

THE EXPERIENCE OF ICD UTILIZATION ON VERBAL AUTOPSY DATA TO OBTAIN TREND OF CAUSE OF DEATH IN INDONESIAN POPULATION (1992–2007)

(Pengalaman Penggunaan ICD terhadap Data Autopsi Verbal (CAV) untuk Memperoleh Tren Penyebab Kematian pada Penduduk Indonesia Tahun 1992–2007)

Sarimawar Djaja¹

Naskah masuk: 11 November 2013, Review 1: 14 November 2013, Review 2: 14 November 2013, Naskah layak terbit: 29 Januari 2014

ABSTRACT

Background: Cause of death data is necessary for arranging health programs. The needs of these data is not fulfill yet through reporting and recording system from health facilities **only**, therefore national health survei should be conducted regularly. **Objective:** To obtain cause of death trends in the populations from VA data. **Methods:** Material taken from Nasional Health Survey 1992, 1995, 2001, 2007 covering 65,664 households (HH), 206,240 HH, 211,168 HH, 258,366 HH respectively, selected by stratified random sampling technique using core and module sample of Socio Economic National Survey (Susenas) and taken with a Probability Proportional to Size method. Cause of death data was collected by structured questionnaire using verbal autopsy (VA) technique and was classified based on ICD 9 and ICD 10. **Results:** The disease patterns of cause of death from 1992 to 2007 showed the non-communicable disease is increasing continuously while communicable disease (infectious, maternal and perinatal, nutritional deficiencies) is decreasing; however the burden of disease is still present on both groups of diseases. **Conclusions:** The little bit less accurate VA data (1992–2007) collected is able to produce national statistic data of cause of death and could be used to suggest health planning program managers in Indonesia.

Key word: ICD Utilization, VA Data, Cause of Death

ABSTRAK

Latar Belakang: Data penyebab kematian diperlukan untuk menyusun program kesehatan. Kebutuhan akan data ini belum terpenuhi seluruhnya melalui sistem pelaporan dan perekaman data dari fasilitas kesehatan dan survei kesehatan nasional yang seharusnya dijalankan secara teratur. **Tujuan:** Menentukan tren penyebab kematian di masyarakat dari data Autopsi verbal. **Metode:** Bahan diambil dari hasil Surkesnas 1992, 1995, 2001, 2007 secara berurutan mencakup 65.664 RT, 206.240 RT, 211.168 RT, 258.366 RT yang dipilih dengan teknik sampel acak menggunakan sampel core dan modul Susenas berdasarkan metode *Proportional to Size*. Data penyebab kematian telah dikumpulkan dengan kuesioner terstruktur yang menggunakan teknik AV dan diklasifikasikan berdasarkan ICD 9 dan ICD 10. **Hasil:** Pola penyebab kematian tahun 1992-2007 memperlihatkan penyakit tidak menular terus meningkat sedangkan penyakit menular cenderung menurun (infeksi, maternal dan perinatal, gizi kurang), namun beban penyakit masih berada pada ke dua kelompok penyakit tersebut. **Kesimpulan:** Data AV (1992-2007) meskipun sedikit kurang akurat masih dapat menghasilkan pola penyebab kematian nasional yang dapat digunakan sebagai masukan kepada para manajer perencana program kesehatan di Indonesia.

Kata kunci: penggunaan ICD, data Autopsi Verbal (AV), penyebab kematian

¹ Has been presented as Poster Scientific Paper on 17th International Federation Health Information Management Association (IFHIMA) Congress, 12-16 May 2013 in Montreal (Canada).

² Pusat Teknologi Intervensi Kesehatan Masyarakat, Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan RI. Alamat e-mail: sarimawardjaja@yahoo.com

INTRODUCTION

Health indicators are very important as a barometer to determine the success of implementation health programmes in the population. The major indicators are mortality rate and cause of death, they are able to identified health problems and monitoring health conditions in the society (CDC, 2001). Death indicators are able to be obtained from a reliable data source which is death certificate. It is estimated only one third of the death citizens in the world are recorded completely with age, sex, and cause of death, which is the data source came up from developed countries (Lopez AD *et al.*, 2000).

