

## ALL CAUSES OF MORTALITY IN HANOI CITY, VIET NAM

Le Tran Ngoan<sup>1,\*</sup>, Lai Duc Truong<sup>2</sup>, Le Thuy Linh<sup>1</sup>  
Le Hoai Chuong<sup>3</sup>, Nguyen Tuan<sup>4</sup>  
Nguyen Van Thuong<sup>5</sup>, Nguyen Xuan Hiep<sup>6</sup>

<sup>1</sup>*Hanoi Medical University*

<sup>2</sup>*WHO office in Hanoi*

<sup>4</sup>*Ha Tinh Province Health Department*

<sup>5</sup>*Nghe An Province Health Department*

<sup>6</sup>*Medical Clinic of Ministry of Police*

*e-mail: Letranngoan@yahoo.com*

### Abstract

A cross-sectional survey-based for all causes of mortality was performed for all 233 communes, and then identified eligible communes for both completeness and accuracy in the Hanoi city. Age-standardized mortality rates per 100,000 for all causes were 683.8 in male and 294 for female. For the 18 ICD-10 groups of diseases, age-standardized mortality rates per 100,000 for the five most common groups of diseases were 220.7, 140.2, 90.1, 41.4, and 19.4 for CVD, cancer, respiratory, injury, and infectious, respectively in males, and they were 105.0, 49.1, 43.1, 11.0, and 6.6 for CVD, cancer, respiratory, injury, and digestive, respectively in females. The proportion of deaths due to the three leading groups of CVD, cancer and injury was 60% in males and 54% in females.

---

\*Corresponding author **Key words:** all causes, mortality, large city, epidemiology.

## 1. Background

The Socialist Republic of Viet Nam with an estimated population of 86 million[1] has placed significant emphasis on economic development, particularly since the introduction of the doi moi (or economic reform) in 1986. As a consequence, Viet Nam has achieved much in a short timeframe. For example, the percentage of the population living on less than a dollar a day has fallen from 39.9% to 4.1% over a 15 year period from 1993 to 2008 and so too, have the health indices improved with life expectancy for men now 70.2 years and for women 75.6 years[2]. However, the measurement of health indices is reliant on a health information system that is reliable, timely, and in the context of a low-middle income country such as Viet Nam, affordable. A national mortality reporting system is the cornerstone of such an information system; yet in many low and middle income countries, mortality reporting systems either do not exist, or if they exist, have significant limitations including misclassification of the cause of death, under-reporting, lack of timeliness and incomplete capture of mortality [3].

For many countries, civil registration and vital statistics systems are considered the gold-standard for mortality statistics, as data on deaths recorded as a result of legal requirement tend to be completed [4]. Civil registration was initiated in Viet Nam in 1956 and despite the 50 years of collecting mortality data, only limited information has been published [5]. However, a recent study assessed the civil registration and vital statistics system in Viet Nam and reported that the system had significant limitations including a lack of completeness, particularly for early neonatal deaths and deaths of temporary residents and/or migrants. The death certificate provided by the authorities does not require the signature of the doctor and therefore, the cause of death is poorly recorded [5]. Beyond Viet Nams civil registration and vital statistics system, a national mortality reporting system has also been introduced. Under the auspices of the Ministry of Health, the A6 mortality reporting system relies on commune-level health officials providing basic demographic data and information on the cause of death, which is recorded in an official book referred to as the A6 [6,7]. The data from the A6 is collated by the district-level health service and the information is then forwarded to the provincial and central-level governments. The commune-level officials play a significant role in maintaining the current mortality reporting system and in turn, are able to actively use the information gained to plan commune-level health services. A recent study entitled Evaluating and enhancing the national mortality reporting system in Vietnam (in using Verbal Autopsy as the reference quality) confirmed that the agreement between A6 and Verbal Autopsy output was 85% for injury, 79% for cancer, and 72% for CVD. The findings suggested that utilization and sensitivity analysis of the A6 database is feasible and it is reliable in terms of completeness. Another previous independent study has also confirmed that the

