

<b>Work package number</b> <sup>9</sup>	WP3	<b>Lead beneficiary</b> <sup>10</sup>	2 - UCL
<b>Work package title</b>	Tracking health transitions in SSA in a context of double burden of disease		
<b>Start month</b>	1	<b>End month</b>	48

### Objectives

WP3 will promote interactions between academia and non-academic institutions in SSA and EU to advance knowledge on the health transitions in SSA.

### Description of work and role of partners

#### **WP3 - Tracking health transitions in SSA in a context of double burden of disease** [Months: 1-48]

##### **UCL**

Task 3.1: Mortality levels and trends: measurement issues (Lead: G. Pison, Ined)

Although comprehensive vital registration is the best long-term goal, surveys and censuses will remain interim sources of data on mortality and health. In-depth evaluations of surveys and censuses are often conducted by NSOs and academic institutions to correct for recall errors and refine data collection protocols. In this task 3.1, continuous mortality data collected in HDSS will be used as a reference to evaluate censuses conducted in Senegal (2002 and 2013) and Burkina Faso (2016). Individual-level data will be linked to census reports using probabilistic record linkages. These validation studies will pinpoint the various types of reporting errors, the extent of misclassification of maternal deaths, and their effects on mortality estimates. In 2014, a team of researchers from ANSD, INED/IRD and UCL tested the linkage process in one HDSS in Senegal and could automatically link

more than 80% of individuals based on names, first names, and relationships to the head of household. In the context of the continuous DHS organized in Senegal, the three populations from HDSS sites will also be over-sampled in 2016 to allow for an in-depth examination of the quality of survey data on child and adult mortality (Helleringer et al., 2014). Burkina Faso is also planning its next census in 2016, and similar validation studies are in preparation with the HDSS located in Ouagadougou.

The DEMOSTAF programme will facilitate exchanges between research institutions (INED, IRD, UCL, ISSP) and staff from NSOs in Senegal and Burkina (INSD, ANSD). Expertise in dealing with HDSS data will be transferred to NSOs staff. Expertise in dealing with census/DHS data, including postenumeration surveys, will be transferred to academic researchers. These exchanges will help to develop adjustments to be applied to census data and facilitate discussions on revisions to census questionnaires which could improve the quality of the data. Recommendations to other NSOs and HDSS in Sub-Saharan Africa will be issued and disseminated.

Associated participants : UCL, INED, ANSD, IRD, INSD, ISSP

Task 3.2: Improving the collection and interpretation of cause-of-death data (Lead: B. Masquelier, UCL)

Counting who is dying and what they are dying from is one of the best investments to reduce premature mortality (Jha 2012). However, in SAA, most people die at home without medical attention. Few deaths are registered in official records, and when they are, the underlying cause is not always documented. In this context, interim methods are needed. Among these, verbal autopsies (VAs) are emerging as a very promising tool. VAs consist in post-mortem interviews among relatives and caretakers of the deceased to collect data on circumstances and symptoms preceding the death through a structured questionnaire. A probable cause of death is later assigned by physicians reviewing each VA or through computer-coded verbal autopsies (CCVA) that automatically assign a cause of death from the reported symptoms, based on statistical models. In 2012, the WHO published a revised and shortened VA instrument, designed primarily for electronic data capture and amenable to automated processing (Leitao et al. 2013). There is a consensus within the academia, international agencies (WHO & World Bank, 2014) and governments (e.g. African program on accelerated civil registration and vital statistics) that verbal autopsies should be a stepping stone to increasing the quality of civil registration and vital statistics systems. Verbal autopsies have not yet been scaled-up in routine death registration, however. Participants will introduce VAs for assigning causes of death when no physician is available in urban areas of Ouagadougou (Burkina Faso), Dakar (Senegal) and large cities in Madagascar (Tamatave, Fianarantsoa). The proportion of deaths due to a specific cause will be compared by age and sex with hospital records and with model-based estimates (e.g. WHO estimates). These pilot studies should demonstrate that real-time monitoring of urban mortality is feasible at low cost. Two causes of death – maternal mortality, and mortality from external causes (accidents, violence, suicide) – will be particularly examined.