In Indonesia, health indicators are usually taken out from monthly or quarterly routine reports made for each program implementation, reporting evaluation activities, and can also be acquired from the national survey report periodically every 3 or 5 years. Crude death rate (CDR) and the cause-specific death rate (CSDR) should be collected from routine reports of any existing hospital which are having death cases.

However, the percentage of the population died in a hospital is quite small due to most of Indonesian live in rural areas and they died in their house. Although Indonesia has the Act No. 23 of 2007 on Population and Civil Registry that each birth and death event of a resident should be noted and reported, it is not properly implemented in each district because of not having specific guidelines yet.

Therefore, to obtain the number of deaths, illnesses and to know the cause of death population in Indonesia before the Act No. 23 of 2007 thoroughly implemented, Ministry of Health has been conducted a national health survey periodically every 3–5 years to collect various health data such as morbidity, mortality data, as well as health care utilization data from 1992–2007.

To collect mortality data, verbal autopsy (VA) technique is the best way to determine cause of death cases in the society with the situation of large percentage number of people who died at home. The collection of cause of death data through VA questionnaire with specific diagnosis and high accuracy result are still limited compare to cause of death data collected from hospital. Besides that, the quality of determining cause of death for each disease through VA are also rely on the results of sensitivity and specificity test (Michel Garenne, 2006).

However, in a country with insufficient recording, VA techniques become useful to obtain cause of death information of infant and under five (Anker M, 1999). This paper intended to have the pattern of cause of death based on VA data and to present the leading cause of death in Indonesian population from 1992–2007.

MATERIALS AND METHODS

Mortality data collected in the Household Health Survey (HHS) 1992, 1995, National Health Survey 2001, and Baseline Health Research 2007 (further more stated as National Health Survey/NHS) has taken by cross-sectional method. A sample of households (HH) totaled 65,664 HH (NHS 1992), 206,240 HH (NHS 1995), 211,168 HH (NHS 2001), and 258,366 HH (NHS 2007) using Socio-economic national survey (“Susenas”) sampling frame selected by Probability Proportional to Size (PPS).

DIAGNOSIS OF CAUSE OF DEATH DETERMINATION

The best method to determine cause of death diagnosis in the population is by using verbal autopsy questionnaire through interviewing the family of the deceased concerning signs, symptoms and history of illness. The interviewer and one who determines COD diagnosis of NHS 1992 was medical doctors from Ministry of Health. 1995 NHS interviewers were nurses/midwives, while the determination of diagnosis done by a medical doctor from Primary Health Care (PHC). The diagnosis of cause of death classified based on the International Classification of Diseases (ICD) 9 for 1992 NHS while 1995–2007 NHS classified by ICD-10 (WHO, 2005). On the 2007 NHS, there was Glossary of disease symptoms inserted in the Manual Book to Determine the Diagnosis of Cause of Death from VA data (Badan Litbangkes, 2008).

Diagnosis of the cause of death in NHS aged 7 days and above refer to the multiple cause of death. Tabulation mortality statistics uses the diagnosis of the underlying cause of death (UCOD) (WHO, 2005). Mortality diagnosis of perinatal to infant from 22 weeks to 7 days old neonates consists of the main cause and other causes. Underlying cause of death (7 days and above) and the main cause of perinatal death (0–6 days) is the most important diagnosis to

tabulate because by knowing the underlying cause of death and the main cause for perinatal death, the right intervention can be done. Thus, further complication which is cause death can be prevented. Diagnosis of the cause of death were classified according to the list of ICD-9 mortality tabulation for 1992 NHS, and ICD-10 for the 1995-2007 NHS.

