

Counting births and deaths 4



Towards universal civil registration and vital statistics systems: the time is now

Carla AbouZahr, Don de Savigny, Lene Mikkelsen, Philip W Setel, Rafael Lozano, Alan D Lopez

The health and development challenges of the coming decades cannot be tackled effectively without reliable data for births, deaths, and causes of death, which only a comprehensive civil registration and vital statistics (CRVS) system can deliver. Alternative methods such as surveys, censuses, or surveillance are not adequate substitutes from a statistical perspective, and do not provide individuals with the legal documentation they need to benefit from services and participate fully in a modern society. Research is needed to generate and disseminate evidence about which CRVS strategies work best in which contexts and to ensure that the potential benefits of innovation are successfully scaled up, and that possible pitfalls are avoided. Research findings need to be compiled and made readily accessible to users for policy making, programming, and practice. Modernisation of CRVS systems necessitates new, broad-based national and international coalitions. The global architecture for CRVS, so far dominated by UN agencies, should extend to include bilateral donors, funds, foundations, non-governmental organisations, the private sector, academic institutions, and civil society. This change is essential to ensure that further development of CRVS systems is inclusive, participatory, multisectoral, and has a strong evidence base.

Introduction

The other papers in this Series describe the momentum and sense of urgency of civil registration and vital statistics (CRVS), show that investments in CRVS result in measurably improved health, and propose an accountability framework to track improvement in the performance of CRVS systems. In this Series paper, we argue that improved CRVS will be key to tackle the health and development challenges of coming decades and to monitor progress towards country, regional, and global goals.

Monitoring challenges of the post-2015 development agenda

The world is facing complex challenges that will need to be addressed as part of the post-2015 development agenda.¹ In health, these challenges include: the so-called unfinished agenda of preventable mortality in infants and children;^{2,3} the burden of infectious

diseases and threats to health associated with epidemics and antimicrobial resistance;^{4,5} the toll of premature mortality in adults;⁶ and the shift of causes of death from communicable, maternal, and perinatal conditions to non-communicable diseases.^{6,7} Further challenges include: inequities in health outcomes and preventable mortality among poor and marginalised populations, including in high-income settings;⁸ people's expectations for health equity and universal coverage of health care;⁹ calls for accountability of civil society, donors, and development partners;^{10,11} demands for incorporation of human rights principles—

Lancet 2015; 386: 1407–18

Published Online

May 11, 2015

[http://dx.doi.org/10.1016/S0140-6736\(15\)60170-2](http://dx.doi.org/10.1016/S0140-6736(15)60170-2)

See [Editorial](#) page 1312

See [Comment](#) pages 1313 and e14

This is the fourth in a [Series](#) of four papers about counting births and deaths

CAZ Consulting, Geneva, Switzerland (C AbouZahr MSc); Swiss Tropical and Public Health Institute, University of Basel, Basel, Switzerland (Prof D de Savigny PhD); LM Consulting, Brisbane, QLD, Australia (L Mikkelsen PhD); The Union North America, New York, NY, USA (P W Setel PhD); National Institute of Public Health, Mexico City, Mexico (Prof R Lozano MD); and School of Population and Global Health, University of Melbourne, Melbourne, VIC, Australia (Prof A D Lopez PhD)

Search strategy and selection criteria

The search strategy included a search of websites of international health and development agencies with mandates covering aspects of civil registration and vital statistics, a search of relevant electronic databases (PubMed and Google Scholar), scanning of reference lists from relevant published studies, study of conference proceedings, and direct contacts with technical and in-country experts for references to relevant publications and grey literature. Preference was given to papers with a focus on low-income and middle-income countries and that addressed CRVS in a systemic way. Exclusion criteria were a reference period before 2000 and production of vital statistics from sources other than the civil registration system.

Key messages

- Ability to monitor and steer progress towards the Sustainable Development Goals will crucially depend on the availability of comprehensive civil registration and vital statistics (CRVS) systems; suboptimum data collection methods, such as surveys, and reliance on indicators derived from statistical modelling are inadequate to meet the needs of decision makers, who require continuous, timely, and locally relevant statistics for births, deaths, and causes of death
- Historical models of CRVS development cannot be relied on to achieve accelerated progress; innovative strategies are needed that build on examples from countries that have achieved rapid progress, harness opportunities offered by new technologies, and bring together research evidence and implementation experiences
- The global development architecture at present has failed to provide the leadership and coordination needed to support country CRVS development; UN agencies and development partners should coordinate and collaborate with each other and, crucially, with partners beyond the international system and non-state actors—only through such an approach will effective, coordinated support aligned around country needs and priorities be possible
- Nationally, bold vision, leadership, and authority to initiate and harmonise the mandates and activities of different players and compel collaboration and coordination will be needed for the potential contribution of CRVS to development to be realised

Correspondence to: Carla Abouzahr, CAZ Consulting, 1218 Geneva, Switzerland abouzahr.carla@gmail.com

participation, equality, and non-discrimination—into health and development strategies;¹² and limited national budgets and fragmented development assistance for health and statistics.^{13–16}

Civil registration systems and the vital statistics they generate have a crucial role in the response to these challenges. This role was recognised in 2011 by the Commission on Information and Accountability for Women's and Children's Health, which called on countries to establish systems to record and register births and deaths (with causes of death) as the most efficient source of data to monitor child and maternal mortality.³ Progress in implementation of these

recommendations is tracked by an independent expert review group (iERG), which reports to the UN Secretary-General.¹⁷ The iERG has called for investment in CRVS systems, alignment of partner actions with country and regional leadership, positioning of CRVS improvements at the forefront of partner activities, and inclusion of CRVS as a goal in the post-2015 development framework.¹⁸

The potential of CRVS systems to generate reliable data for levels and patterns of mortality is especially relevant to position health within the Sustainable Development Goals. An overarching health goal—“ensure healthy lives and promote well-being for all at all ages”—has been proposed by the Open Working Group of the UN General

	Target	Potential monitoring indicators
Overall goal		
Ensure healthy lives and promote wellbeing for all at all ages	Increase healthy life expectancy by 6 years in developing countries and by 2 years in developed countries	Life expectancy at birth (including 40% reduction in premature deaths before age 70 years)
Subgoal		
Reduce the global maternal mortality ratio (MMR)	Reduce global MMR to <70, and no country to have MMR >140	Maternal deaths per 100 000 livebirths
End preventable newborn deaths	All countries to reduce neonatal mortality to <12/1000	Neonatal mortality per 1000 livebirths
End preventable under-5 child deaths	All countries reduce under-5 mortality to <25/1000	Under-5 mortality per 1000 livebirths
End epidemics of AIDS	90% reduction of new adult HIV infections; no new infections among children; 90% reduction of AIDS-related deaths	HIV incidence per 100 person-years; HIV deaths per 100 000 population
End epidemics of tuberculosis	80% reduction in tuberculosis incidence (<20 cases per 100 000 population); 90% reduction of tuberculosis deaths	Tuberculosis incidence per 1000 person-years; tuberculosis deaths per 100 000 population
End epidemics of malaria	90% reduction of worldwide malaria incidence; 90% reduction of worldwide malaria mortality	Malaria incident cases per 1000 person-years; malaria deaths per 100 000 population
Combat hepatitis	90% reduction in hepatitis B and C incidence rate	Technical discussions about hepatitis monitoring indicators under way
Reduce premature mortality from non-communicable diseases (NCDs)	One-third reduction of premature mortality from NCDs	Probability of death from cardiovascular disease, cancer, chronic respiratory disease, or diabetes between ages 30 and 70 years
Strengthen prevention and treatment of substance abuse, including narcotic drug use and harmful use of alcohol	10% reduction of alcohol per capita consumption	Alcohol per capita consumption
Reduce deaths and injuries due to road traffic accidents	Halve the number of global traffic deaths (from 1.2 million to 600 000)	Number of deaths due to road traffic accidents
Ensure universal access to sexual and reproductive health-care services, including for family planning, information, education, and integration of reproductive health into national strategies and programmes	Ensure universal access to sexual and reproductive health-care services	Adolescent birth rate; contraceptive prevalence rate; unmet need for family planning; antenatal care use (four or more visits)
Achieve universal health care, including financial risk protection, access to quality essential health-care services, and access to safe, effective, high-quality, and affordable essential medicines and vaccines for all	All populations, independent of household income, expenditure, wealth, place of residence, or sex, have at least 80% essential health service coverage; everyone has 100% financial protection from out-of-pocket payments for health services	Coverage with a set of tracer interventions* for prevention and treatment; fraction of population protected against impoverishment by out-of-pocket health expenditures; fraction of households protected from incurring catastrophic out-of-pocket health expenditure
Substantially reduce number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination	No specifics	Mortality attributed to household air pollution, outdoor ambient pollution, and unsafe water and sanitation
*The tracer interventions might vary by country, but all should include for prevention—family planning, antenatal care (four or more visits), immunisation (full or diphtheria-tetanus-pertussis [DTP3]), non-tobacco use, and adequate water source and sanitary facilities—and for treatment—skilled birth attendance, tuberculosis treatment, antiretroviral therapy, and diabetes and hypertension treatment.		
Table 1: Main health-related goals and targets proposed by the Open Working Group for the Sustainable Development Goals, and potential monitoring indicators		

