

Use of verbal autopsy to determine mortality patterns in an urban slum in Kolkata, India

Suman Kanungo,^a Ataru Tsuzuki,^b Jacqueline L Deen,^b Anna Lena Lopez,^b Krisnan Rajendran,^a Byomkesh Manna,^a Dipika Sur,^a Deok Ryun Kim,^b Vinay Kumar Gupta,^b R Leon Ochiai,^b Mohammad Ali,^b Lorenz von Seidlein,^b Sujit K Bhattacharya^a & John D Clemens^b

Objective To define mortality patterns in an urban slum in Kolkata, India, in the context of a cholera and typhoid fever project.

Methods In a well-defined population that was under surveillance for 18 months, we followed a dynamic cohort of 63 788 residents whose households were visited monthly by community health workers to identify deaths. Trained physicians performed verbal autopsies and experienced senior physicians assigned the primary cause of death according to the *International classification of diseases, 10th edition*. We tabulated causes of death in accordance with Global Burden of Disease 2000 categories and assessed overall and cause-specific mortality rates per age group and gender.

Findings During 87 921 person-years of follow-up, we recorded 544 deaths. This gave an overall mortality rate of 6.2 per 1000 person-years. We assigned a cause to 89% (482/544) of the deaths. The leading causes of death, in descending order, were cardiovascular diseases (especially among adults aged over 40 years), cancer, respiratory ailments and digestive disorders. Most deaths in children under 5 years of age were caused by tuberculosis, respiratory infections and diarrhoeal diseases.

Conclusion Although the most common causes of death in children were infectious, non-communicable diseases were predominant among adults. There is a need for continuing interventions against infectious diseases in addition to new and innovative strategies to combat non-infectious conditions.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

Mortality data are important indicators of population health and are crucial for setting priorities for health interventions and research. However, in areas with scanty resources little reliable information is available on mortality rates and causes of death since many deaths go unregistered. For example, in 2001 only 53% of the expected deaths in the Indian state of West Bengal were reported, according to national census data.¹ Even when they are available and accessible, death certificates may not be complete or reliable sources of cause of death data. Many deaths in developing countries do not occur in hospitals and death certificates are often signed by public officials who have not treated or as much as seen the deceased person.

In Kolkata (formerly Calcutta), the capital of West Bengal, an official death report is required before cremation can take place. Death registration records are therefore relatively complete. Nonetheless, the stated cause of death that is registered in hospitals, private clinics or police stations is not always reliable. If the deceased was seen by a health-care provider during the course of the illness leading to the death, the information may be accurate, but because the poorest people generally have limited access to health care, accurate cause of death data seldom exists for them.

Verbal autopsy, an alternative method for collecting mortality data, enables investigators to establish the cause of death retrospectively.² The tool comprises a methodical interview with the next of kin or caregiver of the deceased to determine the symptoms and signs of the illness that preceded the death, and a review of medical records. Verbal autopsy is used by the

Registrar General of India's Sample Registration System, the country's primary system for collecting demographic data, to estimate cause-specific mortality rates at the national and state levels. Studies in Tamil Nadu and in the state's capital of Chennai (formerly Madras) have shown that verbal autopsies can be used in rural and urban adult populations.^{3,4} A study in Ballabgarh in northern India showed that health workers can be trained to use the verbal autopsy to ascertain the cause of death among children under 5 years of age.⁵

The objective of this paper was to determine mortality patterns by cause, age group and gender in an urban slum in Kolkata by conducting surveillance of all deaths over a period of 18 months in a well-defined population. The surveillance was conducted in the context of a cholera and typhoid fever project.^{6,7}

Methods

Study site and census

Kolkata, with over 4 million residents, is one of the most populous cities in the world. The Kolkata Municipal Corporation is divided into 141 administrative wards. Our study site, which covered the slum areas of wards 29 and 30, is extremely overcrowded.⁸ Water is available through municipal taps but only intermittently. Many households share common municipal latrines and sewage collects in open drains. Streets are narrow, with huts and small shops encroaching on the pavement.

A baseline *de jure* census was conducted in March 2003 to enumerate the study population and assign a unique identification number to each household and individual. The baseline study population consisted of 63 788 individuals. Households in

^a National Institute of Cholera and Enteric Diseases, Kolkata, India.

^b International Vaccine Institute, Kwanak PO Box 14, Seoul, Republic of Korea 151-600.

Correspondence to Jacqueline L Deen (e-mail: jdeen@ivi.int).

(Submitted: 27 October 2009 – Revised version received: 14 January 2010 – Accepted: 18 January 2010 – Published online: 21 May 2010)

the study area have 1.5 rooms on average, a median of 5 members (range, 1–30), and a median monthly family income of 67 United States dollars (US\$).⁹ Follow-up censuses were carried out in March and October 2004 to update demographic information.