DATA ANALYSIS

Supervisors recheck all VA questionnaires about the completeness, consistency, and accuracy of diagnosis of cause of death coding based on ICD-9 for the results of 1992 NHS, and based on ICD-10 for 1995-2007 NHS. Data were recorded and analyzed with SPSS by data management team. Code of cause of death by ICD-9 adjusted (match) following the ICD-10. From the diagnosis of diseases that have been encoded, conducted classification disease according to mortality tabulation list 2 (general mortality selected list) for the death 7 days and above; and using mortality tabulation list 4 (infant and child mortality selected list) for perinatal mortality (WHO, 2005).

Analysis of underlying of cause of death are grouped into eight major diseases which are selected based on the high proportion of deaths. They are infectious diseases, circulatory system, respiratory system, digestive system, neoplasms, accidents/injuries, maternal-perinatal. Other analyzes based on the three disease groups according to Burden of Disease (BoD) are communicable/infectious diseases, non-communicable diseases, external causes/injury.

Communicable disease is a collection of various infectious diseases that originate from the ICD-10 classification, such as diarrhea, typhoid, tuberculosis, malaria, dengue, tetanus, hepatitis, respiratory tract infections are otitis media, upper and lower respiratory tract infection, meningitis/encephalitis, nutritional disorders, and maternal-perinatal. Non-communicable diseases consist of circulatory disease, respiratory disease, neoplasm, endocrine, gastro-intestinal disease. External causes consist of accident, intentional self-harm, assault (WHO, 2001).

LIMITATION

In general, investigation of deaths in 12 months time through surveys show underestimate in calculating the proportion of mortality and does not give satisfactory

results (United Nation, 1992). The events and the age of death was difficult to be documented precisely because most of the people who were interviewed live in rural areas, lack of knowledge, low income and do not pay attention to the cause of death. The selection of cause of death ascertained from differential diagnosis based on signs and symptoms which collected with VA questionnaires. The accuracy level of diagnosis based on VA is lower than diagnosis based on medical record. However, for a country where a lot of death events occurred at home without any medical data, VA is the only possible method commonly used to obtain the cause of death data.

RESULTS

The results of mortality data collection with VA questionnaires was classified based on mortality tabulation list 2 and list 4 ICD-10 (WHO, 2005) such as infectious diseases/infections, neoplasms, endocrine diseases, diseases of the circulatory system, respiratory system, digestive system, maternal diseases, disorders in the perinatal period, accidents and injury.

For a group of infectious diseases, diseases prevalent cause of death was diarrhea (A09), typhus (A01.0), TB (A15.9, A16.9), tetanus and other neonatal tetanus (A33, A35), unspecified septicemia (A41.9), Dengue Haemorrhagic Fever (A41.9), measles complicated by pneumonia or by meningitis/encephalitis (B05.2, B05.1/B05.0), viral hepatitis unspecified (B19.9), malaria (B50.0, B54).

Group of neoplasms that cause the most death was malignant neoplasm of the liver (C22.9), malignant neoplasm of lung (C34.9), malignant neoplasms of breast (C50.9), malignant neoplasm of the cervix (C53.9), malignant neoplasm of prostate (C61), malignant neoplasm of colon (C18.9).

Group of endocrine disease, metabolic and nutrition that caused many deaths are anemia unspecified (D64.9), nutritional anemia (D53.9), DM with unspecified complications (E14.2 and E14.5), malnutrition (E46).

Group of circulatory system diseases that cause the most death was hypertensive heart disease (I11), hypertensive renal disease (I12), acute myocardial infarction (I21.9), heart failue unspecified (I50, 9), intracranial haemorrhage unspecified (I61.9), Stroke not specified as haemorrhage or infarction (I64).

Group of respiratory system diseases that caused the most deaths were unspecified pneumonia (J18.9), unspecified COPD (J44.9), asthma, unspecified (J45.9), status asmaticus (J46), respiratory failure (J96.9).