Assembly, along with subgoals and targets (table 1).^{19,20} Other proposals have come from the High-Level Panel of Eminent Persons and the Sustainable Development Solutions Network.^{21,22}

To monitor progress towards this health goal and targets will need an overarching summary indicator and indicators for each of the subgoals and targets. Suggestions for the overarching indicator include the following: life expectancy; healthy life expectancy; premature mortality (years of life lost before age 70 years); and preventable mortality (deaths preventable by health interventions) (table 1).^{23,24} Interest is increasing in monitoring of avoidable deaths amenable to primary prevention or health-care interventions such as universal health coverage. Although discussions about goals, targets, and indicators will continue during 2015, monitoring of health-related targets will need better data for mortality by age, sex, and cause. Only CRVS systems can comprehensively meet these information needs.

The alternatives are no longer sufficient

In developing countries, during the past 50 years, mortality statistics have been produced from various data sources, such as the census, household surveys, health facility information systems, and mortality surveillance in sample or sentinel sites.²⁵ These methods have proved their worth as interim solutions in settings in which the CRVS system does not generate useable data.²⁶ However, none of these methods matches functional CRVS systems in terms of production of the essential health intelligence needed for policy on all-cause and cause-specific mortality, for the whole country, on a continuous basis, and at subnational levels (table 2).

When CRVS systems are strengthened, the need for alternative data sources to track mortality diminishes.²⁷ Figure 1 compares estimates of under-5 child mortality from household surveys and censuses in Egypt, Mexico, Thailand, and Turkey with data from civil registration.²⁸ The trends show the high level of under-reporting of deaths in the CRVS system in the early period and the progressive convergence of values in the past 10–15 years as CRVS coverage increased in all four countries. As the CRVS system strengthens and generates indicator values close to those produced from surveys and censuses, CRVS becomes the most useful, efficient, and advantageous method to monitor progress.

With purposeful investment, sustained commitment, and technical and organisational leadership, substantial improvements in the coverage and quality of CRVS can be achieved in an impressively short period of time. Countries and development partners should reject continuing dependence on suboptimal data sources to monitor mortality and fertility. Investment in the CRVS platform will provide a strong evidence base for country health and development policies and free household surveys and censuses to concentrate on what they do best, such as production of information about behavioural

	Civil registration system	Demographic surveillance sites	Sample registration systems	Population censuses	National household sample surveys
Births					
National	Yes	No	Yes	Perhaps*	Yes
Subnational	Yes	Limited to specific sites	Limited†	Perhaps*	Limited‡
Socioeconomic differentials	Limited‡	Limited to study population	Limited†	Perhaps*	Yes
Continuous trends	Yes	Limited to study population	Yes	Partly, if intercensal projections available and reliable	Partly, if surveys are conducted regularly
Child mortality					
National	Yes	No	Yes	Yes§	Yes§§
Subnational	Yes	Limited to specific sites	Limited†	Yes§	Limited‡
Socioeconomic differentials	Limited‡	Limited to study population	Limited†	Yes§	Yes
Continuous trends	Yes	Limited to study population	Yes	Partly, if intercensal projections available and reliable	Partly, if surveys conducted regularly, but problem of wide CIs
Adult mortality					
National	Yes	No	Yes	Perhaps*¶	Weak
Subnational	Yes	Limited to specific sites	Limited†	Perhaps*¶	Weak, but might be possible with new techniques
Socioeconomic differentials	Limited‡	Limited to study population	Limited†	Perhaps*¶	Weak, but might be possible with new techniques
Continuous trends	Yes	Limited to study population	Yes	No	No
Cause of death					
National	Yes, ICD	No	Yes VA**	Perhaps VA††‡‡	Yes**
Subnational	Yes	Yes VA** limited to study population	Limited†	Perhaps VA	Maybe VA but sample sizes generally too small for stable estimates
Socioeconomic differentials	Limited‡	Limited to study population	Limited†	Unlikely	Possibly, using VA
Continuous trends	Yes	Limited to study population	Yes	Unlikely	Possibly if surveys with VA conducted regularly but sample size problem

ICD=International Classification of Diseases. VA=verbal autopsy. Adapted from Hill and colleagues.²⁶ *With assessment and possible adjustment: methods do not always work. †For high-level administrative areas (eg, regions and provinces) only. ‡Possible if registration records can be linked to socioeconomic data. §For a recent period by indirect estimates. ¶For an intercensal period. ||Medical certification by ICD rules generates individual and population-based causes of death. **Use of VA generates population cause-specific fractions only. ††If VA applied in post-censal follow-up study. ‡‡Only for maternal mortality and road traffic accidents. §§Where mortality is high.

Table 2: Potential of alternative approaches to measure key population health indicators

characteristics, socioeconomic differentials, disease prevalence, and biomarkers, which are especially important in the context of the worldwide increase in non-communicable diseases. Furthermore, only a CRVS platform can provide the legal documentation needed for individuals to participate fully in a modern society.