Staff exchange between the participants' institutions will provide opportunities for training and transfer of knowledge between academic and non-academic partners, in addition to drafting the study protocols. Knowledge of verbal autopsies

will be transferred to NSOs in Senegal, Burkina Faso and Madagascar. NSOs will benefit from a better integration of non-standard data (including local death registers) in the national statistical system.

Associated participants : UCL, ANSD, INED, INSTAT-Madagascar, ISSP

Task 3.3: Investigating the “double burden of disease” (Lead: A. Soura, ISSP)

SSA is currently facing a “double burden of disease”, especially in urban areas, among the most marginalized sections of the cities (Agyei-Mensah and de Graft Aikins, 2010). African populations continue to be affected by the persistence of life-threatening infections such as malaria and tuberculosis, as well as high levels of maternal mortality. At the same time, the prevalence of noncommunicable diseases (NCDs) is rising as a result of population aging, inadequate diet habits and changes in life style. In this context, the task 3.3 will follow three streams of research:

1) Participants will investigate risk factors for NCDs in three HDSS, in Senegal, Burkina Faso and Madagascar. Preliminary studies have highlighted the importance of NCDs in these populations, including mental disorders and risk factors (Rossier et al. 2014, Duthé & Pison 2008). In Madagascar, previous studies have demonstrated a high prevalence of hypertension and diabetes. Data collection on NCD morbidity and risk factors is planned in the coming years to confirm these preliminary insights. Closer collaboration between the different research teams involved in DemoStaf will help to better monitor the increasing burden of NCDs.

2) Other participants will focus on three infectious diseases targeted by the SDGs: tuberculosis (TB), diarrhoea and malaria (in task 3.4). Declines in diarrheal, malaria and TB mortality have been largely dependent on anti-microbial and anti-parasitic medicine, and this raises concerns in the context of increasing threats from drug-resistant infections.

- Trends and risk factors of TB-mortality will be investigated in Antananarivo, Madagascar. Participants will use digitized data from death registers covering the period 1976-2013 to explore changes in TB-mortality and link these changes to patterns of detection and control (Masquelier et al. 2014). Infection clusters have been identified based on detected TB cases in Antananarivo (Randremanana et al., 2009), but the corresponding patterns of mortality clustering remains unexplored. It is also unclear whether rises in the number of TB-deaths are due to a better accuracy of diagnoses, in part due to better monitoring, or a genuine increase in TB-mortality. - Trends and risks factors of diarrheal mortality will be studied and compared using the data of two urban Ouagadougou and Nairobi HDSS. Despite an increasing access to water and sanitation globally (WHO/UNICEF, 2014), many uncertainties remain about how to improve public health through improvements in water supply and sanitation (Hunter et al, 2012,). Ouagadougou and Nairobi present very interesting profiles to undertake this study. Ouagadougou looks like a shining example of improvements in access to water in African cities, while improved water access in Kenyan cities fell from 92 % to 82 % between 1990 and 2012 (WHO/UNICEF, 2014). Yet looking past these initial measurements to examine detailed on access to water, a much more complicated reality is revealed, with great inequalities between zones, especially in the outskirts (Dos Santos et al. 2014). In Kenya, the gap between urban and rural child mortality is currently narrowing. This could be linked to the unsanitary living conditions in urban slums (Kimani-Murage, 2014).

3) Finally, there has been much discussion in Sub-Saharan Africa around the emergence of an “urban penalty” in mortality, particularly due to the rapid development of slums (Kimani-Murage, 2014). However, few studies have been devoted to comparisons of cause-of-death patterns between urban and rural settings. Participants in this WP will undertake a systematic comparison of cause-of-death patterns in urban and rural areas in Burkina Faso (Ouagadougou & Nouna HDSS) and Madagascar (Moramanga HDSS and urban death registration). These comparisons aim to inform reforms of health care systems which are still mainly shaped to deal with communicable diseases in cities and the countryside.

