13.6	15.2

ENDNOTES

ⁱThe Centre for Disease Control (CDC) have also carried out a series of reproductive and health surveys <http://www.cdc.gov/reproductivehealth/Global/Surveys.htm> accessed 30th November 2012

ⁱⁱIn Cambodia, about a quarter of million have been evicted (LICADHO) and there are 190,000 military (IISS 2010) meaning are least 3% rather than 2%; the 0.1% figure in Ghana is because homelessness is defined as 'people not belonging to a household' so that those on the street or in institutions but with a relative are not counted as homeless; 1.0% in India when there are estimated to be 80 million nomads (Misra and Malhotra, 200?) or 7% of the population; 0.05% in Lesotho when there are 2,000 military (ISIS, 2010); 1.6% in Uganda when at least 5% of Uganda's population is nomadic (Ongweg and Odada, 2002).

ⁱⁱⁱThere may be a growing problem of servants in rich households in developed countries: although they will be included in inter-censal estimates in terms of counts of immigration, they will not be in a census-based sampling frame and, even if a block of building approach to sampling is used, those servants are unlikely to reply to the survey.

^{iv}The measurement and commentary on poverty itself has of course a much longer history: in the UK, obvious examples are Booth (1902-1903) and Rowntree (1901).

^vUNICEF has carried out MICS surveys in Wave 4 of Roma Settlements in the former Yugoslavia and Informal Settlements in Mombasa but there is no indication that they used different approaches to identification of households.

^{vi}In fact, mainly because the 2010 census round was often conducted in 2011 or 2012 and so the results are not available, it proved difficult to find examples of large-population countries with geographical breakdowns in the census data which could be compared with a household survey in the last five years.

^{vii}All refugees include official refugees and those in refugee-like situations; IDPs included both IDPs and returned IDPs; Others includes Asylum Seekers, Returned Refugees and Various.

^{viii}For example, for India, the National Convention (2005) estimates that there are 60 million nomads in India and 110 million including De-Notified populations, compared to the Thornton-based estimate of about 3.75 million; in contrast, the estimate for Pakistan is 'a few million' (Spooner, 1984), whilst the Thornton-based estimate is over 18 million.

^{ix}The data in this section are for Sub-Saharan Africa as a whole: detailed data for each country in Sub-Saharan Africa are given in the Annex (Tables 1 and 2).

^xA community was declared to be a slum if it met 4 of 5 basic conditions: poor housing conditions, high overall population density, very poor sanitation and inadequate water sources, high prevalence of people below poverty level, and insecure land tenure. (Angeles, Lance et.al., 2009)

^{xi}Both the Bangladeshi and Indian censuses go to considerable pains to locate and enumerate slum dwellers but, apart from the problems identified by Schurmann (2009), there were other critiques of the Bangladesh Census (bdnews24.com/nih/mr/1900h). The Indonesian and the 2004 Timor Leste censuses encountered security problems in the follow-up verification procedures.