Mortality surveillance

Surveillance for deaths was carried out from 1 May 2003 to 31 October 2004. Community health workers detected deaths through monthly visits to each household during which they recorded the name, age and address of the deceased. All deaths were reported to the study physicians, who conducted verbal autopsies after approximately 2 months; a grieving period was felt to be appropriate. The completeness of mortality reporting was verified during the second and third censuses. Verbal autopsies were also conducted for deaths missed during the surveillance period and detected during the second or third census.

Verbal autopsy technique

We used a combination of two previously validated instruments: the World Health Organization (WHO) standard verbal autopsy questionnaire for infants and children¹⁰ and the Adult Morbidity and Mortality Project form.¹¹ The adapted form was pilot tested and included questions on demographic information and previously diagnosed medical conditions and, most importantly, a checklist of signs and symptoms occurring within 2 weeks of death. It also contained open-ended questions regarding signs and symptoms. A narrative of the events leading to death was recorded as stated by the respondent. When available, hospital records, laboratory tests and death certificates were photocopied and included in the review process.

Study physicians were trained to conduct the verbal autopsy interview and complete the form. The immediate next of kin of the deceased, preferably the main caregiver, was invited to a project health outpost for the interview or, if the respondent preferred, the physician visited the household instead. Two experienced senior physicians working in a referral hospital and otherwise not involved in the surveillance study independently assessed the completed verbal autopsy forms. They identified the cause of each death based on the information recorded on the form and in available records. Only one cause was

assigned for each death, and it was considered the primary cause of death. Each physician was unaware of the diagnosis assigned by the other physician. If the two diagnoses were discordant, the forms were reviewed by a third physician, also otherwise uninvolved in the study. If the three physicians could not determine or agree on the cause of death, the death was recorded as having an unspecified cause. The causes of death were then coded according to the *International statistical classification of diseases and related health problems, 10th revision (ICD-10)*.¹² After coding, the Global Burden of Disease 2000 classification was used to divide all causes into pre-transitional conditions that included infectious, maternal, perinatal and nutritional disorders (group I); non-communicable diseases (group II), and injuries (group III).¹³

Data management and analysis

Data were double entered into Visual Fox Pro version 6.0 (Microsoft Corp., Redmond, United States of America) and analyses were performed using Stata version 10.0 (Stata Corp., College Station, USA). We calculated mortality rates (overall, as well as by cause, age group and gender) in person-years using the number of deaths as the numerator and the period of time at risk contributed by each individual in the study population as the denominator. We defined life expectancy at birth as the average number of years a neonate in the study area can expect to live if current mortality trends continue. Highly influenced by the infant mortality rate, life expectancy is considered a good indicator of health and socio-economic development. The life expectancy at birth of the study population (adjusted for infant mortality) was calculated using abridged life tables.¹⁴ The sex ratio was expressed as the number of females per thousand males.

Causes of death were ranked according to mortality rate per 1000 person-years. We calculated the relative risk (RR) of death by gender, adjusted for age (at death) using Poisson regression analysis. The age-adjusted RR for males versus females was obtained using the male population as the standard. Ninety-five percent confidence intervals (CIs) were interpreted in a two-tailed fashion.

Ethics

Participating next of kin were interviewed after the purpose of the study was ex-

plained and verbal informed consent was obtained. The ethics committees of the National Institute of Cholera and Enteric Diseases (NICED) and the Indian Council of Medical Research (ICMR), the Institutional Review Board of the International Vaccine Institute, and the WHO Secretariat Committee for Research Involving Human Subjects approved the study protocol and instruments.

Results

There were 87 921 person-years of follow-up during the 18 months of surveillance. The population pyramid is shown in Fig. 1. The age distribution of the population was as follows: 28% from 0 to 14 years of age; 65% from 15 to 59 years of age, and 7% aged 60 years and older. The sex ratio was 860 females to 1000 males overall and 950 females to 1000 males for children 6 years of age and younger. Males outnumbered females in all age groups except among those over 70 years of age. During this period, 544 deaths were detected.

Fig. 2 shows the flow of verbal autopsies. Of the 544 deaths detected, 21 (4%) had incomplete verbal autopsies and 23 (4%) were classified at the time of death as suicides and traffic accidents. The remaining 500 (92%) deaths had complete verbal autopsies assessed by physician reviewers. A concordant cause of death was identified in 488 (98%) of the verbal autopsies by two independent reviewers, whereas discordant diagnoses were noted in 12 (2%). Thus, diagnoses were assigned to 482 of the 544 deaths (89%), whereas the cause could not be specified in 62 of them (11%). The overall mortality rate was 6.2 per 1000 person-years. We estimated a life expectancy at birth in the study population of 70 years overall and of 68 and 72 years, respectively, for males and females.