Group of digestive system diseases that cause the most deaths is gastric ulcer, unspecified (K25.9), duodenal ulcer, unspecified (K26.9), gastritis, unspecified (K29.7), diseases of stomach and duodenum unspecified (K31, 9), acute appendicitis unspecified (K35.9), Crohn’s diseases unspecified (K50.9), chronic hepatitis, unspecified (K73.9), unspecified cirrhosis of the liver (K74.6).

Maternal disease consists of complication following abortion unspecified (O08.9), pre-eclampsia, unspecified (O14.9), eclampsia (O15.9), unspecified maternal hypertension (O16), premature rupture of mambranes, unspecified (O42.9), antepartum haemorrhage, unspecified (O46.9), atony of the uterus (O62.2), long labor (O63.9) obstructed labor due to breech presentation (O64.1) and shoulder presentation (O64.4) obstructed labor, unspecified (O66.9), labor and delivery complicated by prolapsed of cord (O69.0), by the cord around the neck with compression (O69.1), haemorrhage associated with retained placental (O72.0), complication of labor and delivery, unspecified (O75.9), puerperal sepsis (O85).

Perinatal disorders include fetus and newborn affected by maternal hypertensive disorders (P00.0),

fetus and newborn affected by premature rupture of membranes (P01.1), fetus and newborn affected by prolapse cord (P02.4), fetus and newborn affected by other compression of umbilical cord (P02.5), fetus and newborn affected by breech delivery ang extraction (P03.0), low birth weight (P07), intrauterine asphyxia (P20.0), birth asphyxia (P21.9), bacterial sepsis of newborn unspecified (P36.9), neonatal jaundice, unspecified (P59.9), perinatal unspecified digestive system disorders (P78.9), hypothermi of newborn unspecified (P80.9), fetal Death of unspecified (P95), congenital malformation (Q00).

The most case of accidental is death and injury traffic accidents (V01-V99), drowning (W70). From the cases of deaths that have specific signs and symptoms, doctors can determine the leading causes of death, whereas for the cases of deaths which have no specific signs and symptoms of the disease can only be determined as unspecific cause of death (unspecified).

The next review will explain the disease group proportion of cause of death in Indonesia since 1992 until 2007. From the underlying cause of death (UCOD) are grouped into 8 groups of major diseases which were prevalent as cause of death in the community. The highest proportion of leading causes of death in Indonesia in 1992 is an infectious disease, but in 1995 the proportion of infectious diseases decreased and became equal to the proportion of circulatory system diseases. In 2001 the death proportion due

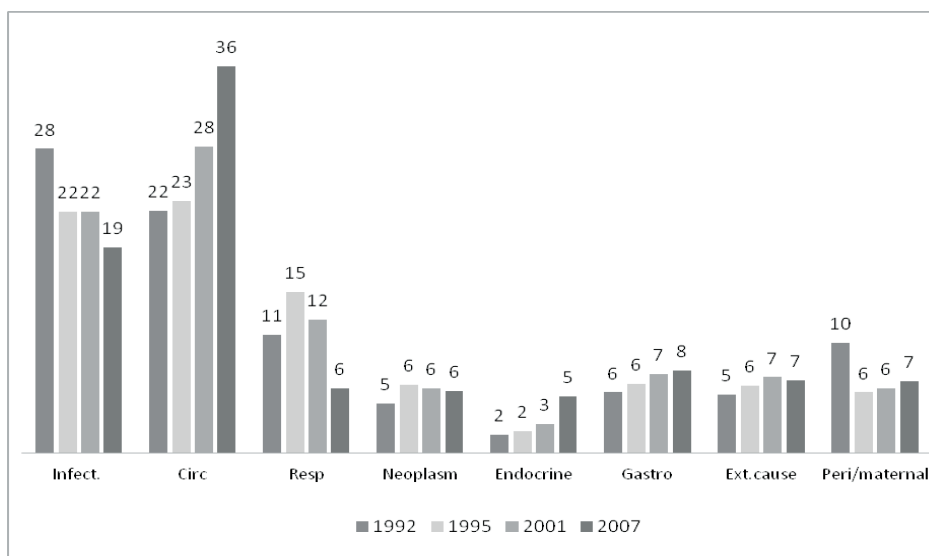


Figure 1. The Proportion of Cause of Death (Group of Diseases) in 1992–2007 in Indonesia