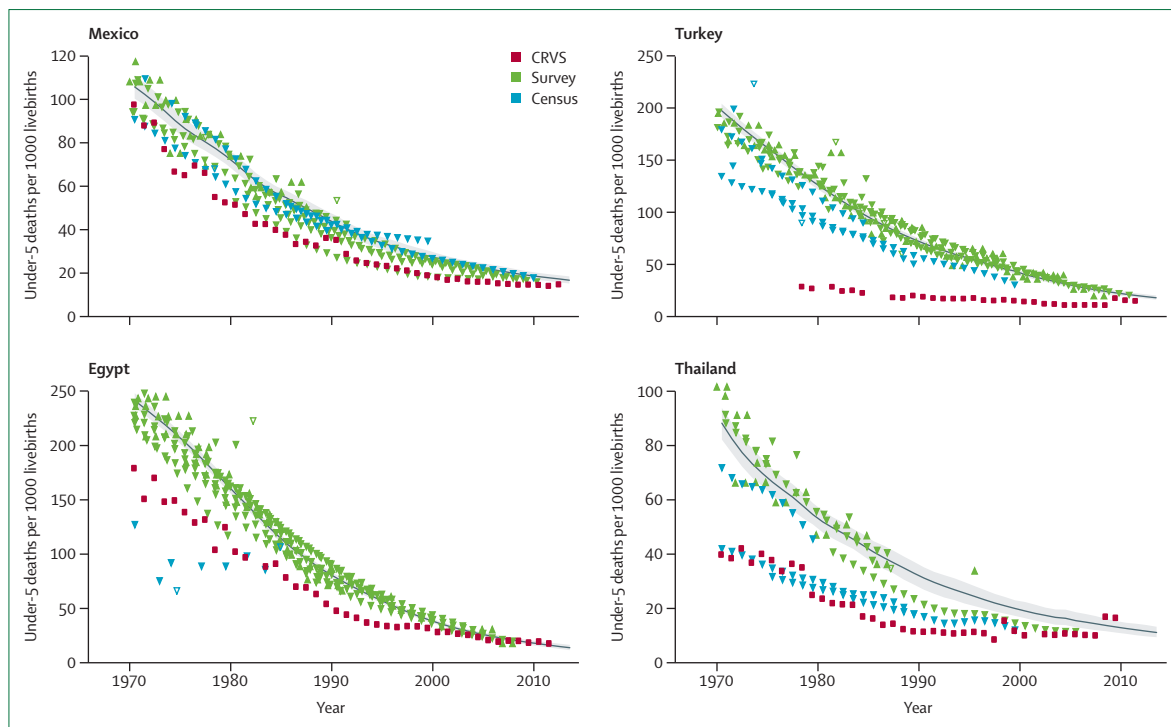


Figure 1: Comparison of child mortality figures from surveys and censuses compared with civil registration and vital statistics (CRVS): Mexico, Turkey, Egypt, and Thailand

Based on data and estimates from Wang and colleagues.²⁸

Is there a place for estimates?

The weakness of CRVS systems in many low-income and middle-income countries, and the need to make sense of the patchwork of non-comparable statistics derived from several data sources, has led to reliance on model-based estimates of overall and cause-specific mortality developed by international agencies and academic institutions.^{20–31} Use of modelled estimates to fill data gaps can have unintended adverse effects, diminish country ownership, mislead users to think that empirical data are available, reduce pressures on governments to fix broken information systems, and discourage development partners from support to strengthen statistical systems, including CRVS. Furthermore, original sources of data and the methods used are not always available to enhance comparability across definitions and data collection methods. The growing sophistication of estimation methods should not blind users to the need for more reliable and regular empirical data generated through country statistical and health information systems. The foundation for such systems is CRVS.

Estimation brings together and critically assesses data from several sources to synthesise best estimates for key indicators (figure 1). Application of these kinds of analytical methods is mostly confined to international agencies and academics. Development of similar skills in country institutions and experts would increase transparency and

confidence in the quality of their statistical outputs, enabling them to be “masters of their mistakes” and empowering them to correct them.³² In turn, this development would enhance the relevance of worldwide estimates and help to build country ownership and participation.³³ In the final analysis, any estimate is only as good as the underlying data on which it is based. Estimates offer a succinct way to summarise the state of health around the world, but they cannot replace or replicate the policy value of high-quality, detailed, and timely vital statistics generated subnationally and nationally.

What works? The need for a research agenda for CRVS

The resurgent interest in CRVS should be matched by innovative approaches to implementation. Historical examples of CRVS development in Sweden, the UK, and other high-income countries offer inappropriate models in a world of rapidly increasing urbanisation, education, interconnectedness, and connectivity. The opportunity for innovations through the digital revolution has been mostly untapped by the registration, statistical, and health communities, but has the potential for major acceleration of improvements in data availability and quality of CRVS performance.

Progress will depend on knowledge and evidence of what works.³⁴ Evidence and experience is accumulating, as shown by increased numbers of regional meetings

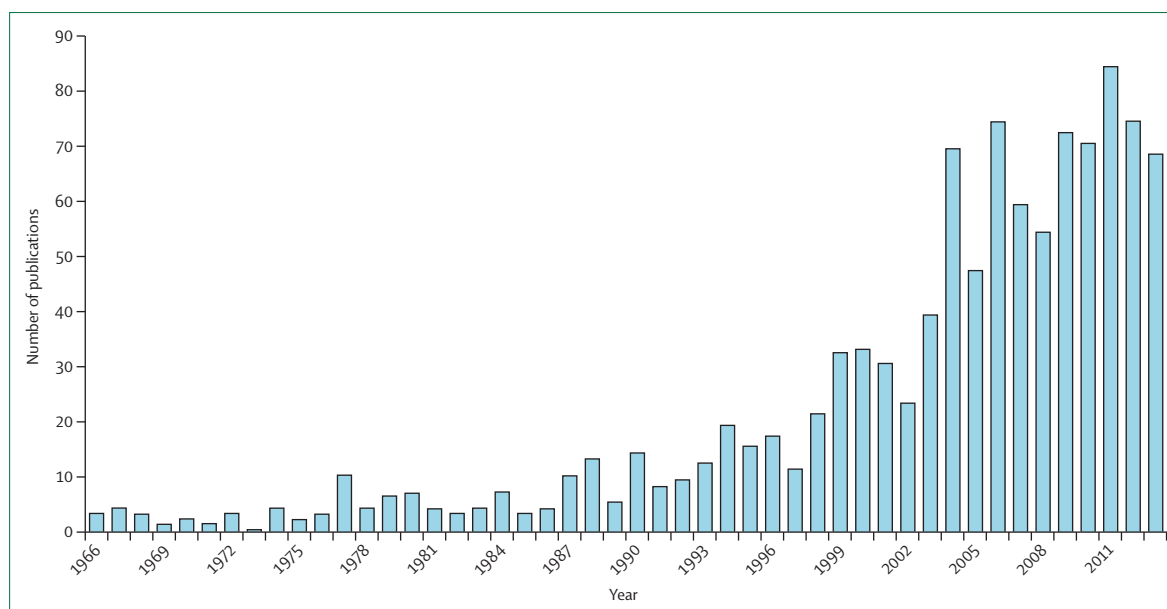


Figure 2: Trends in peer-reviewed publications indexed in the ProQuest database, 1966–2013

Publications addressing the keyword search term “civil registration” either alone or in combination with “vital statistics”. Approximately 10% of such publications across this time period address both civil registration and vital statistics.

and peer-reviewed publications about CRVS (figure 2). However, long-term neglect of CRVS has left substantial knowledge gaps and, although research into specific aspects of CRVS is being done, it is not always well documented or accessible.³⁵

What would a step change in the coverage and quality of CRVS systems cost? A framework designed to respond to this question has been developed, but has not been populated with country data.³⁶ A comparative costing of different ways to obtain information about births and deaths concluded that household surveys are fairly expensive compared with continued surveillance of vital events.³⁷ However, major methodological challenges exist in comparison of costs across sources because of differences in the scope of data collection, frequency, and population coverage. Further research is under way to estimate costs and develop a solid investment case for CRVS in terms of comparative costs and cost-effectiveness.³⁸

What are effective ways to incentivise individuals and families to register vital events? Conditional cash transfers have been shown to increase birth registration,³⁹ but more evidence is needed for the long-term sustainability of such approaches and their potential for extension to registration of deaths. A promising pathway is to link registration authorities with other sectors, for example, by use of health service platforms to increase notification of events and promote registration and certification (see panel for definition of terms). Vital events occurring in health facilities should be recorded and notified to the registration authorities. Maternal and child health visits—especially for immunisation—are

Panel: Distinction between notification, registration, and certification of vital events

Notification

Notification is the issuance by an appropriate authority—such as a health worker—of a form confirming that a birth or death has occurred. The notification form can be used as evidence when reporting to the civil registration office. In the case of a death, a notification form might be needed to obtain a burial permit. Notification forms do not have the legal status of a birth or death certificate.