Predominant causes of death

We assessed the number of deaths and the mortality rate per 1000 person-years for every category of the Global Burden of Disease (Table 1). Overall, group II causes were the most common and were responsible for 360 of the 544 deaths (66%), or 4.09 deaths per 1000 person-years. Of group II conditions, cardiovascular diseases were in the lead, having caused 198 of the 544 deaths (36%), or 2.25 deaths per 1000 person-years. Mortality from cardiovascular problems, mainly isch-

aemic heart disease and cerebrovascular accidents, increased in people 40 years of age and older. Cancer, respiratory diseases and digestive disorders were the second, third and fourth leading causes of death, respectively.

Group I conditions were responsible for 86 of the 544 deaths (16%), or 0.98 deaths per 1000 person-years. In this group, tuberculosis, respiratory infections and diarrhoeal diseases were the most common diagnoses. Our surveillance detected only one maternal death. There were seven cases of malnutrition among debilitated older children and adults with underlying chronic illness.

Group III conditions were responsible for 36 (7%) of the deaths, or 0.41 deaths per 1000 person-years. The majority of group III fatalities were due to traffic-related accidents.

Age group patterns

We also evaluated the number of deaths and mortality rate per 1000 person-years by age group (Table 1). Children died more frequently from group I conditions, whereas group II and III conditions spared young children and increased with age. Overall, the mortality rate was 7.92 per 1000 person-years among children less than 1 year of age, declined in older childhood and early adulthood and increased to 8.09 in middle-aged adults and to 47.87 in the elderly.

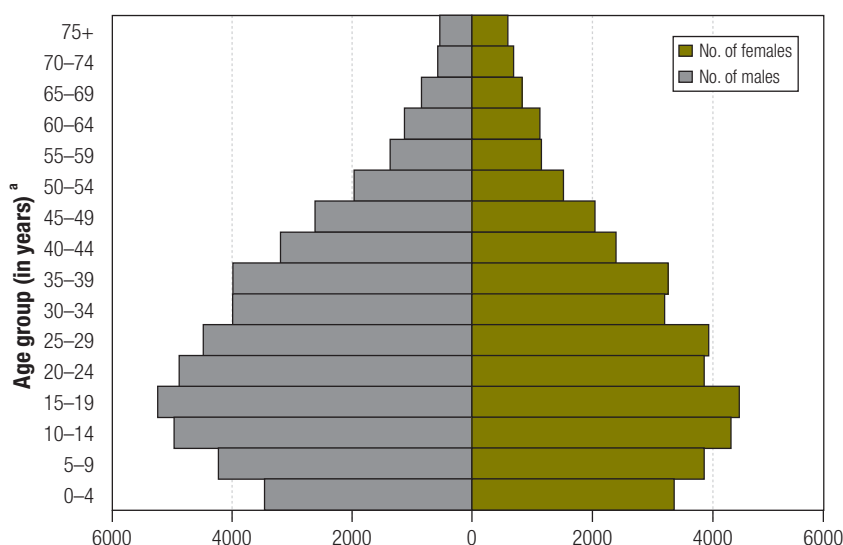
Gender-specific mortality

We analysed the RR for death by gender, adjusted for age (Table 2). Overall, males had a 1.37 (95% CI: 1.15–1.63) greater risk of dying earlier when compared with females. Males died more frequently than females from non-communicable diseases (adjusted RR: 1.50; 95% CI: 1.21–1.86), particularly digestive disorders, respiratory ailments and cancer. Compared with females, males had a lower risk of death from diarrhoeal diseases (adjusted RR: 0.31; 95% CI: 0.10–0.98), 2.29 times (95% CI: 1.10–4.75) the risk of death from injuries in general and 4.48 times (95% CI: 1.30–15.50) the risk of death from fatal traffic accidents.

Discussion

Although infectious diseases are the leading cause of death in the paediatric population, non-communicable conditions are the most common cause among adults. Cardiovascular diseases were a

Fig. 1. Population pyramid



^a Age was calculated using the midpoint of the surveillance period (31 January 2004) as the reference date.

Fig. 2. Verbal autopsy of deaths detected during a mortality surveillance study in Kolkata, India, 1 May 2003 to 31 October 2004

