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## CHES: an innovative concept for a new generation of population surveillance

Momentum towards the post-2015 Sustainable Development Goals (SDGs) is encouraging, after the UN Conference on Funding for Development in Addis Ababa, Ethiopia,<sup>1</sup> and the UN Sustainable Development Summit.<sup>2</sup> However, one of the major difficulties in assessment of the Millennium Development Goals (MDGs) has been the absence of effective measurability. Data of better quality and greater quantity, especially at the subnational level, must underpin the SDGs.

We propose a new generation of population surveillance operations—the Comprehensive Health and Epidemiological Surveillance System (CHES)—capable of timely delivery of high-quality data for disease-specific and pathogen-specific morbidity, together with data for overall and cause-specific mortality. In addition to disease causes and morbidities, CHES will include full risk factor surveillance and address the full range of the rapidly transitioning burden of disease, including non-communicable diseases and external causes and their associated morbidities. Importantly, CHES will include monitoring health systems and policy initiatives because they affect communities and households.

In implementing CHES, we will not underplay the importance of documentation, study, and implementation of intervention studies related to inequalities in health, health-care access and use, and intervention coverage. CHES will be founded on established dynamic cohort surveillance approaches, by building on existing methods used in health and demographic surveillance systems (HDSSs).<sup>3</sup> The HDSS platform longitudinally documents millions of person-years relating to individuals across sites in Africa, Asia, and the Pacific.<sup>2</sup> HDSSs have developed and

managed integrated field and data systems to monitor causes of death and their determinants. HDSSs, mostly close to district hospitals, provide broad research platforms for nested drug and vaccine trials, cohort studies, behavioural studies, assessments of health services effectiveness, and mortality and morbidity surveillance.

The main CHES innovation is integration across population and health facility data systems, linking demographic, epidemiological, mortality, morbidity, clinical, laboratory, household, environmental, health systems, and other contextual data, with a unique electronic individual identification system throughout. This integration will generate empirical unbiased data essential for development and assessment of interventions at the subnational level. Data from health facilities will be linked to community-level information. For example, mortality data will be collected both from health facilities (with medical certificates of cause of death) and from the community, through verbal autopsy.

Subcohorts within CHES populations will be followed up to monitor morbidity incidence and collect clinical data and laboratory specimens, through frequent scheduled household visits (active surveillance) and unscheduled visits triggered by mobile phone contacts from households. Additionally, sentinel health facility data will provide information about severe diseases and their causes, with outcomes traced back to household levels on a timely basis. CHES will provide numerators and denominators for population-based diseases with causes and mortality disaggregated by finely specified age groups (including neonates).

The HDSS foundation for CHES will be enhanced by crucial innovations needed for the morbidity and aetiological surveillance components, at both household and health facility levels. Household-based cohort studies with an electronic illness notification system, in addition to operational and

data linkages with health facilities, will be complemented by advanced quality-assured clinical and laboratory investigations and expertise.

Data collection for CHES will build on existing HDSS platforms, thereby making unique identifiers (either electronic or biometric) available for every individual. These identifiers also have the potential to be linked to national identification systems, which is necessary for integration of datasets from households, health facilities, and laboratories. CHES will use technological solutions to establish an integrated electronic surveillance system combining all relevant data sources and allowing for appropriate response. CHES will provide complementary data to national health management and information systems and link to local civil registration systems, enabling access to birth and death registration and certification for the population, and thus providing individuals and families with direct benefits.

We are aware that the enhancements we propose need substantial developments in resources, expertise, and capacity, and will have substantial opportunity costs. Robust ethical safeguards also have to be considered. However, now is the moment to firmly state that the world cannot continue to work without essential and large-scale population health information.

We declare no competing interests.

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Members of the INDEPTH Network and partner institutions are listed in the appendix