A6 mortality data was a reliable data of injury and cancer registration in the community [8,9]. Mortality pattern and time trend on the causes of death has been reported and analyzed for a long period in the history of mankind. It is one of the four essential facts and figures for the human health at the worldwide, country, regional, provincial (or city) and community level; examples include incidence, prevalence, mortality, and survival. However, good quality health data and indicators have been available in developed countries, but lacking in less developed countries, such as Viet Nam. Viet Nams two biggest cities of Hanoi and Ho Chi Minh represent the two regions of the North and South of the country, respectively. With progressed human civilization and urbanization, our living environment and health change. This study examines mortality as an indicator of human health related to urbanization. Regional variation and time trend of mortality is an essential indicator in planning, decision making, and prevention implementing to control diseases in our society, as well as in a highly urban city. There are few studies that have been done in Viet Nam to address this issue in Hanoi city to date. The aim of the present pilot study was to examine the cause of mortality (ICD-10) and time trend during 2005-2010 in Hanoi city, Viet Nam.

## 2. Objective

- ♡ To describe characteristics of mortality pattern from all causes (ICD-10) among registered cases;
- ♡ To estimate crude and age-standardized mortality rates and time trend during 6 year-period, 2005-2010 and regional variable in the Hanoi city, Viet Nam.

## 3. Methods

### 3.1 Study design and population

Design: Descriptive Epidemiology and community-based mortality survey was performed in the Hanoi city for 6-year period from 2005-2010(see [10,11]). Hanoi city Capital of Viet Nam has 14 districts covered with 233 commune health stations where the estimated average population during 2005-2010 was 3,289,300 [12-15]. Three areas, the heart of Hanoi city, sub-urban districts, and rural districts were grouped for ecological analysis in the present study.

### 3.2. Survey-based mortality data collection

Both demographic data and list of all deaths during 2005-2010 were collected from all commune health stations. The five indicators, including name, age, sex, date of death and the cause of death were collected for each case of death.

The designed data collection form was prepared in Vietnamese - presented, and printed in one A3 sized page double-sided. Instructions and guidelines in Vietnamese were explained for how to register the cause of death. Based on ICD-10, we introduced the underlying-cause of death and explained injury, cancer, and other causes. A guideline to report the demographic data of each commune and information on each case, who has been living in their commune for at least 6 months, were prepared. Average resident population was reported for both male and female for each year. From 2005 to 2010, we annually collected mortality data from all 233 commune health stations of Hanoi city:

♥ the first round was conducted in 2007 for two years of 2005-2006, participated commune number was 210,

♥ second round was conducted in 2008 for 2007, participated commune number was 230,

♥ third round was conducted in 2009 for 2008, participated commune number was 230,

♥ fourth round was conducted in 2010 for 2009, participated commune number was 180,

♥ fifth round was conducted in 2011 for 2010. participated commune number was 207.

### **3.3. Selection criteria of eligible communes**

The obtained mortality data from 233 commune health stations were checked by telephone interview with each commune to confirm the number of cases by years and the number of residents by years. Database of survey-based mortality from all 233 communes was checked by experts for a completeness and accuracy. For eligibility in terms of completeness, communes that have a crude mortality rate for all causes from 350 per 100,000 person-years or higher were selected. In terms of accuracy, communes that have a clear cause of death for 75% or higher of all registered cases were selected. A previous pilot survey confirmed that 92% of mortality cases were reported underlying-cause of death. A mortality rate was estimated for the communes that were eligible in both terms. Among all registered cases from 2005-2010, characteristics of mortality pattern from all causes (ICD-10) was examined. Specific causes of deaths were presented for ICD-10 groups based on its chapters: 18 groups of infectious, cancer, benign tumor, blood, endocrine, mental, nervous, CVD, respiratory, digestive, skin, skeletal, urine, maternal, newborn, malformation, symptoms, and injury.

### **3.4. Demographic data**

The number of inhabitants was counted annually by each commune health station, and it was verified by comparing the results to the National Census in

1999 and 2009 [1,16]. Number of person-year was estimated by sex and by age groups of 1-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, and 80+, using the age structure of 2009 based on the results of the National Census.