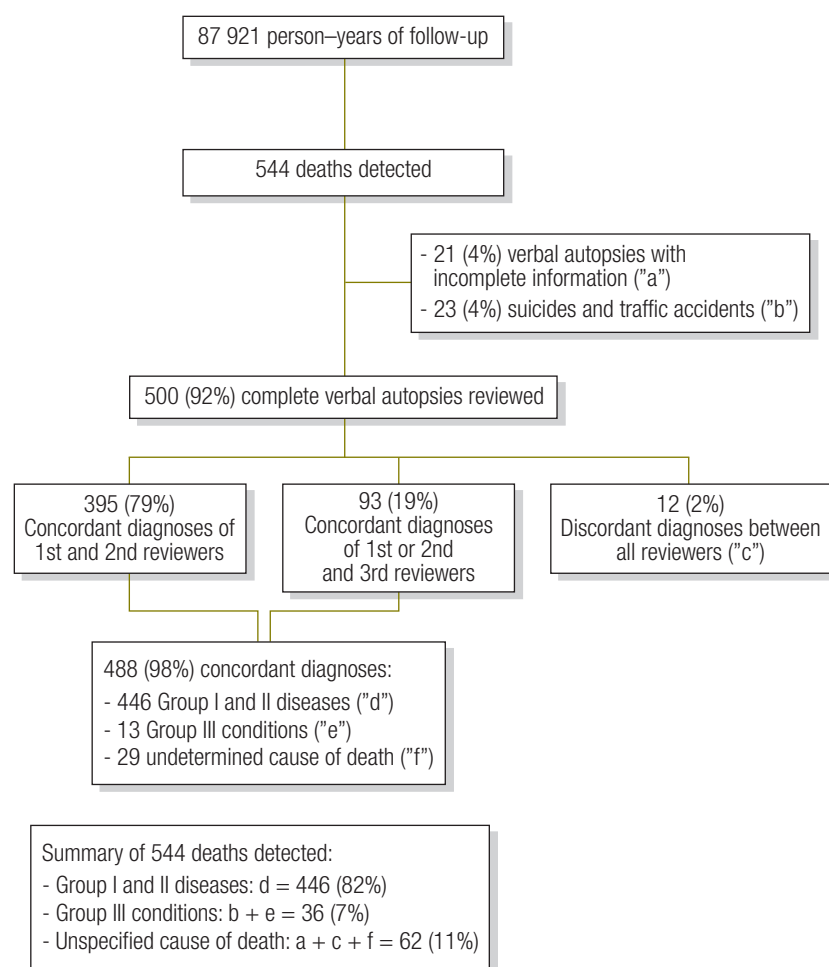


Table 1. Number of deaths and mortality rate (per 1000 person-years) by cause and age group, in a slum area of Kolkata, India, 1 May 2003 to 31 October 2004

Cause of death	Age group (years)												Total		Rank ^a
	<1		1-4		5-19		20-39		40-59		60+		(87921.1 person-years)		
	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	No.	Rate	
Group I^b	7	6.93	12	2.07	7	0.26	13	0.41	17	1.05	30	4.79	86	0.98	
Tuberculosis	2	1.98	3	0.52	1	0.04	9	0.28	9	0.56	7	1.12	31	0.35	5
Respiratory infections	3	2.97	5	0.86	0	0.00	0	0.00	4	0.25	6	0.96	18	0.20	7
Diarrhoeal diseases	2	1.98	2	0.34	3	0.11	0	0.00	2	0.12	7	1.12	16	0.18	9
Tetanus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.16	1	0.01	17
Meningitis	0	0.00	0	0.00	0	0.00	0	0.00	1	0.06	0	0.00	1	0.01	17
Viral hepatitis	0	0.00	0	0.00	0	0.00	1	0.03	0	0.00	0	0.00	1	0.01	17
Other infectious diseases	0	0.00	2	0.34	2	0.07	1	0.03	1	0.06	4	0.64	10	0.11	11
Nutritional deficiencies	0	0.00	0	0.00	1	0.04	1	0.03	0	0.00	5	0.80	7	0.08	12
Maternal conditions	0	0.00	0	0.00	0	0.00	1	0.03	0	0.00	0	0.00	1	0.01	17
Group II^c	0	0.00	2	0.34	12	0.44	31	0.98	89	5.05	226	36.06	360	4.09	
Cardiovascular diseases	0	0.00	1	0.17	1	0.04	7	0.22	46	2.84	143	22.82	198	2.25	1
Cancer	0	0.00	0	0.00	2	0.07	6	0.19	17	1.05	25	3.99	50	0.57	2
Respiratory ailments ^d	0	0.00	0	0.00	1	0.04	3	0.09	9	0.56	28	4.47	41	0.47	3
Digestive disorders ^e	0	0.00	0	0.00	6	0.22	8	0.25	9	0.56	12	1.19	35	0.40	4
Nephritis and nephrosis	0	0.00	0	0.00	0	0.00	5	0.16	6	0.37	14	2.23	25	0.28	6
Diabetes mellitus	0	0.00	0	0.00	0	0.00	1	0.03	1	0.06	2	0.32	4	0.05	14
Epilepsy	0	0.00	1	0.17	1	0.04	1	0.03	0	0.00	0	0.00	3	0.03	16
Other	0	0.00	0	0.00	1	0.04	0	0.00	1	0.06	2	0.32	4	0.05	14
Group III^f	0	0.00	0	0.00	5	0.18	14	0.44	7	0.43	10	1.60	36	0.41	
Traffic-related accidents	0	0.00	0	0.00	1	0.04	5	0.16	5	0.31	7	1.12	18	0.20	7
Suicides	0	0.00	0	0.00	0	0.00	3	0.09	2	0.12	0	0.00	5	0.06	13
Other ^g	0	0.00	0	0.00	4	0.15	6	0.19	0	0.00	3	0.48	13	0.15	10
Unspecified cause of death	1	0.99	0	0.00	4	0.15	5	0.16	18	1.11	34	5.43	62	0.71	
All causes	8	7.92	14	2.41	28	1.04	63	1.99	131	8.09	300	47.87	544	6.19	