to circulatory system diseases increases beyond infectious diseases and in 2007 deaths from circulatory system diseases was increased rapidly. The proportion of deaths from other degenerative diseases such as diabetic increased 2.5 times more in 2007 compared to 15 years ago. The proportion of deaths due to diseases of respiratory system decreased to half while the proportion of deaths due to neoplasms, digestive system, and accident/ injury increases. The proportion of maternal deaths due to diseases and disorders in the perinatal period has declined from 10% in 1992 to 6% in 1995, but increased again to 7% in 2007 (Figure 1).

Burden of disease analysis extracted from further grouping of cause of death diseases group on figure 1. Analysis the pattern of the cause of death based on Burden of Disease showed the decreased proportion of communicable diseases for 15 years however for non-communicable diseases significantly increased from 46 percent to 61 percent. The cause of death due to external causes also increased from 5 percent to 7 percent within 15 years (Figure 2).

DISCUSSION

The implementation of the cause of death survey in Indonesia emerged lots of trouble to get the signs and symptoms of the disease when the deceased suffered before dying. The cause of death showed varies of kind specified diseases and unspecified diseases. The reason is the respondent /family do not know the signs or symptoms of illness before the deceased died and also most of the people who went to health center before dying had not enough information about the illness. The result is many deaths (over 10 percent) with ill defined diagnosis (R95-R99) or disease cannot be grouped. Therefore on the 1992 survey, we used fresh graduated general practitioners interviewers, who understand medical science, making it easy to define the cause of death. If the diagnosis of ill defined becomes smaller it means the quality of the data is good (CD Mathers, 2013).

In 1992–2004, WHO sponsored study of the implementation and validation of Verbal Autopsy (VA) in Tanzania, then in China, India, Malawi (Anker M, 1999), and Ethiopia to get the cause of death in infants and children. As a tool of investigating the cause of death, is used method closed verbal autopsy questionnaire. Verbal Autopsy instruments can be

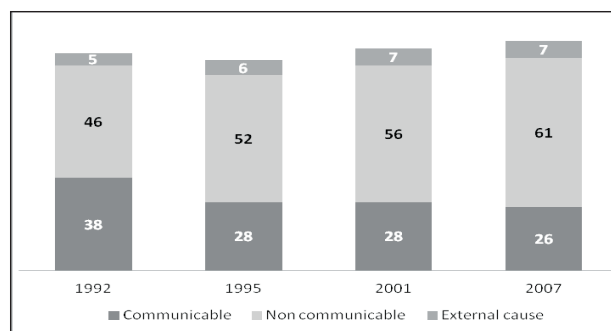


Figure 2. The Proportion of Cause of Death base on *Burden of Diseases* in 1992–2007 in Indonesia.

used by the layman, thus the cost of data collection will be cheaper than using medical personnel. According to WHO, if the survey using medical personnel as an interviewer, it was not sufficient to be done in all districts (WHO, 2006). Since 2001 mortality survey using questionnaires enclosed VA prepared by WHO and the use of force layman as data collectors.

The study of validation VA in Namibia showed that VA is useful to ascertain the cause of death in children, but may have limitations for assessing the health effects (Mobley CC. *et al.*, 1996). The use of a simple VA to identify the cause of death in adults in rural areas can yield useful information for determining priority health interventions (Kiddest Lulu *et al.*, 2005). The simplified approach to verbal autopsy diagnosis can produce useful data is a priority that can guide health effectively interventions in rural areas where routine information system is either very weak or non-existent.