### 3.5. Data handle and analysis

All obtained data was computed using Excel software. The Excel data was exported to STATA 10.0 for analysis [17]. The age-specific mortality rate (age groups of 1-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 and 80+) and age-standardized mortality rate (ASR) were estimated by using the world populations structure. To examine the time trend of the causes of death for 6 years, every 2-year period of 2005-2006, 2007-2008, and 2009-2010 was grouped to increase the number of cases by each level of exposures. The other approach in this study was to test for any regional variation between the three areas of Hanoi city, sub-urban, and rural districts and estimate the odds ratio (OR) and 95% confidence interval (CI) by logistic regression analysis for grouped data in using STATA 10.0 (see [17]). Among 14 districts, 4 districts were excluded from the final data presentation due to ineligibility of the databases. The remaining ten districts were grouped into three areas of Hanoi city for regional variable analysis:

- ♥ heart of Hanoi city included Ba Dinh and Hoan Kiem districts,
- ♥ sub-urban included Tay Ho, Long Bien, Dong Da, and Hai Ba Trung districts,
- ♥ rural districts included Dong Anh, Gia Lam, Tu Liem, and Thanh Tri.

## 4. Results

### 4.1. Eligible communes

There were 35 of 233(15%) communes selected to be eligible for a final analysis and presentation with person-year number of 2,608,919 for 6 years period, 2005-2010 (Table 1).

Table 1: Selection of Eligible communes for final analysis and estimation of

Hanoi city	Number of communes		Person-year, 2005-2010
	Number	%	
All communes	233	100%	19,720,599
Eligible communes	35	15%	2,608,919

## 4.2. Cause of death for ICD-10 groups of diseases

All districts combined, data was presented by 18 groups following chapters of ICD-10.

Age-standardized mortality rates per 100,000 for the five most common ICD-10 groups of diseases were 220.7, 140.2, 90.1, 41.4, and 19.4 for CVD, cancer, respiratory, injury, and infectious, respectively in males and 105.0, 49.1, 43.1, 11.0, and 6.6 in females, with respect to the diseases, (Table 2).

Among the three leading groups, CVD, cancer and injury, the proportion of deaths due to these causes was 60% in males and 54% in females.

Table 2: Mortality rate per 100,000 by 18 groups of diseases (ICD-10) and sex

No	Group ICD-10	Male				Female			
		Total	Crude	ASR	%	Total	Crude	ASR	%
1	Infectious	257	20.1	19.4	3.9	76	5.7	5.0	1.6
2	Cancer	1,455	113.8	140.2	22.0	681	51.2	49.1	14.3
3	Benign tumor	7	0.5	1.0	0.1	2	0.2	0.1	0.0
4	Blood	2	0.2	0.3	0.0	3	0.2	0.2	0.1
5	Endocrine	66	5.2	7.1	1.0	92	6.9	6.0	1.9
6	Mental	46	3.6	3.3	0.7	5	0.4	0.4	0.1
7	Nervous	22	1.7	2.2	0.3	13	1.0	0.9	0.3
8	CVD	1,952	152.7	220.7	29.5	1,730	130.0	105.0	36.2
9	Respiratory	784	61.3	90.1	11.8	765	57.5	43.1	16.0
10	Digestive	273	21.4	24.9	4.1	96	7.2	6.6	2.0
11	Skin	1	0.1	0.1	0.0	1	0.1	0.0	0.0
12	Skeletal	9	0.7	1.0	0.1	7	0.5	0.5	0.1
13	Urine	120	9.4	13.1	1.8	100	7.5	5.9	2.1
14	Maternal					2	0.2	0.1	0.0
15	Newborn	28				28			
16	Malformation	29	2.3	2.6	0.4	25	1.9	2.4	0.5
17	Symptom	766	59.9	85.4	11.6	767	57.6	41.1	16.1
18	Injury	539	42.2	41.4	8.1	156	11.7	11.0	3.3
	Unknown	263	20.6	28.1	4.0	224	16.8	13.7	4.7
	Total	6,619	517.9	683.6	100	4,773	358.7	294	100

## 4.3. Time trend of ICD-10 groups of diseases

For each ICD-10 group of diseases, all districts were combined. During 2005-2010, there was a significant decline of mortality for four groups of diseases as shown below:

- ♡ for infectious (OR=0.60, 95% CI=0.46-0.80, P < 0.001);
- ♡ for endocrine (OR=0.67, 95% CI=0.46-0.96, P= 0.029);
- ♡ for CVD (OR=0.90, 95% CI=0.83-0.97, P = 0.010); and

♡ for injury (OR=0.78, 95% CI=0.65-0.94, P = 0.010).