^a Ranked according to mortality rate per 1000 person-years.^b Communicable, maternal, perinatal and nutritional conditions.^c Non-communicable diseases.^d Comprised 34 cases of chronic obstructive pulmonary disease and 7 cases of asthma.^e Comprised 30 cases of liver cirrhosis and other liver disorders and 5 cases of peptic ulcer disease.^f Injuries.^g Comprised 3 drownings, 3 unspecified intracranial injuries, 3 burns, 1 case of food causing obstruction of the respiratory tract, 1 assault by bodily force/blunt object, 1 poisoning and 1 unspecified injury.

Table 2. Poisson regression analysis of relative risk (RR) of death, by gender, in a slum area of Kolkata, India, 1 May 2003 to 31 October 2004

Cause of death	Deaths		Crude RR	95% CI	Adjusted RR ^a	95% CI	
	Total	Males					Females
Group I^b	86	42	44	0.82	0.53–1.25	0.87	0.57–1.34
Tuberculosis	31	16	15	0.91	0.45–1.84	0.93	0.46–1.89
Respiratory infections	18	10	8	1.07	0.42–2.71	1.17	0.46–2.98
Diarrhoeal diseases	16	4	12	0.28	0.09–0.88	0.31	0.10–0.98
Tetanus	1	1	0	–	–	–	–
Meningitis	1	1	0	–	–	–	–
Viral hepatitis	1	0	1	–	–	–	–
Other infectious diseases	10	8	2	3.42	0.73–16.10	3.79	0.80–17.89
Nutritional deficiencies	7	2	5	0.34	0.07–1.76	0.39	0.08–2.03
Maternal conditions	1	0	1	–	–	–	–
Group II^c	360	220	140	1.34	1.09–1.66	1.50	1.21–1.86
Cardiovascular diseases	198	106	92	0.98	0.74–1.30	1.11	0.84–1.48
Cancer	50	34	16	1.82	1.00–3.29	1.94	1.07–3.53
Respiratory diseases	41	31	10	2.65	1.30–5.41	2.99	1.46–6.11
Digestive diseases	35	28	7	3.42	1.49–7.83	3.57	1.56–8.19
Nephritis and nephrosis	25	14	11	1.09	0.49–2.40	1.18	0.53–2.61
Diabetes mellitus	4	3	1	2.56	0.27–24.63	2.75	0.29–26.54
Epilepsy	3	2	1	1.71	0.16–18.84	1.79	0.16–19.73
Other	4	2	2	0.85	0.12–6.07	0.93	0.13–6.61
Group III^d	36	26	10	2.22	1.07–4.61	2.29	1.10–4.75
Traffic-related accidents	18	15	3	4.27	1.24–14.76	4.48	1.30–15.50
Suicides	5	3	2	1.28	0.21–7.67	1.20	0.20–7.21
Other	13	8	5	1.37	0.45–4.18	1.42	0.46–4.34
Unspecified	62	34	28	1.04	0.63–1.71	1.13	0.68–1.86
All causes	544	322	222	1.24	1.05–1.47	1.37	1.15–1.63

CI, confidence interval; RR, relative risk.

^a Adjusted for age at death.^b Communicable, maternal, perinatal and nutritional conditions.^c Non-communicable diseases.^d Injuries.

particularly common cause of death, especially among people aged over 40 years, followed by cancer, respiratory ailments and digestive disorders. These “diseases of affluence”, linked to lifestyle (i.e. poor eating habits, physical inactivity, obesity, tobacco smoking and alcohol consumption) are becoming increasingly common in the developing world.¹⁵ Even the seven cases of nutritional deficiency found in our study and categorized under group I could have perhaps been more appropriately categorized under group II had the underlying chronic illnesses been specifically diagnosed. Our study population illustrates the epidemiological transition in developing countries, with non-communicable diseases and injuries becoming increasingly common and coexisting alongside communicable diseases. These findings highlight the need for continuing interventions against communicable diseases while developing

new and innovative strategies to combat non-communicable ones.

Table 3 compares our findings with those for India overall.¹ Because India is a huge country, its different populations are very heterogeneous and published indicators vary. There are differences in the data from rural versus urban areas and from India's 28 states and 7 union territories. Nevertheless, the comparison provides some indication of where our study site stands relative to the country overall.

The study population showed a lower proportion of people under 15 years of age and a higher proportion between the ages of 15 to 59 years than in India as a whole (Table 3). The tapering at the bottom of the age pyramid (Fig. 1) may reflect the practice by mothers in the slums of Kolkata of returning to rural districts, where they have extended family, to deliver their babies. It may also reflect declining fertility. The study area's

population shows an age distribution that is more typical of urban rather than rural India.¹ The widening of the middle portion of the study site's population pyramid may be the result of the in-migration of individuals of working age.