Associated participants : UCL, INED, Institut Pasteur de Madagascar, INSPC, IRD, ISSP

Task 3.4 – Identifying health risks in mobile populations and effects of human movements on vector-borne diseases (Lead: P. Bocquier UCL)

Health analyses and public statistics in SSA commonly produce indicators separately for cities and rural areas. These urban and rural health indicators make the implicit assumption of no migration, which is paradoxical given the intensity of migration on the rapidly urbanizing African continent. Migration may be both life-enhancing and life-threatening for the migrant and his or her family. Migrations can also facilitate the spread of vector-borne diseases through human and vector movements. This task will address these issues in two directions:

1) Health-migration relationships are complex and changing in an urbanizing Africa. For example, some migrants move to the city to get care or access to health services. Poorer migrants also return to their rural places of origin when sick to get care (Clark et al. 2007, Rossier et al. 2014). Considering the interplay of in- and out-migration selection effects, it is likely that urban health indicators, however well-measured, would not reflect the true state of health of local urban populations. The contribution that migration has on the general urban health advantage or penalty is uncertain, and may also depend on the chosen health indicator. For example, in-migration selection may have different effects on communicable and non-communicable diseases. Also, compared to acute illness, chronic illnesses may lead poorer migrants to return to their place of origin to seek care from

relatives, or on the other hand may lead richer migrants in cities to host sick parents coming from the village to get care. Do urban health indicators really reflect urban health risks and access to health services? To what extent do

these indicators reflect past exposure to other health environments and health care systems? To answer these questions, participants will test a new data collection tool for migrant follow-up using mobile phone as well as statistical tools to control for migration effect in health analysis. The data collection will be funded by the Belgian cooperation and take place the Ouagadougou HDSS. The migrant follow-up survey will be the first conducted in West Africa, in an urban area, and will be representative of all adults aged 30-74. This project is based on a collaborative process bringing together UCL, ISSP and IDEMO.

2) Malaria-related mortality and its risk factors will be investigated in the urban context of Dakar. Although malaria is generally considered to be more prevalent in rural areas, recent years have seen an unexpected trend, whereby the vectors of malaria become more accustomed to the urban environment of Dakar (Pages et al. 2008). Moreover, rural-urban migration has seen a significant increase in recent decades. These intensified interactions pose added threat for the parasite to further penetrate into the city. Given the past low prevalence of the disease, Dakar residents generally have low acquired malaria immunity (Machault et al., 2009). Hence, in the event of an infection, they are at higher risk of developing severe forms of the disease. The context of Dakar itself is highly heterogeneous, which leads to a highly clustered incidence of malaria and to interactions

between environmental and behavioural factors in its transmission (Dos Santos et al., 2014; Rautu, 2014). Recently, there has been a growth in the availability of data for measuring human population movements across spatial and temporal scales that are important for malaria control (Pindolia et al.2012). The use of mobile phone call data records to model parasite movements offers one of the most promising approaches, providing fine scale estimates in space and time, and covering large percentages of national populations (LeMenach et al. 2011). Closer collaboration between demographers and epidemiologists is needed to advance the field in this area, and the DEMOSTAF programme will contribute to bridging this gap.

Associated participants : UCL, ISSP, IDEMO, UCAD

#### Participation per Partner

Partner number and short name <sup>10</sup>
1 - INED
2 - UCL
4 - IRD
6 - INSD
7 - ISSP
8 - Agence Nationale de la Statistique et de la Démographie
9 - UNIVERSITE CHEIKH ANTA DIOP DE DAKAR
11 - INSTAT
12 - INSPC
13 - IPM

#### List of deliverables

Deliverable Number <sup>14</sup>	Deliverable Title	Lead beneficiary	Type <sup>15</sup>	Dissemination level <sup>16</sup>	Due Date (in months) <sup>17</sup>
D3.1	Working paper “Mortality levels and trends: measurement issues – insights from the DEMOSTAF project	1 - INED	Report	Public	42
D3.2	Working paper “Improving the	2 - UCL	Report	Public	42