An increased trend was seen for death due to skeletal disease with OR=4.60, 95% CI=1.01-21.00. (Table 3)

#### 4.4. Regional variable of mortality

All districts were combined for the ICD-10 groups of diseases. Results of the regional variation analysis showed a significant increased risk of mortality in the rural district area for cancer (OR=1.37, 95% CI=1.23-1.53, P < 0.001) and for injury (OR=2.29, 95% CI=1.86-2.82, P < 0.001). (Table 4)

### 5. Discussions

#### 5.1. New findings

The present work is the first study on the cause of death in the largest city and capital of Viet Nam, Hanoi. The new findings were included and presented for 18 groups of diseases based on the ICD-10 chapters. Non-communicable diseases were the leading causes of death in this study. The present findings were consistent with previous results of the leading causes of death in Viet Nam due to non-communicable diseases (see [9,18-23]).

However, the male to female ratio of 2.3 was unexpected, with insufficient information to explain. Vietnamese males attend to have significantly increased risk of cancer when compared to females [20,21,23,24]. Risk factors and causes of death in males in Viet Nam should continue to be studied, while promoting primary prevention at community level.

#### 5.2. Time trend and Regional variable of mortality

The mortality trend of NCD of cancer, CVD, diabetes had not changed during the 6-year period from 2005-2010. Continuous studies should follow up for a longer period than this study did to observe a more significant trend.

Rural districts were found to have significantly risk of all types of infectious, road traffic injuries, other types of injuries, and cancer. This could be explained by the process of urbanization in rural districts during the last decade.

### 6. Conclusions

#### 6.1. Mortality by ICD-10 groups of diseases

For the 18 ICD-10 groups of diseases, age-standardized mortality rates per 100,000 for the five most common groups of diseases were 220.7, 140.2, 90.1, 41.4, and 19.4 for CVD, cancer, respiratory, injury, and infectious, respectively in males, and they were 105.0, 49.1, 43.1, 11.0, and 6.6 for CVD, cancer,

Table3: Age-sex adjusted OR and 9% CI for time trend of ICD-10's groups of diseases rate

Time	Person-year	Selected disease	Rate /100,000	OR	95% CI		P
<i>Infectious#</i>							
2005-06	826,284	125	15.1	1.00	Reference		
2007-08	884,426	116	13.1	0.87	0.67	1.12	0.268
2009-10	898,209	82	9.1	0.60	0.46	0.80	0.000
<i>Cancer</i>							
2005-06	826,284	659	79.8	1.00	Reference		
2007-08	884,426	729	82.4	1.03	0.93	1.15	0.538
2009-10	898,209	694	77.3	0.97	0.87	1.08	0.559
<i>Endocrine</i>							
2005-06	826,284	69	8.4	1.00	Reference		
2007-08	884,426	33	3.7	0.45	0.29	0.68	0.000
2009-10	898,209	50	5.6	0.67	0.46	0.96	0.029
<i>CVD</i>							
2005-06	826,284	1168	141.4	1.00	Reference		
2007-08	884,426	1320	149.2	1.06	0.98	1.15	0.168
2009-10	898,209	1143	127.3	0.90	0.83	0.97	0.010
<i>Respiratory</i>							
2005-06	826,284	451	54.6	1.00	Reference		
2007-08	884,426	553	62.5	1.15	1.01	1.30	0.030
2009-10	898,209	499	55.6	1.02	0.90	1.16	0.782
<i>Digestive</i>							
2005-06	826,284	111	13.4	1.00	Reference		
2007-08	884,426	120	13.6	1.01	0.78	1.31	0.939
2009-10	898,209	127	14.1	1.05	0.82	1.36	0.693
<i>Skeletal</i>							
2005-06	826,284	2	0.2	1.00	Reference		
2007-08	884,426	4	0.5	1.87	0.34	10.20	0.470
2009-10	898,209	10	1.1	4.60	1.01	21.00	0.049
<i>Urinary</i>							
2005-06	826,284	62	7.5	1.00	Reference		
2007-08	884,426	84	9.5	1.27	0.91	1.76	0.159
2009-10	898,209	67	7.5	0.99	0.70	1.40	0.974
<i>Injury*</i>							
2005-06	826,284	238	28.8	1.00	Reference		
2007-08	884,426	252	28.5	0.99	0.83	1.18	0.905
2009-10	898,209	202	22.5	0.78	0.65	0.94	0.010