Registration

Registration is the act of formal registration of an event at a civil registration office. Details of the event are entered into the official civil register by the registrar. Registration is an essential step to obtain a birth or death certificate. Registration records are archived, thus enabling copies of certificates to be obtained when needed.

Certification

Certification is issuance by the civil registrar of a legal document certifying a birth or death and associated characteristics.

likewise opportunities for notification and delivery of certificates. Health outreach workers can report community births and deaths and inform families about the importance of registration.⁴⁰ Community health workers are increasingly acting as vital events reporting and registration agents—a role that improves CRVS system coverage, and provides local areas with real-time health information for planning and improvement. As

regional initiatives such as the One Million Community Health Workers Campaign in Africa gain traction,⁴¹ development of a cohesive research agenda focusing on issues of shared interest, including community empowerment, training, management and supervision, scalability, new technologies, health information system integration, and data quality would be prudent.

Strategies to link death registration to issuance of burial permits have proved successful in settings in which disposal of bodies is well regulated as a public health imperative, such as in Egypt, the Philippines, and Thailand. Examples of effective linkages between registration and religious authorities and funeral services need to be documented. Research is likewise needed to identify effective ways to improve cause-of-death certification practices of physicians⁴² and to show how new verbal autopsy methods could be integrated into routine registration systems when physicians are not available to certify deaths.^{43,44}

Several projects have introduced mobile communication devices and short messaging services (SMS) to increase notification of vital events from communities to health and civil registration authorities.^{45–47} However, a review⁴⁸ of 58 studies of eCRVS or mCRVS interventions concluded that a rigorous assessment component was often absent from the projects, rendering them of limited usefulness. Many projects were implemented on a small scale at local levels, and issues of scalability and systems integration were rarely addressed. Moreover, the potential for error and deliberate fraud was rarely acknowledged.

Whereas several interventions have focused on use of mobile devices to increase notification, very few investigated how notification could be used to increase registration and certification of vital events. Results of one study that addressed this issue showed that SMS intervention resulted in substantial improvements in the notification step, and modest improvements in the registration step, but that notifications and registrations did not match the number of vital events identified in the

local demographic surveillance system (table 3).⁴⁹ The study identified systematic issues—rather than community hostility to, or ignorance of, registration—that accounted for the very low rates of both notification and registration.

Proof-of-concept projects have a continuing role—such as the Health Metrics Network's Monitoring of Vital Events through Information Technology projects,⁵⁰ Plan International's birth registration pilots,⁵¹ and demonstration projects by the US Centers for Disease Control and Prevention's Global Program for CRVS Improvement.⁵² Lessons learnt from such projects encourage funding partners, such as GAVI, the Vaccine Alliance, the Global Fund, US President's Emergency Plan for AIDS Relief, and the World Bank, to support country activities. Successes established on a small scale can achieve support for expansion.

The strength of the advocacy case for CRVS would benefit from a solid evidence base showing links between registration, individual identity, citizenship, justice, democratic governance, and reduction of poverty and inequities.^{53–57} Studies in Bolivia, Brazil, Ecuador, and Guatemala have shown how not having a national identity can be a determining factor in the cycle of poverty.^{58–60} As interest expands in use of digital biometric identification technologies such as fingerprints or iris scans to bypass traditional paper-based identity systems, an evidence base is needed of the possible benefits and risks of such approaches. Moreover, the introduction of these technologies needs to build on, and be clearly aligned with, the foundations provided by CRVS in terms of legal, policy, and statistical systems.^{61,62}

If the potential of research to improve CRVS is to be exploited optimally, it will be important to create synergies and complementarities across national, regional, and global research efforts, and to ensure the active contribution of academic institutions and think tanks as partners to undertake the needed research.^{63,64}

Knowledge translation services—possibly hosted or coordinated by regional or worldwide partners—could help to ensure that research findings and lessons learnt from countries are analysed and made readily accessible to users, especially those entrusted with maintenance and development of CRVS systems in resource-poor countries. The potential of engagement with journals across the specialty of development—statistics, governance, development, planning, health, and human rights—to solicit possible interest in CRVS studies, either on an individual basis or as part of a series about CRVS should likewise be investigated.

The global leadership vacuum

Although an improved evidence base for CRVS is needed, it will not be sufficient by itself to bring about lasting change. To ensure continuing visibility and sustainability needs institutions that “create, negotiate, promote and sustain”⁶⁵ and that can help to overcome gridlock between institutions, harness a broad range of

	Births		Deaths	
	Number	Percentage	Number	Percentage
No specific reason	140	34%	0	0%
Transport issues	87	21%	15	31%
Cost issues	49	12%	3	6%
Household unwilling	49	12%	14	29%
Sickness	40	10%	1	2%
Household moved out of district	25	6%	16	33%
Household lost notification	12	3%	0	0%
Child died before 90 days	7	2%
Total	409	100%	49	100%

Reproduced from Kabadi and colleagues⁵⁰ by permission of University of Queensland Health Information Systems Knowledge Hub.

Table 3: Number and type of reasons for households' failure to certify their events (pilot project in Rufiji district, Tanzania, 2013)

efforts, and achieve rapid progress towards defined goals and targets. Examples of the importance of such institutions include UNAIDS (1994), the Roll Back Malaria Partnership (1998), the Stop TB Initiative (1998), GAVI, the Vaccine Alliance (2000) and the Expanded Program on Immunization, the Global Fund to fight AIDS, TB, and Malaria (2002), and the Partnership for Maternal, Newborn and Child Health (2005). No similar worldwide advocacy, action-oriented, and delivery-focused mechanism exists for CRVS. Worldwide, leadership for CRVS is lamentably absent, coordination of technical support to countries is inadequate, and coordination and alignment of development partner activities around country-led efforts is poor.⁶⁶

The contribution of UN agencies: a patchy history

Within the UN system, efforts have been made in the past to address the weakness of country CRVS systems. The UN Economic and Social Commission (ECOSOC) established the World Programme for the Improvement of Vital Statistics in 1968 and the International Programme for Accelerating the Improvement of Civil Registration and Vital Statistics in 1991. These initiatives led to production of standards and handbooks and provision of technical and financial support to several countries for CRVS assessment and planning.⁶⁷ Support was provided (through UNFPA) to CRVS improvement projects in Africa, but was discontinued after an assessment that identified a failure to mobilise high-level political commitment across all government departments and a scarcity of long-term vision needed to ensure sustainability.⁶⁸ The results of these initiatives were the important series of guidelines that have provided international standards for CRVS. However, in terms of country progress, the legacy is mixed. Indeed, a 1993 report to the UN Economic and Social Council alluded to the need for sustainability and specifically highlighted the need for improved coordination across sectors, including health.⁶⁹

Although the UN Statistics Division continues to update (albeit slowly) its guidance documents, it offers only limited technical or financial support for country strengthening of CRVS.⁷⁰ The UN Statistics Division does not maintain a high-quality database of birth and death registration completeness, but relies instead on intermittent and usually outdated reports from countries that do not have stringent criteria of quality and timeliness.⁷¹ Establishment of a UN inter-agency group for CRVS⁷² seems to be confined to information sharing and has limited ambitions for provision of support to country improvement efforts.

The UN Population Division produces worldwide demographic estimates by combining mortality and fertility statistics from countries, but does not offer capacity development to enable countries to appraise and critically assess the quality of their vital statistics. The UNFPA, which is mandated to help countries to generate data for

populations and provided project-based support to CRVS during the 1990s, pays scant attention to civil registration.⁷³ UNICEF has a laudable history of support for birth registration, but does not contribute to compilation of birth registration information into vital statistics and has only in the past 3–4 years recognised the need to register deaths and causes of death among children.^{74,75}

Funding by the World Bank for statistical capacity building has not been directed to civil registration or the vital statistics it produces, although its engagement in efforts to develop investment cases for CRVS suggests that a change might occur.³⁸ The Paris 21 partnership focuses on support of countries to develop national strategies for development of statistics, but has, until 2014, been strangely silent about CRVS as an essential foundation on which to build a national statistics system.⁷⁶ The UN Development Programme, which addresses development and governance, and is the lead UN agency responsible for coordination of UN support at country level, would seem an obvious choice for coordination of activities in countries but has not made the link with civil registration. The time has come to integrate CRVS into national strategies for development of statistics and into UN Development Assistance Frameworks as a central component of country development and poverty-reduction strategies. However, doing so will need more effective and proactive worldwide leadership than has been visible so far.