List of deliverables

Deliverable Number <sup>14</sup>	Deliverable Title	Lead beneficiary	Type <sup>15</sup>	Dissemination level <sup>16</sup>	Due Date (in months) <sup>17</sup>
	collection and interpretation of cause-of-death data – insights from the DEMOSTAF project				
D3.3	Working paper “Investigating the double burden of disease – insights from the DEMOSTAF project	7 - ISSP	Report	Public	42
D3.4	Working paper “Identifying health risks in mobile populations and effects of human movements on vector-borne diseases – insights from the DEMOSTAF project	2 - UCL	Report	Public	42
D3.5	Report of three restitution meetings with stakeholders on “Improving the measurement and interpretation of mortality data in Sub-Saharan Africa”	7 - ISSP	Report	Public	36
D3.6	Peer-reviewed paper on the theme “The roles of National Statistical Systems in Sub-Saharan Africa for monitoring health changes: the case of Senegal, Burkina and Madagascar”	8 - Agence Nationale de la Statistique et de la Démographie	Report	Public	36

Description of deliverables

Deliverables will be organized along the following features :

- A working paper related to each task of the WP, based on the scientific production of the participants (articles, papers, communications...)
- Several more policy-oriented document related to each task/to the whole WP, based on the round-tables, meetings, other contacts with stakeholders in the course of the project and/or translation of research findings into policy insights
- A finalized product specific to the WP

D3.1 : Working paper “Mortality levels and trends: measurement issues – insights from the DEMOSTAF project [42]

Working paper “Mortality levels and trends: measurement issues – insights from the DEMOSTAF project Working paper summarizing the main findings of task 1 under WP3, including insights on methodological issues (probabilistic and manual linkages between HDSS and census data), evaluation of the quality of census data, and coverage and content errors and their impact on demographic estimates, and insights on impact of data quality issues in urban/rural differences of mortality estimates.

D3.2 : Working paper “Improving the collection and interpretation of cause-of-death data – insights from the DEMOSTAF project [42]

Working paper “Improving the collection and interpretation of cause-of-death data – insights from the DEMOSTAF project : Working paper summarizing main findings of task 2 under WP3, including proposal for protocols for pilot studies of VA in urban vital registration offices, feasibility of supplementing routine death registration with verbal autopsies in African capitals.

D3.3 : Working paper “Investigating the double burden of disease – insights from the DEMOSTAF project [42]

Working paper “Investigating the double burden of disease – insights from the DEMOSTAF project Working paper summarizing main findings of task 3 under WP3, including maps of TB-clusters in Antananarivo, analysis of cause of death patterns in Ouagadougou and Nouna HDSS and analysis of trends and risk factors in child mortality related to diarrheal diseases.

D3.4 : Working paper “Identifying health risks in mobile populations and effects of human movements on vector-borne diseases – insights from the DEMOSTAF project [42]

Working paper “Identifying health risks in mobile populations and effects of human movements on vector-borne diseases – insights from the DEMOSTAF project Working paper summarizing the main findings of task 4 under WP4, including the migration-health relationship in Ouagadougou, insights on measurement of migration effect on health using data collection and statistical tools and role of rural-urban migration as intensifying factor for urban malaria.

D3.5 : Report of three restitution meetings with stakeholders on “Improving the measurement and interpretation of mortality data in Sub-Saharan Africa” [36]

Report of three restitution meetings with stakeholders in Senegal, Burkina Faso, and Madagascar on the theme “Improving the measurement and interpretation of mortality data in Sub-Saharan Africa”.

D3.6 : Peer-reviewed paper on the theme “The roles of National Statistical Systems in Sub-Saharan Africa for monitoring health changes: the case of Senegal, Burkina and Madagascar” [36]

Peer-reviewed paper on the theme “The roles of National Statistical Systems in Sub-Saharan Africa for monitoring health changes: the case of Senegal, Burkina and Madagascar”

#### Schedule of relevant Milestones

Milestone number <sup>18</sup>	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
--------------------------------	-----------------	------------------	----------------------	-----------------------