• # Included tuberculosis and HIV/AIDS; \* Included Mental-suicide and Homicide



Table 4: Age-sex adjusted OR and 95% CI for regional variation of mortality by ICD-10<sup>1</sup> groups of diseases

Region	Person-year	Selected disease	Rate /100,000	OR	95% CI	P
<i>Infectious#</i>						
Heart of Hanoi	765,480	82	10.7	1.00	Reference	
Sub-unban	895,680	107	11.9	1.12	0.84 1.49	0.457
Rural Districts	947,759	134	14.1	1.32	1.00 1.74	0.048
<i>Cancer</i>						
Heart of Hanoi	765,480	536	70.0	1.00	Reference	
Sub-unban	895,680	638	71.2	1.02	0.91 1.14	0.770
Rural Districts	947,759	908	95.8	1.37	1.23 1.53	0.000
<i>Endocrine</i>						
Heart of Hanoi	765,480	51	6.7	1.00	Reference	
Sub-unban	895,680	56	6.3	0.94	0.64 1.37	0.743
Rural Districts	947,759	45	4.7	0.71	0.48 1.06	0.098
<i>CVD</i>						
Heart of Hanoi	765,480	1,082	141.3	1.00	Reference	
Sub-unban	895,680	1,106	123.5	0.87	0.80 0.95	0.001
Rural Districts	947,759	1,443	152.3	1.08	1.00 1.17	0.060
<i>Respiratory</i>						
Heart of Hanoi	765,480	745	97.3	1.00	Reference	
Sub-unban	895,680	510	56.9	0.58	0.52 0.65	0.000
Rural Districts	947,759	248	26.2	0.26	0.23 0.30	0.000
<i>Digestive</i>						
Heart of Hanoi	765,480	117	15.3	1.00	Reference	
Sub-unban	895,680	147	16.4	1.07	0.84 1.37	0.565
Rural Districts	947,759	94	9.9	0.65	0.49 0.85	0.002
<i>Urinary</i>						
Heart of Hanoi	765,480	80	10.5	1.00	Reference	
Sub-unban	895,680	82	9.2	0.88	0.64 1.19	0.399
Rural Districts	947,759	51	5.4	0.51	0.36 0.73	0.000
<i>Injury*</i>						
Heart of Hanoi	765,480	119	15.5	1.00	Reference	
Sub-unban	895,680	236	26.3	1.70	1.36 2.11	0.000
Rural Districts	947,759	337	35.6	2.29	1.86 2.82	0.000

• # Included tuberculosis and HIV/AIDS; \* Included Mental-suicide and Homicide

respiratory, injury, and digestive, respectively in females. The proportion of deaths due to the three leading groups of CVD, cancer and injury was 60% in males and 54% in females.

## **6.2. Time trend and regional variable of mortality by ICD-10 groups of diseases**

For all districts combined, the time trend during 2005-2010 showed a significant decline of mortality for infectious included HIV/AIDS (OR=0.60, 95% CI=0.46-0.80,  $P < 0.001$ ), for endocrine (OR=0.67, 95% CI=0.46-0.96,  $P = 0.029$ ), for CVD (OR=0.90, 95% CI=0.83-0.97,  $P = 0.010$ ), and for injury (OR=0.78, 95% CI=0.65-0.94,  $P = 0.010$ ).

For all districts combined, the regional variation analysis showed a significant increased risk of death in the rural district area for cancer (OR=1.37, 95% CI=1.23-1.53,  $P < 0.001$ ) and for injury (OR=2.29, 95% CI=1.86-2.82,  $P < 0.001$ ).

## **Acknowledgements**

The present study was supported by WHO office in the Hanoi city (PTEAO:WPDHP1005400 - 1.4 - 53314 - 513 - WPDHP). We specially thank to the Hanoi City Health Department (Dr. Kieu Mai Phuong, Dr. Nguyen Thi Thuy, Dr. Pham Thanh Nhan), Research assistances (Ms Nguyen Thi Lua and Ms Lai Thi Minh Hang). We are deeply appreciated to a fruitful cooperation of Dr. Jonathon Passmore (WHO-VTN), Dr. Hai-Rim Shin, Ms Trinetta Lee and Ms Jennifer (WHO-WPRO).