The role of WHO

Leadership has been inadequate for production of cause-of-death statistics. WHO is responsible for the International Statistical Classification of Diseases and Related Health Conditions (ICD), which is the international standard for cause-of-death data.⁷⁷ However, WHO has prioritised development and updating of ICD, and has failed to mobilise either the political commitment or organisational resources to provide operational support to countries for ICD implementation. Indeed, the way the ICD has developed is an unfortunate example of generation of complexity out of simplicity. Initially conceived as a system for classification of deaths, mostly for public health purposes, the ICD became a system for classification of “diseases and related health problems”.⁷⁷ Although this expansion has been of substantial value for classification of morbidity, it has made classification of mortality more complex.

Furthermore, the need to regularly update the ICD in line with changing medical knowledge and administrative needs has created an unresolved tension between statistical and administrative uses of the ICD. Statistical users need continuity for trend analysis and broad levels of aggregation, consistent with diagnostic reporting on death certificates. Administrative users need up-to-date and detailed diagnostic terminology and specificity.⁷⁸ The ICD claims to meet both needs, but in practice falls short when it comes to generation of reliable time-series of statistics for causes of death.

For the **The Asia-Pacific
Ministerial Conference on CRVS**
see www.getinthepicture.org

For countries in which implementation of ICD coding to three or four digits is not feasible, WHO has developed a simplified, short list of cause-of-death groupings that will generate an overview of the health situation and emerging mortality trends, and enable comparisons between countries.⁷⁹ This development is welcome, but needs to be followed by systematic support to countries for implementation.⁸⁰

WHO has belatedly acknowledged the need to develop ICD standards appropriate to a range of country circumstances and capacities. In resource-constrained countries, physicians able to correctly certify cause of death are in short supply and poorly distributed.⁸¹ Additionally, WHO should provide technical support to countries for routine implementation of verbal autopsy techniques in settings in which widespread medical certification of causes of death is not possible. Although verbal autopsy cannot match the exactitude of medical certification of cause of death at the individual level, it can produce cause-specific mortality fractions at the population level, thus improving the evidence base for public health decision making.⁸²

Strengthening of its work to develop and implement standards and tools for cause-of-death ascertainment in a range of country settings is a matter of strategic choice for WHO. In view of the momentum to strengthen CRVS systems and generate better statistics, WHO urgently needs to provide worldwide leadership and raise awareness about the crucial public health importance of reliable monitoring of leading causes of mortality in populations and their implications for public health decision making.

The need for worldwide governance

International agencies have tended to work in the area of CRVS in an uncoordinated and intermittent manner. This fragmentation risks an instrumental approach to CRVS, with it being seen as a vehicle to meet specific programme needs, rather than as a mechanism with intrinsic value to individuals, the state, and several sectors and disease-specific programmes.⁸³ Unfortunately, no global custodian for civil registration exists, and no mechanism exists for strategic leadership, collaboration, and coordination of standard setting and technical support to countries. The International Institute for Vital Registration and Statistics (IIVRS) created in 1977 provided, on a low budget, an informal coordination function for CRVS, and brought together 147 members—including civil registrars and health and statistical experts—from 97 countries (Israel RA, personal communication). IIVRS generated many reports about technical methods and country experiences, but ceased its activities in 1998 owing to poor funding.⁸⁴

Civil registrars from the Asia-Pacific region convened for the first time in May, 2014, and established an Asia-Pacific Civil Registrars' Network⁸⁵ intended to enable sharing of ideas and experiences of the

contributions of civil registrars to strengthening of CRVS. The Asia-Pacific Ministerial Conference on CRVS took place in November, 2014, bringing together stakeholders across sectors—including registrars, statistical offices, the health sector, civil society, and the private sector—to mobilise high-level political commitment for CRVS in the region. The Africa Symposium for Statistical Development, a platform aiming to strengthen Africa's statistical systems, has identified CRVS as a key priority.⁸⁶ As noted in the first paper of this Series,⁸⁷ three ministerial-level meetings have already taken place in Africa. These events, which bring together registration, statistical, and health ministers, with the African Development Bank and the Africa Union, have been key to mobilise political and financial support for implementation of a regional plan of action for CRVS.⁸⁸

The regional examples are indicative of the need to improve the development architecture for CRVS by creation of new mechanisms for cooperation, coordination, and funding. These mechanisms are designed to foster collaboration across sectors, stakeholder involvement, and country capacity development for CRVS implementation in Africa. Energy and commitment at regional levels needs to be matched by a similar engagement of worldwide partners.

A worldwide alliance for CRVS

No single agency can be expected to remedy the weaknesses in development architecture for CRVS and achieve sustained improvements in CRVS at country level. However, if each agency were to play its part fully in coordination with others, including partners outside the international system and non-state actors, support to country implementation would be more effective and coordinated than it has been so far. Several calls have been made for a global alliance for CRVS.⁸⁹ The role of such a worldwide alliance could be: to advocate CRVS systems and bridge gaps between human rights, statistical, health, and development communities; to work with government agencies and non-governmental organisations (NGOs) to get CRVS messages across to policy makers and civil society; and to provide a platform for countries, multilateral agencies, funds and foundations, NGOs, academia, civil society, and businesses to support CRVS. Additionally, the alliance could also bring together academic institutions, demographers, epidemiologists, statisticians, public health specialists, researchers, and analysts to drive a strategic research agenda and generate the evidence base for CRVS improvements; provide a means to publish research about CRVS and country experiences, or support for a journal of CRVS studies; establish a knowledge repository to share experiences, lessons learnt, and good practices; work with development partners to prioritise, promote, and coordinate CRVS work; and engage with financing institutions, donors,

For the **global alliance for CRVS**
see www.globalsummitoncrvs.org

funds, and foundations to gain support for strengthening of CRVS.^{90,91} The alliance would have a pivotal role to ensure that CRVS is appropriately positioned as part of the health, aid effectiveness, and post-2015 development agendas.

Although the functions of a global alliance for CRVS are fairly easy to identify, questions about the form such an alliance should take are more difficult to answer. Does CRVS need an independent, overarching institution, with associated resources and transaction costs? Or should the CRVS community opt instead for a loose confederation or so-called creative coalition characterised by a strong collective vision and application of shared rules, norms, and strategies by individuals operating within or across organisations?^{92,93} Should the alliance be housed in a UN system agency, such as the UN Department of Economic and Social Affairs or the UN Development Programme, or hosted by a funding body—for example, a development bank—that could harness resources across the development spectrum and build on expertise across sectors?

Country experiences of strengthening of CRVS show the importance of strategic alliances and decision making processes across many government sectors—particularly registration authorities, health, and statistics—and active engagement of many non-state components, including civil society. The composition of a global alliance should be this inclusive. The governance structure should have the flexibility and responsiveness to function effectively in a multifaceted and dynamic development context.⁹⁴ Legitimacy and accountability will depend on involvement of civil society, NGOs, the private sector, academia, researchers, public health agencies, development partners, UN agencies, donors, funds, and foundations. Making a complex coalition such as this work in practice needs vision, leadership, and the authority to initiate and maximise the mandates and activities of different actors, and compel collaboration and coordination.