The overall ratio of females to males in the study site is lower than in India as a whole (Table 3) but similar to that found in other areas of India where the sex distribution is unequal.¹ While the sex ratio of children under 6 years of age in the study site is as expected under natural conditions (i.e. about 100 females for every 105 males at birth), the sex ratio is most unequal between the ages of 30 and 54 years. This suggests that there is considerable in-migration of male workers and out-migration of females of reproductive age.

According to the Registrar General of India, in mid-2003 Indian males and females had a life expectancy at birth of 62

Table 3. Comparison of findings from a surveillance study in an urban slum area of Kolkata (1 May 2003 to 31 October 2004) with those for all of India (2003)

Study population	Broad age percentage distribution (years)			Sex ratio (females to males)		Life expectancy at birth (years)		Crude death rate (per 1000)	Percentage distribution of deaths by cause				
	0-14	15-59	60+	Overall	Children (0-6 yr)	Male	Female		Overall	Group I ^a	Group II ^b	Group III ^c	Unspecified or ill-defined
	India ¹	28	65	7	860:1000	950:1000	68	72	70	6	16	66	7
	32	61	7	933:1000	927:1000	62	64	63	8 ^d	38 ^e	42 ^f	10	10

^a Communicable, maternal, perinatal and nutritional conditions.

^b Non-communicable diseases.

^c Injuries.

^d Six in urban areas.

^e Lower in urban areas.

^f Fifty-six per cent in urban areas.

and 64 years, respectively, and the overall life expectancy at birth was 63 years.¹ By comparison, the overall life expectancy among dwellers of the urban slum we studied was seven years longer (Table 3). This goes against the commonly-held assumption that mortality in the slums is very high. The crude death rate in the study site was lower than for India as a whole but similar to the rate for Indian urban areas.

We also compared our findings with those from a report on the causes of death in India in 2001–2003.¹ As in our study, cardiovascular diseases were the leading cause of death reported for the entire country. The percentage distribution of causes of death in our study population more closely resembled that reported for urban India (Table 3). Differences in causes of death by gender were noted in the report.¹ In common with our findings, females died of diarrhoeal diseases more often than males, perhaps because of their greater exposure to sick children, whereas males died of cardiovascular conditions more often than females.

Our study had several limitations. First, neonatal deaths were not included and maternal deaths are likely to be underreported, as described earlier. We recorded only 1010 births. Maternal deaths that occurred outside Kolkata were reported under “out-migration” by the community health worker. Second, only 5 deaths due to suicide were reported in our study, resulting in a suicide mortality rate of 0.06 per 1000 person-years, which contrasts sharply with previously reported annual rates of suicide among young men and women in southern India of 0.58 and 1.48 per 1000, respectively.¹⁶ Although we may have failed to detect more suicides owing to inaccurate reporting triggered by social taboos, we found no evidence to suggest that this was the case. It is possible that suicide rates are genuinely lower in this community.

The Registrar General of India's Sample Registration System is conducting a large study, known as the Prospective Study of 1 Million Deaths in India, that monitors nearly 14 million people in 2.4 million Indian households for vital status and causes of death from 1998 to 2014.¹⁷ The study is designed to provide national- and state-level data and will provide much-needed, more representative information on all-cause mortality in India.¹⁸ However, its results will only become available after 2014 and may not

be accurate for specific areas of India, such as poor urban slums in need of selective public health interventions.

In summary, we obtained mortality information that, coupled with population-based data, allowed us to calculate death rates by cause, age and gender among dwellers of an Indian urban slum. Demographic and lifestyle changes have influenced mortality patterns in this urban slum area, where non-communicable diseases are now predominant but communicable ones are still prevalent, particularly in children. The results of this study may be useful to the local health authority in setting priorities for research and health interventions. ■

Acknowledgements

We would like to acknowledge the tireless work of the field staff. We also thank CJ Acosta, C Galindo, MC Danovaro-Holliday and K Holliday for their important contributions.

Funding: This work was supported by the Bill & Melinda Gates Foundation through the Diseases of Most Impoverished Program administered by the International Vaccine Institute. We have not entered into any agreement with the funding organization that may have limited our ability to complete the research as planned, and we have had full control of all primary data.

Competing interests: None declared.