Setel, Philip W. argues that VA validation studies are required in different epidemiological situations although VA tool has been developed with a specific procedure. This is due to differences in the prevalence of the main cause of death are found (Setel, Philip W, 2006). Widespread the use of VA to determine the burden of disease and to set priorities for health interventions in areas with a weak registration systems required accurate analysis of VA. From validation studies in several countries with a clinical diagnosis as the gold standard, the accuracy of cause-specific mortality fraction for adults of 0.546 for adults, 0.504 for children, and 0.404 for neonates (Rafael Lozano, 2011).

Validation VA questionnaires test in Indonesia (Sarimawar Djaja, 2009), using hospital data as “Gold

Standard”, shows that the value of diagnoses based on VA questionnaires varies, diseases with sensitivity values > 70% is bronchopneumonia in infants, cervical neoplasm, lung neoplasm, dengue hemorrhagic fever, diarrhea, maternal complication, and injury. Diseases with 60–70% sensitivity is tuberculosis, gastro intestinal tract carcinoma, breast cancer, and stroke. Diseases with less than 60% sensitivity is diabetes, ischemic heart diseases, congestive heart failure, pneumonia, chronic obstructive pulmonary diseases (COPD), and cirrhosis hepatic.

In general it can be concluded that diagnose of cause of death based of VA tool developed by WHO are used on the survey of the causes of death in Indonesia during 1992–2007 is lack and have some limitation. On the other hand this data is useful because we don't have any source of cause of death data. Therefore the cause of death from VA data was better analyzed to be a group disease of cause of death. The proportion of leading cause of deaths due to circulatory disease, neoplasm, endocrine disease, gastrointestinal, external causes increased, while the proportion of deaths due to infectious diseases and diseases of the respiratory system decreases.

Further analyses of these groups of cause of death shows the non-communicable diseases continues to increase from year to year (2002–2007), otherwise communicable disease is descended, but the burden of disease is still present on both groups of disease. The same situation happened in South East Asia which is currently facing an epidemic condition of non-communicable disease responsible for 60 percent of deaths in the region (Dans A., 2013).

CONCLUSION

The verbal autopsy data based on ICD-10 which determined from 1992–2007 national health survey was a little bit less accurate; however it is still able to produce national statistic data of cause of death and could used to suggest health planning program managers in Indonesia.

Reparing from the verbal autopsy data, it is appeared that non-communicable disease is increasing continuously while communicable disease is decreasing, however the burden is still present on both groups of diseases.

SUGGESTION

Strengthening civil registration and vital statistics management based on the Act No. 23 of 2007 on Population and Civil Registry to collect routine birth and death data to change periodically mortality survey as a main source of mortality data.

Strengthening vital registration and vital statistics must be done immediately in all districts of Indonesia in order that there will be no more polemic happened concerning mortality rate, with the crucial issue of maternal mortality ratio and infant mortality rate.

Strengthening and improving hospitals and PHC doctors should involve ascertaining the diagnosis of cause of death of their patients in hospitals and their citizen in each PHC district area.