Conclusions

Bold and visible leadership, and framing of CRVS as a public good and development imperative is needed to maintain the momentum that exists at present and to enable countries to overcome half a century of neglect. With discussions about the shape and content of the Sustainable Development Goals reaching a conclusion, a worldwide policy window exists to advocate an intensive, purposeful, and well funded focus to strengthen CRVS in ways that ensure country ownership and sustainability. CRVS systems can contribute to a range of development priorities, including the need for every individual to be able to document his or her identity, the progressive realisation of human rights, increased equity, increased targeting of policies and programmes, reliable vital statistics, effective monitoring of national and donor resources, and accountability between governments and citizens.

Correct registration and certification of births and deaths, including age, sex, and cause of each death, is not only an appropriate recognition of all individuals and their fundamental human right to be counted, but is also good public policy. Vital statistics derived from functioning civil registration systems meet many development imperatives, but need to be reliable, comprehensive, and timely. The technical skills, political momentum, country, and donor interest to accelerate civil registration systems are now well aligned. Very substantial progress with this key, but much neglected, component of global health development is possible during the next 5–10 years, but will need bold, concerted, responsive, and sustained engagement from the major worldwide development partners. Signs are emerging that this progress is beginning to happen. Failure to capitalise on these encouraging developments would be a gross dereliction of duty to the billions of people worldwide who would benefit, and would perpetuate the inertia and general scarcity of support for CRVS improvement that has characterised the past half century of worldwide development.

Acknowledgments

We thank F Notzon and E Nichols for their contributions to the research section of the article. We thank A Karim of the Swiss Tropical and Public Health Institute for assistance with the bibliometric analysis.

Contributors

CAZ and ADL conceived the idea for the Series and developed the outline for the Series, including this paper. CAZ, LM, and DdS prepared the first draft of the paper on the basis of initial inputs from the rest of the group. All authors provided feedback, additional and new inputs and suggestions, and reviewed the final manuscript.

Declaration of interests

We declare no competing interests.

References

- 1 Jamison DT, Summers LH, Alleyne G, et al. Global health 2035: a world converging within a generation. *Lancet* 2013; **382**: 1898–955.
- 2 Bryce J, Victora CG, Black RE. The unfinished agenda in child survival. *Lancet* 2013; **382**: 1049–59.
- 3 WHO. Keeping promises, measuring results. Commission on information and accountability for women's and children's health. Geneva: World Health Organization, 2011. http://www.who.int/topics/millennium_development_goals/accountability_commission/Commission_Report_advance_copy.pdf?ua=1 (accessed April 14, 2015).
- 4 WHO. Antimicrobial resistance: global report on surveillance. Geneva: World Health Organization, 2014. http://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf?ua=1 (accessed March 18, 2015).
- 5 UN ECA. Socioeconomic impacts of the Ebola virus disease on Africa. Addis Ababa, Ethiopia: UN Economic Commission for Africa, 2014.
- 6 IHME. The Global Burden of Disease: generating evidence, guiding policy. Seattle, USA: Institute for Health Metrics and Evaluation, 2013.
- 7 UN General Assembly. Prevention and control of non-communicable disease. New York: United Nations, May 14, 2010. http://www.who.int/mediacentre/news/notes/2010/noncommunicable_diseases_20100514/en/index.html (accessed April 17, 2015).
- 8 Wang H, Schumacher AE, Levitz CE, Mokdad AH, Murray CJL. Left behind: widening disparities for males and females in US county life expectancy, 1985–2010. *Popul Health Metr* 2013; **11**: 8.
- 9 Horton R, Das P. Universal health coverage: not why, what, or when—but how? *Lancet* 2015; **385**: 1156–57.