ملخص

الاستفادة من التشريح السردي في تحديد أنماط الوفيات في الإحياء الحضرية الفقيرة في مدينة كلكتا بالهند

الغرض تحديد أنماط الوفيات في الأحياء الحضرية الفقيرة في مدينة كلكتا بالهند في سياق مشروع مكافحة الكوليرا وحمى التيفود. الطريقة في فئة سكانية محددة جيداً خضعت للترصد لمدة 18 شهراً، تتبع الباحثون أتراباً ديناميكين من 63788 مقيماً كانت تجري زيارة منازلهم شهرياً من قبل عاملي الصحة العمومية لتحديد الوفيات. أجرى أطباء مدربون تشريحاً سردياً وحدد كبار الأطباء ذوي الخبرة السبب الرئيسي للوفاة حسب التصنيف الدولي للأمراض، الطبعة العاشرة. وأعد الباحثون جداول لأسباب الوفيات وفقاً لفئات العبء العالمي للمرض 2000، وقيم الباحثون معدلات الوفيات الإجمالية والمعدلات حسب الأسباب لكل فئة عمرية ولكل من الجنسين.

الموجودات من خلال متابعة 87921 شخصاً سنوياً، سجل الباحثون 544 وفاة. وبذلك بلغ إجمالي معدل الوفيات 6.2 لكل 1000 شخص سنوياً. وحدد الباحثون سبباً للوفاة في 89% من الوفيات (544/482). وكانت الأسباب الرئيسية للوفاة المرتبة ترتيباً تنازلياً هي الأمراض القلبية الوعائية، وبخاصة بين البالغين أكبر من عمر 40 سنة)، والسرطان، والعلل التنفسية، والاضطرابات الهضمية. ووقعت أغلب وفيات الأطفال في عمر أقل من 5 سنوات بسبب السل، والعدوى التنفسية، وأمراض الإسهال. الاستنتاج بالرغم من أن العدوى تشكل غالبية أسباب الوفيات بين الأطفال، إلا أن الأمراض غير السارية كانت هي السائدة بين البالغين. وهناك حاجة لتدخلات متواصلة ضد الأمراض المعدية بالإضافة إلى استراتيجيات جديدة ومبتكرة لمحاربة الأمراض غير المعدية.

Résumé

Utilisation de l'autopsie verbale pour détecter des modèles de mortalité dans un quartier urbain pauvre de Kolkata en Inde

Objectif Définir des modèles de mortalité dans un quartier urbain pauvre de Kolkata en Inde, dans le contexte d'un projet choléra et fièvre typhoïde.

Méthodes Au sein d'une population bien définie, surveillée pendant 18 mois, nous avons suivi une cohorte dynamique de 63 788 résidents dont les foyers ont été visités chaque mois par des professionnels communautaires de la santé pour identifier les décès. Des médecins compétents ont réalisé des autopsies verbales et des professeurs experts ont référencé la cause primaire du décès à partir de la *Classification internationale des maladies*, 10^e édition. Nous avons mis en tableau les causes de décès conformément aux catégories du «Global Burden of Disease 2000» et nous avons évalué les taux de mortalité généraux et pour cause spécifique par tranche d'âge et par sexe.

Résultats Au cours des 87 921 personnes-années de suivi, nous avons enregistré 544 décès. Cela donne un taux de mortalité total de

6,2 par 1 000 personnes-années. Nous avons attribué une cause à 89% (482/544) des décès. Les principales causes de décès, par ordre décroissant, étaient des maladies cardio-vasculaires (surtout parmi les adultes âgés de 40 ans et plus), des cancers, des maladies respiratoires et des troubles digestifs. La plupart des décès chez les enfants de moins de 5 ans ont été causés par la tuberculose, des infections respiratoires et des maladies diarrhéiques.

Conclusion Alors que les causes de décès les plus communes chez les enfants étaient d'origine infectieuse, les maladies non transmissibles ont été prédominantes chez les adultes. Des interventions en continu sont nécessaires contre les maladies infectieuses, conjointement à des stratégies nouvelles et innovatrices pour combattre les conditions non infectieuses.

Resumen

Utilización de las autopsias verbales para determinar las causas de mortalidad en un barrio urbano pobre de Kolkata, India

Objetivos Definir los patrones de mortalidad en un barrio urbano pobre de Kolkata, India, dentro del contexto de un proyecto contra el cólera y la fiebre tifoidea.

Métodos En una población bien definida y sometida a vigilancia durante 18 meses se realizó el seguimiento de un conjunto de 63 788 residentes, cuyos hogares recibieron visitas mensuales del personal sanitario comunitario para identificar las defunciones. Las entrevistas con los familiares y allegados de las personas fallecidas fueron realizadas por médicos expertos, y los directores médicos atribuyeron la causa principal de la muerte siguiendo la *Clasificación Internacional de Enfermedades*, 10.ª edición. Las causas de la muerte se clasificaron según las categorías de la Carga Mundial de Morbilidad del 2000 y se evaluaron las tasas de mortalidad general y específica de cada caso en función del grupo de edad y del sexo.

Resultados Se registraron 544 muertes durante el seguimiento de 87 921 años-persona. Estos datos generaron una tasa de mortalidad de 6,2 por 1000 años-persona. En el 89% de las muertes (482/544) se asignó una causa. Las principales causas de defunción, en orden descendente, fueron: las enfermedades cardiovasculares (fundamentalmente, entre los adultos mayores de 40 años), el cáncer, las enfermedades respiratorias y los trastornos digestivos. La mayoría de las muertes acaecidas en niños menores de cinco años se debieron a la tuberculosis, las infecciones respiratorias y las enfermedades diarreicas.