BIBLIOGRAPHY

- Anker M, Black RE, Coldham C, Kalter HD, Quigley MA, *et al.*, 1999. A Standard Verbal Autopsy Method for Investigating Causes of Death in Infants and Children. WHO/CDS/CSR/ISR/99.4. World Health Organization. Geneva. Available at: <http://www.who.int/csr/resources/publications/surveillance/whocdscsr994.pdf>. [Accessed: April 15, 2013].
- Badan Penelitian dan Pengembangan Kesehatan, WHO, NCCH, SPH-QUT. 2008. Buku Panduan Penentuan Kode Penyebab Kematian Menurut ICD-10, Juni 2008. ISBN 978-979-8270-68-0. Editor Soewarta Kosen, Penyusun Sarimawar, Suhardi. Jakarta.
- CDC. 2001. The Autopsy, Medicine, and Mortality Statistics. CDC'S Department of Health and Human Services, Series 3, No.32, October 2001. Available at: <http://www.cwru.edu/med/epidbio/mph439/autopsy.pdf>. [Accessed: April 14, 2013].
- Colin D. Mathers, *et al.* 2005. Research: Country the dead and what they died from: An assessment of the global status of cause of death data. Bulletin of the World Health Organization 2005; 83:171-177. Available at: <http://www.who.int/bulletin/volumes/83/3/171.pdf>. [Accessed: April 16, 2013].
- Dans A, Ng Nawi, Varghese C, *et al.*, 2011. The rise of chronic non-communicable diseases in southeast Asia: time for action. The Lancet, Febr 2011; vol.377, issue 9766, p.680-9. Doi:10.1016/50140-6736 (10) 61506-1. Available at: [http://www.thelancet.com/journals/lancet/article/P1150140-6736\(10\)61506-1/fulltext](http://www.thelancet.com/journals/lancet/article/P1150140-6736(10)61506-1/fulltext).
- Kiddest Lulu and Yemane Berhane. 2005. The used of Simplified verbal autopsy in identifying cause of adult

- death in a predominantly rural population in Ethiopia. *BMC Public Health* 2005, 5:58doi: 10.1186/1471-2458-5-58. Available at: <http://www.biomedcentral.com/1471-2458/5/58>. [Accessed: April 19, 2013].
- Lopez AD, Ahmad O, Guillot M, Ferguson BD, Salomon J, *et al.*, 2001. World mortality in 2000: Life tables for 191 countries. World Health Organization. 800 p. Geneva. Available at: http://www.cdc.gov/nchs/data/series/sr_03/sr03_032.pdf. [Accessed: April 14, 2013].
- Michel Garenne and Vincent Faeveau. 2006. Editorials Potential and Limits of Verbal Autopsies *Bulletin of the WHO*, March 2006, 84 (3): 164. Available at: <http://www.who.int/bulletin/volumes/84/3/164.pdf>. [Accessed: April 15, 2013].
- Mobley CC, Boerma JT, Titus S, *et al.*, 1996. Validation study of a verbal autopsy method for causes of childhood mortality in Namibia. *J Trop Pediatr.*, Dec 1996; 42 (6): 365–9. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/9009566>. [Accessed: April 16, 2013].
- Rafael Lozano, Michael K Freeman, Spencer L James, *et al.*, 2011. Performance of InterVA for assigning causes of death to verbal autopsies: multisite validation study using clinical diagnosis standards. *Population Health Metrics* 2011, 9:50 doi:10.1186/1478-7954-9-50. Available at: <http://www.pophealthmetrics.com/content/9/1/50>. [Accessed: April 15, 2013]
- Sarimawar Djaja, Lamria Pangribuan. 2009. Sensitivity and Positive Predictive Value Calculation of Verbal Autopsy Questionnaire Used to Diagnose Certain Causes of Death. Unpublished paper, October 2009.
- Setel, Philip W., Chalapati Rao, Hemed Yusuf, *et al.*, 2006. Core Verbal Autopsy Procedures with Comparative Validation Results from Two Countries, *PLoS Medicine*, August 2006; 3 (8): 1282–1291.
- The World Health Report. 2006. Working Together for Health. Available at: <http://www.who.int/whr/2006>. [Accessed: March 10, 2011].
- United Nations. 1992. Handbook of population and housing censuses, 1992, part II, series F no. 54, page 36–49.
- World Health Organization. 2005. International Classification of Diseases, Manual of The International Statistical Classification of Diseases, Injury and Causes of Death, volume 1, second edition, Geneva.
- World Health Organization. 2001. National Burden of Disease Studies: A Practical Guide Edition 2.0, October 2001. Global Program on Evidence for Health Policy, WHO Geneva. Available at: <http://www.who.int/healthinfo/nationalburdenofdiseasemanual.pdf>. [Accessed: April 16, 2013].