- 10 Hill M, Hupe P. Analysing policy processes as multiple governance: accountability in social policy. *Policy & Politics* 2006; 34: 557–73.
- 11 Chan M, Kazatchkine M, Lob-Levyt J, et al. Meeting the demand for results and accountability: a call for action on health data from eight global health agencies. *PLoS Med* 2010; 7: e1000223.
- 12 UN Office of the High Commissioner for Human Rights. Human rights indicators: a guide to measurement and implementation. New York, USA: United Nations, 2012. http://www.ohchr.org/Documents/Issues/HRIndicators/AGuideMeasurementImplementationCompleteGuide_en.pdf (accessed March 18, 2015).
- 13 Organisation for Economic Cooperation and Development. Paris Declaration and Accra Agenda for Action. Paris, France: Organisation for Economic Cooperation and Development, 2005/2008. <http://www.oecd.org/dac/effectiveness/34428351.pdf> (accessed March 18, 2015).
- 14 Organisation for Economic Cooperation and Development. Busan partnership for effective development co-operation. Paris, France: Organisation for Economic Cooperation and Development, 2011. <http://www.oecd.org/dac/effectiveness/49650173.pdf> (accessed March 18, 2015).
- 15 Institute for Health Metrics and Evaluation. Financing Global Health 2011: continued growth as MDG deadline approaches. Seattle, USA: Institute for Health Metrics and Evaluation, 2011.
- 16 Partnership In Statistics For Development in the 21st Century, PARIS21. Partner report on support to statistics (PRESS) 2012 round. Paris, France: Paris 21, 2012. <http://www.paris21.org/Press> (accessed April 14, 2015).
- 17 WHO. Every woman, every child: strengthening equity and dignity through health: the second report of the independent expert review group (iERG) on information and accountability for women's and children's health. Geneva: World Health Organization, 2013.
- 18 WHO Independent Expert Review Group. International Women's Day, 8 March 2015. A Statement from the independent Expert Review Group on Women's and Children's Health (iERG). Geneva: World Health Organization, 2015. http://www.who.int/woman_child_accountability/iERG/en/ (accessed March 18, 2015).
- 19 UN. Report of the Open Working Group of the General Assembly on Sustainable Development Goals. UN General Assembly, Aug 12, 2014. <https://sustainabledevelopment.un.org/sdgsproposal> (accessed April 14, 2015).
- 20 UN. Open Working Group proposal for sustainable development goals. United Nations, 2014. <http://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=1579&menu=1300> (accessed March 18, 2015).
- 21 Sustainable Development Solutions Network. Framing sustainable development goals, targets and indicators. <http://unsdsn.org/resources/goals-and-targets/> (accessed March 18, 2015).
- 22 Norheim OF, Jha P, Admasu K, et al. Avoiding 40% of the premature deaths in each country, 2010–30: review of national mortality trends to help quantify the UN Sustainable Development Goal for health. *Lancet* 2014; 385: 239–52.
- 23 Mathers CD, Murray CJL, Salomon JA. Methods for measuring healthy life expectancy. In: Murray CJL, Evans D, eds. Health systems performance assessment: debates, methods and empiricism. Geneva: World Health Organization, 2003.
- 24 The Commonwealth Fund. Variations in amenable mortality—trends in 16 high-income nations. <http://www.commonwealthfund.org/publications/in-the-literature/2011/sep/variations-in-amenable-mortality> (accessed March 18, 2015).
- 25 UN Statistics Division. Manual X: indirect techniques for demographic estimation, No 81. United Nations, 1983.
- 26 Hill K, Lopez AD, Shibuya K, Jha P, and the Monitoring of Vital Events (MoVE) writing group. Interim measures for meeting needs for health sector data: births, deaths, and causes of death. *Lancet* 2007; 370: 1726–35.
- 27 UN DESA. UN principles and recommendations for a vital statistics system revision 3. United Nations Statistics Division, 2014. <http://unstats.un.org/unsd/demographic/standmeth/principles/default.htm> (accessed March 18, 2015).
- 28 Wang H, Liddell CH, Coates MM, et al. Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; 384: 957–79.
- 29 Salomon JA, Wang H, Freeman MK, et al. Healthy life expectancy for 187 countries, 1990–2010: a systematic analysis for the Global Burden Disease Study 2010. *Lancet* 2012; 380: 2144–62.
- 30 Kassebaum N, Bertozzi-Villa A, Coggeshall MS, et al. Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; 384: 980–1004.
- 31 WHO, UNICEF, UNFPA, World Bank. Trends in maternal mortality: 1990 to 2010. WHO, UNICEF, UNFPA, World Bank, 2012. http://www.unfpa.org/sites/default/files/pub-pdf/Trends_in_maternal_mortality_A4-1.pdf (accessed March 18, 2015).
- 32 Rosling H. The joy of facts and figures. *Bull World Health Organ* 2013; 91: 904–05.
- 33 Chan M. From new estimates to better data. *Lancet* 2012; 380: 2054.
- 34 UNESCAP Committee on Statistics. Development of a regional programme for the improvement of vital statistics in Asia and the Pacific. UNESCAP, Nov 29, 2010. <http://www.unescap.org/sites/default/files/CST2-3E.pdf> (accessed March 19, 2015).
- 35 Abouzahr C, Harbitz M, Fu H, Mitra RG. Towards a research agenda for civil registration and vital statistics in the Asia–Pacific region. *Asia Pac Popul J* 2014; 29: 99–136.
- 36 Jimenez Soto E, Nguyen K, Dettrick Z, Hodge A, Lopez AD. An economic evaluation of data collection methods for vital statistics. *PLoS One* 2015; 9: e106234.
- 37 HMN. Technical note on the costs of alternative approaches to collecting population and vital events data. Geneva: World Health Organization. http://www.who.int/healthmetrics/resources/Technical_note_on_costs.pdf (accessed March 18, 2015).
- 38 World Bank, WHO. Global civil registration and vital statistics: scaling-up investment plan 2014–2025. Washington DC, USA: World Bank, May 28, 2014. <http://www.worldbank.org/content/dam/Worldbank/document/HDN/Health/CRVS%20Scaling-up%20plan%20final%205-28-14web.pdf> (accessed March 18, 2015).
- 39 Robertson L, Mushati P, Eaton JW, et al. Effects of unconditional and conditional cash transfers on child health and development in Zimbabwe: a cluster-randomised trial. *Lancet* 2013; 381: 1283–92.
- 40 WHO. Using innovative approaches in the health sector to strengthen and modernize civil and vital statistics (CRVS) systems: guiding principles and good practices. Report of a technical meeting sponsored by the World Health Organization in collaboration with Canada, UNICEF, USAID and the World Bank. Geneva, 17–18 December 2013. http://www.unicef.org/protection/files/Strengthening_Civil_Registration_and_Vital_Statistics_Systems_through_Innovative_Approaches_in_the_Health_Sector.pdf (accessed March 18, 2015).
- 41 Singh P, Sachs JD. 1 million community health workers in sub-Saharan Africa by 2015. *Lancet* 2013; 382: 363–65.
- 42 Rampatige R, Mikkelsen L, Riley I, Lopez AD. Hospital cause of death statistics: what should we make of them? *Bull World Health Organ* 2014; 92: 3–3A.
- 43 Lopez AD, Lozano R, Murray CJL, Shibuya K. Verbal autopsy: innovations, applications, opportunities—improving cause of death measurement. Seattle, USA: Institute for Health Metrics and Evaluation, University of Washington, 2011. <http://www.healthmetricsandevaluation.org/publications/verbal-autopsy-series> (accessed March 18, 2015).
- 44 França E, Campos D, Guimarães MD, Souza MF. Use of verbal autopsy in a national health information system: effects of the investigation of ill-defined causes of death on proportional mortality due to injury in small municipalities in Brazil. *Popul Health Metr* 2011; 9: 39.
- 45 Toivanen H, Hyvönen J, Wevelsiep M, Metsäniemi M. Mobile birth registration in Liberia. Vuorimiehentie, Finland: VTT Technical Research Centre of Finland, 2011. <http://www.vtt.fi/inf/pdf/workingpapers/2011/W159.pdf> (accessed March 18, 2015).
- 46 Magbity EB. Proposal national birth registration system—Sierra Leone. Sierra Leone: E-technologies inc, July, 2012.
- 47 Ngoma C, Marlen SC, Herstad J. e-infrastructure and e-services for developing countries. Heidelberg, Germany: Springer, 2011: 79.
- 48 University of Oslo, HISP India, HMN. Systematic review of eCRVS and mCRVS interventions in LMICs. http://www.who.int/healthinfo/civil_registration/crvs_report_eocrvs_mocrvs_2013.pdf?ua=1 (accessed April 14, 2015).