## **References**

- [1] GSO. The 2009 Vietnam Population and Housing census: Major findings. Hanoi: General Statistics Office of Viet Nam, 2009.
- [2] UN. MDG Summit 2010 - Viet Nam. Summit on the Millennium Development Goals. Hanoi: United Nations, 2010.
- [3] HMN. Health Metrics Network: A framework and standards for country health information system development. Geneva: World Health Organization, 2006.
- [4] United Nations. Principles and recommendations for a vital statistics system, revision 2. New York: NY: United Nations Statistical Commission, 1999.
- [5] Rao C, Osterberger B, Anh TD, MacDonald M, Chuc NT, Hill PS. Compiling mortality statistics from civil registration systems in Viet Nam: the long road ahead. *Bull World Health Organ* 2010;88 (1): 58-65.
- [6] Ministry of Health. Decision No 822/BYT.QD to issue mortality reporting book A6/YTCS: Ministry of Health, 1992.
- [7] Ministry of Health. Decision No 2554/BYT.QD to issue mandatory and active registration in developing health information at commune health station, district health center and provincial health department: Ministry of Health, 2002.

- [8] Huong DL, Minh HV, Byass P. Applying verbal autopsy to determine cause of death in rural Vietnam. *Scand J Public Health Suppl* 2003;62: 19-25.
- [9] Tra LN, Dung TV. Study on cause of death at Soc Son district, Hanoi city. Hanoi: Hanoi Medical University, 2003: 53.
- [10] Jenicek M. *Epidemiology: the logic of modern medicine*. Montreal: EPIMED International, National Library of Canada, 1995.
- [11] Silva IDS. *Cancer epidemiology: Principle and methods*. Lyon, France: IARC - WHO, 1999.
- [12] Ministry of Health. *Health statistics yearbook, 2005-2006: Injury mortality by regions/causes/provinces*. Ha Noi: Ministry of Health, 2007.
- [13] Ministry of Health. *Health statistics yearbook, 2007: Injury mortality by regions/causes/provinces*. Ha Noi: Ministry of Health, 2008.
- [14] Ministry of Health. *Health statistics yearbook, 2008: Injury mortality by regions/causes/provinces*. Ha Noi: Ministry of Health, 2009.
- [15] Ministry of Health. *Health statistics yearbook, 2009: Injury mortality by regions/causes/provinces*. Ha Noi: Ministry of Health, 2010.
- [16] GSO. *Report, Population Projections of Viet Nam, 1994-2024*. Hanoi: General Statistical Office, Project VIE/97/p14, 1999.
- [17] STATA. *Statistical Software, Statistics, Data Management*. Release 10 ed. College Station, Texas: STATA Press, 2008.
- [18] Anh LV, Linh LC, Cuong PV. *Viet Nam Multi-Center Injury Survey (VMIS - report in Vietnamese)*. Hanoi: Hanoi School of Public Health, 2003: 33.
- [19] Mong N. *Study on mortality at 3 communes of Kim Bang district, Nam Ha province from 1991 to 1994. . Second workshop at Son Tay hospital, 1995 1995, Son Tay city: 125-28*.
- [20] Ngoan LT. *Cancer mortality in a Hanoi population, Viet Nam, 1996-2005*. *Asian Pac J Cancer Prev* 2006;7 (1): 127-30. 21.
- [21] Ngoan LT., Anh NTD., Huong NT. et al., *Gastrie and colo-rectal cancer mortality in Viet Nam in the years 2005-2006*. *Asian Pac J Cancer Prev* 2008;9 (2): 299-302.
- [22] Ngoan LT, Long TT, Lua NT, Hang LT. *Population-based cancer survival in sites in Viet Nam*. *Asian Pac J Cancer Prev* 2007;8 (4): 539-42.
- [23] Ngoan LT, Lua NT, Hang LT. *Cancer mortality pattern in Viet Nam*. *Asian Pac J Cancer Prev* 2007;8 (4): 535-8.
- [24] Ngoan LT. *Development of population-based cancer mortality registration in the North of Viet Nam*. *Asian Pac J Cancer Prev* 2006;7 (3): 381-4.