Conclusión Aunque las causas más frecuentes de muerte infantil fueron las infecciosas, en los adultos predominaron las enfermedades infecciosas no contagiosas. Es necesario continuar con las intervenciones contra las enfermedades infecciosas, así como iniciar estrategias nuevas e innovadoras para luchar contra las enfermedades no infecciosas.

References

1. Registrar General of India. Census of India tables. New Delhi: RGI; 2001. Available from: <http://www.censusindia.net/> [accessed 14 May 2010].
2. World Health Organization. *WHO technical consultation on verbal autopsy tools*. Geneva: WHO; 2005.
3. Gajalakshmi V, Peto R. Verbal autopsy of 80,000 adult deaths in Tamil Nadu, South India. *BMC Public Health* 2004;4:47. doi:10.1186/1471-2458-4-47 PMID:15488138
4. Gajalakshmi V, Peto R, Kanaka S, Balasubramanian S. Verbal autopsy of 48 000 adult deaths attributable to medical causes in Chennai (formerly Madras), India. *BMC Public Health* 2002;2:7. doi:10.1186/1471-2458-2-7 PMID:12014994
5. Nongkynrih B, Anand K, Kapoor SK. Use of verbal autopsy by health workers in under-five children. *Indian Pediatr* 2003;40:766–71. PMID:12951380
6. Sur D, von Seidlein L, Manna B, Dutta S, Deb AK, Sarkar BL et al. The malaria and typhoid fever burden in the slums of Kolkata, India: data from a prospective community-based study. *Trans R Soc Trop Med Hyg* 2006;100:725–33. doi:10.1016/j.trstmh.2005.10.019 PMID:16455118
7. Sur D, Deen JL, Manna B, Niyogi SK, Deb AK, Kanungo S et al. The burden of cholera in the slums of Kolkata, India: data from a prospective, community based study. *Arch Dis Child* 2005;90:1175–81. doi:10.1136/adc.2004.071316 PMID:15964861
8. Understanding slums: case studies for the global report 2003 Kolkata India. In: United Nations Human Settlements Programme. *The challenges of slums: global report on human settlements 2003*. London: UN-Habitat; 2003. Available from: http://www.ucl.ac.uk/dpu-projects/Global_Report/cities/kolkata.htm [accessed 14 May 2010].
9. Sur D, Manna B, Deb AK, Deen JL, Danovaro-Holliday MC, von Seidlein L et al. Factors associated with reported diarrhoea episodes and treatment-seeking in an urban slum of Kolkata, India. *J Health Popul Nutr* 2004;22:130–8. PMID:15473516
10. Anker M, Black RE, Coldham C, Kalter HD, Quigley MA, Ross D, et al. *A Standard Verbal Autopsy Method for Investigating Causes of Death in Infants and Children*. Geneva: World Health Organization; 1999 (WHO/CDS/CSR/ISR/99.4).
11. Tanzania Ministry of Health, UK Department for International Development & University of Newcastle upon Tyne. *The Adult Morbidity and Mortality project*. Dodoma: TMH, UKDID & UNT; 2004. Available from: http://research.ncl.ac.uk/ammp/tools_methods/verbal.php [accessed 14 May 2010].
12. World Health Organization. *International statistical classification of diseases and related health problems*, 10th revision. Geneva: WHO; 2003.
13. Mathers CDVT, Lopez AD. *National burden of diseases studies: a practical guide*. 2nd ed. Geneva: World Health Organization; 2001.
14. London Health Observatory. Calculating life expectancy and infant mortality rates. Available from: <http://www.lho.org.uk/> [accessed 14 May 2010].
15. Ezzati M, Vander Hoorn S, Lawes CM, Leach R, James WPT, Lopez AD et al. Rethinking the “diseases of affluence” paradigm: global patterns of nutritional risks in relation to economic development. *PLoS Med* 2005;2:e133. doi:10.1371/journal.pmed.0020133 PMID:15916467
16. Aaron R, Joseph A, Abraham S, Muliylil J, George K, Prasad J et al. Suicides in young people in rural southern India. *Lancet* 2004;363:1117–8. doi:10.1016/S0140-6736(04)15896-0 PMID:15064031
17. Jha P, Gajalakshmi V, Gupta PC, Kumar R, Mony P, Dhingra N et al. Prospective study of one million deaths in India: rationale, design, and validation results. *PLoS Med* 2006;3:e18. doi:10.1371/journal.pmed.0030018 PMID:16354108
18. Bhutta ZA. The Million Death Study in India: Can it help in monitoring the millennium development goals? *PLoS Med* 2006;3:e103. doi:10.1371/journal.pmed.0030103 PMID:16464134