- 49 Kabadi G, Mwanyika H, de Savigny D. Innovations in monitoring vital events. Mobile phone SMS to improve coverage of birth and death registration: A scalable solution. Working paper No. 31. Brisbane, Australia: University of Queensland Health Information Systems Knowledge Hub, 2013.
- 50 HMN. Corporate plan. Geneva: World Health Organization, 2011. <http://www.who.int/healthmetrics/news/roadmap.pdf> (accessed March 18, 2015).
- 51 PLAN International. Birth Registration. <https://plan-international.org/birthregistration/count-every-child-summary> (accessed March 19, 2015).
- 52 Nichols EK, Notzon F. Global program for civil registration and vital statistics (CRVS) improvement. Hyattsville, MD, USA: US Centers for Disease Control and Prevention, Oct 1, 2013. http://www.cdc.gov/nchs/isr/isr_cvrs.htm (accessed March 19, 2015).
- 53 Breckenridge K, Szreter S, eds. Registration and recognition: documenting the person in world history. Oxford, UK: Oxford University Press/British Academy, Oct, 2012.
- 54 Boekle-Giuffrida B, Harbitz M. Democratic governance, citizenship and legal identity—linking theoretical discussion and operational reality. Working Paper. Washington DC, USA: Inter-American Development Bank, 2009. <http://www10.iadb.org/intal/intalcdi/PE/2009/03791.pdf> (accessed April 14, 2015).
- 55 Lao C, Vandenberg C. Legal identity for inclusive development. Law and policy reform at the Asian Development Bank 2007. Mandaluyong City, Philippines: Asian Development Bank, 2007.
- 56 Abdellatif M. Good governance and its relationship to democracy and economic development. Global forum III on fighting corruption and safeguarding integrity. Seoul, South Korea: Ministry of Justice, Republic of Korea, 2003.
- 57 Barendrecht JM, de Langen M. Legal empowerment of the poor: innovating access to justice. In: The state of access: success and failure of democracies to create equal opportunities. Washington DC, USA: Brookings Institution Press, 2008.
- 58 Harbitz M, Tamargo MC. The significance of legal identity in situations of poverty and social exclusion: the link between gender, ethnicity, and legal identity. Washington DC, USA: Inter-American Development Bank, 2009. <http://publications.iadb.org/bitstream/handle/11319/5456/The%20Significance%20of%20Legal%20Identity%20in%20Situations%20of%20Poverty%20and%20Social%20Exclusion.pdf?sequence=1> (accessed March 18, 2015).
- 59 Thomas P. Ending child poverty and securing child rights: the role of social protection: a briefing paper. Warwick, USA: Plan International, 2005. http://www.crin.org/docs/Plan_Ending_Child_Poverty.pdf (accessed March 19, 2015).
- 60 Hunter W, Borges N. Documenting citizenship: contemporary efforts toward social inclusion in Brazil. APSA 2011 annual meeting paper. Rochester, NY, USA: Social Science Research Network, Aug 1, 2011. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1899755 (accessed March 19, 2015).
- 61 Gelb A, Clark J. Identification for development: the biometrics revolution. CGD Working Paper 315. Washington DC, USA: Center for Global Development. <http://www.cgdev.org/content/publications/detail/1426862> (accessed March 18, 2015).
- 62 Zelazny F. The evolution of India's UID program: lessons learned and implications for other developing countries. CGD Policy Paper 008. Washington DC, USA: Center for Global Development, 2012. <http://www.cgdev.org/content/publications/detail/1426371> (accessed March 18, 2015).
- 63 Phillips DE, AbouZahr C, Lopez AD, et al. Are well-functioning civil registration and vital statistics systems associated with better health outcomes? *Lancet* 2015; Published online May 11. [http://dx.doi.org/10.1016/S0140-6736\(15\)60172-6](http://dx.doi.org/10.1016/S0140-6736(15)60172-6).
- 64 AbouZahr C, Harbitz M, Fu H, Mitra RG. Towards a research agenda for civil registration and vital statistics in the Asia-Pacific region. *Asia Pac Popul J* 2014; 29: 99–136.
- 65 Ostrom E. Institutional rational choice: an assessment of the institutional analysis and development framework. In: Sabatier PA, ed. Theories of the policy process. Boulder, USA: Westview Press, 2007: 21–65.
- 66 AbouZahr C, Gollgoly L, Stevens G. Better data needed: everyone agrees, but no one wants to pay. *Lancet* 2010; 375: 619–21.
- 67 UN Statistics Division. Improvement of civil registration and vital statistics. <http://unstats.un.org/unsd/demographic/CRVS/default.htm> (accessed April 14, 2015).
- 68 Padmanabha P. Review and evaluation of UNFPA-supported projects on civil registration and vital statistics: consultancy report. UN Statistics Division, 1993. <http://unstats.un.org/unsd/demographic/sources/civilreg/docs/Padmanabha%20Paper.pdf> (accessed March 18, 2015).
- 69 Economic and Social Council UN Statistical Commission. Report on demographic and social statistics (E/CN.3/1993/12). New York, USA: UN Statistics Division, 1993. <http://unstats.un.org/unsd/statcom/doc93/1993-12-DemSocialStats-E.pdf> (accessed March 19, 2015).
- 70 UNDESA, UNFPA. UN system task team on the post-2015 UN development agenda. Population dynamics: thematic think piece. UN Department of Economic and Social Affairs, UN Population Fund, May, 2012. http://www.un.org/millenniumgoals/pdf/Think%20Pieces/15_population_dynamics.pdf (accessed March 19, 2015).
- 71 UN Statistics Division. Coverage of birth and death registration. New York, USA: UN Statistics Division, December, 2014. http://unstats.un.org/unsd/demographic/CRVS/CR_coverage.htm (accessed March 18, 2015).
- 72 UN Statistics Division. Global civil registration and vital statistics group. Terms of reference. New York, USA: UN Statistics Division, May, 2014. <http://unstats.un.org/unsd/demographic/CRVS/GlobalCRVS.html> (accessed March 18, 2015).
- 73 UNFPA. The future UNFPA wants for all: keys for the post-2015 development agenda. New York, USA: UN Population Fund, 2012.
- 74 UNICEF. Birth registration: right from the start. *Innocenti Digest* 2002; 9.
- 75 UNICEF. A passport to protection: a guide to birth registration programming. New York, USA: UN International Children's Emergency Fund, 2013.
- 76 PARIS21. Statistics for transparency, accountability and results: a busan action plan for statistics. Paris, France: Paris 21, 2011. http://www.paris21.org/sites/default/files/Busanactionplan_nov2011.pdf (accessed March 18, 2015).
- 77 WHO. International statistical classification of diseases and related health problems, 10th Revision. Geneva: World Health Organization, 2010. <http://www.who.int/classifications/icd/en/> (accessed March 18, 2015).
- 78 Moriyama IM, Loy RM, Robb-Smith AHT. History of the statistical classification of diseases and causes of death. Rosenberg HM, Hoyert DL, eds. Hyattsville, USA: National Center for Health Statistics, 2011.
- 79 Becker R, Silvi J, Ma Fat D, L'Hours A, Laurenti R. A method for deriving leading causes of death. *Bull World Health Organ* 2006; 84: 297–304.
- 80 WHO. WHO Application of ICD-10 for initial low resources cause of death collection. The Simple Mortality List (ICD-10-SMoL). Geneva: World Health Organization, 2014. http://www.who.int/healthinfo/civil_registration/ICD_10_SMoL.pdf?ua=1 (accessed March 18, 2015).
- 81 WHO. Outlining strategies for implementing the International Classification of Diseases in Africa. Workshop report. WHO/HIS/HSI/2014.3. http://www.who.int/healthinfo/civil_registration/ICDinAfrica_WorkshopReport_August2014.pdf?ua=1 (accessed March 18, 2015).
- 82 Murray CJL, Lozano R, Flaxman AD, et al. Using verbal autopsy to measure causes of death: the comparative performance of existing methods. *BMC Medicine* 2014; 12: 5.
- 83 The World Bank. Concept note: a global financing facility in support of every woman and every child. Washington DC, USA: World Bank, Sept 25, 2014. <http://www.worldbank.org/content/dam/Worldbank/document/HDN/Health/ConceptNote-AGlobalFinancingFacilitySupportEveryWomanEveryChild.pdf> (accessed March 18, 2015).
- 84 Linder FE, Moriyama IM. Improving civil registration. Bethesda, MA, USA: International Institute for Vital Registration and Statistics, 1980.
- 85 UNICEF, UNHCR ESCAP, Plan International, WHO. Concept note: Asia-Pacific Civil Registrars Meeting. UNICEF, UNHCR ESCAP, Plan International, WHO, 2014. <http://www.hingx.org/Share/Details/1690> (accessed March 18, 2015).
- 86 10th meeting of the Africa Forum for Statistical Development. Kampala, Uganda: Uganda Bureau of Statistics, January, 2015. <http://www.ubos.org/onlinefiles/uploads/ubos/assd/newsletter%201.pdf> (accessed March 18, 2015).

- 87 AbouZahr C, de Savigny D, Mikkelsen L, Setel PW, Lozano R, Lopez AD. Civil registration and vital statistics: progress in the data revolution for counting and accountability. *Lancet* 2015; published online May 11. [http://dx.doi.org/10.1016/S0140-6736\(15\)60173-8](http://dx.doi.org/10.1016/S0140-6736(15)60173-8).
- 88 Second Conference of African Ministers Responsible for Civil Registration. Africa Programme on Accelerated Improvement of Civil Registration and Vital Statistics (AP AI-CRVS). http://www.uneca.org/sites/default/files/page_attachments/conceptnote-2ndcrmc-en.pdf (accessed March 18, 2015).
- 89 WHO. Every woman, every child: strengthening equity and dignity through health: the second report of the independent expert review group (iERG) on information and accountability for women's and children's health. Geneva: World Health Organization, 2013.
- 90 Global Fund to Fight Aids, TB and Malaria. Monitoring and evaluation Toolkit. Geneva: The Global Fund to Fight AIDS, TB and malaria, 2011. http://www.theglobalfund.org/documents/monitoring_evaluation/ME_MonitoringEvaluation_Toolkit_en/ (accessed April 14, 2015).
- 91 Global Fund to fight AIDS, TB and Malaria. 5th Strategy, Investment and Impact Committee Meeting Geneva, 24–26 October 2012. Strategic investment in country data systems to systematically prepare countries to measure impact. GF/SIIC05 /05. Global Fund to fight AIDS, TB and Malaria, 2012.
- 92 The Economist. Solving global problems. *The Economist* (London), Oct 19, 2013: 8858.
- 93 Lamy P. Oxford Martin Commission for Future Generations. Oxford, UK: Oxford Martin School and University of Oxford, October, 2013.
- 94 Frenk J, Moon S. Governance challenges in global health. *N Engl J Med* 2013; **368**: 936–42.