

HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEM PROFILE

The Chi Linh Health and Demographic Surveillance System (CHILILAB HDSS)

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The Chi Linh Health and Demographic Surveillance System (CHILILAB HDSS) is the only health and demographic surveillance system (HDSS) in an urbanizing area of the Chi Linh district of Hai Duong, a northern province of Vietnam. It is one of the few field laboratories in the world that links operational research and health interventions with field training.

The CHILILAB HDSS provides longitudinal data on demographic and health indicators for the community of Chi Linh. In 2012, when the CHILILAB HDSS included 57 561 people from 17 993 households in 3 towns and 4 communes, it used structured questionnaires to collect information on population changes (birth, death, migration, marriage, and pregnancy) in the community. As of December 2012, 5 rounds of a baseline survey and 17 periodic update surveys or re-enumeration surveys had been conducted. In addition, several specialized public-health research projects, focused particularly on adolescent health, have been implemented by the CHILILAB HDSS. The information that the CHILILAB HDSS has gathered provides a picture of the health status of the population and socio-economic situation in Chi Linh district. The contact person for data sharing is the director of the CHILILAB (E-mail: thb@hsph.edu.vn).

Keywords Demography, age distribution, census, health status, population dynamics, population growth, mortality, morbidity, adolescent health, Vietnam

Why was the HDSS set up?

Following a site-selection process in 1998, a pilot surveillance project was conducted in 2003 before the Chi Linh Health and Demographic Surveillance System (CHILILAB HDSS) officially began its work in 2004. One commune in An Lac and one area (Thai Hoc) in Sao Do town were selected for pilot surveillance. The results of this surveillance were then used to inform the design and operation of the official CHILILAB HDSS surveillance system.

In addition to collecting health and demographic surveillance data, CHILILAB HDSS was designed to focus on adolescent health. The health problems of adolescents were selected because they are closely linked to social developments observed in the region and because young people (<25 years of age) constituted a substantial proportion of the general population (approximately 50%). Adolescents are often sensitive to social changes and are categorized as a high-risk group for sexually transmitted diseases,



Figure 1 Photograph of CHILILAB HDSS site (Reproduced with permission from CHILILAB)

especially human immunodeficiency virus (HIV) infection and acquired immune deficiency syndrome (AIDS). The socio-economic and cultural development and the patterns of urbanization and geographic structure present in Chi Linh district, and the resultant health problems, are considered to be representative of all of Vietnam.

The Hanoi School of Public Health (HSPH) is the first public-health training institution in Vietnam with a particular focus on field-based epidemiology and interdisciplinary training in public health. This creates links between academic coursework and field experience that ensure that learning is grounded in reality.

In the CHILILAB system, the baseline surveillance data are updated regularly and tracked over time to provide longitudinal data for identifying changes in the socio-economic and health status of the community. Additional surveys for the investigation of specific health or demographic topics, and particularly risk factors related to community health status, have been conducted to provide a basis for the implementation of appropriate intervention programmes.

The development of this research facility benefits the site community both by providing accurate data on epidemic local health problems that can inform local health activities, and by building the capacity

of local health groups through their involvement in developing the HDSS and in conducting research based on its findings (Figure 1).

What are the HDSS objectives?

The CHILILAB HDSS is designed as a site for training and research for the HSPH. The objectives of the HDSS are to:

- (i) Establish a demographic and epidemiologic surveillance system of cycles of morbidity and mortality in Chi Linh district.
- (ii) Identify patterns and trends of morbidity and mortality in the district population, periodically and longitudinally.
- (iii) Provide data on adolescent health, especially risk and protective factors of particular relevance to adolescent health issues.
- (iv) Pilot and evaluate community health intervention strategies periodically, to form a basis for developing health policies in the locality and elsewhere.
- (v) Improve the procedures for data collection, analysis, and application at the community level in a reliable and effective manner.
- (vi) Strengthen the capacity of public health professionals in the HSPH.

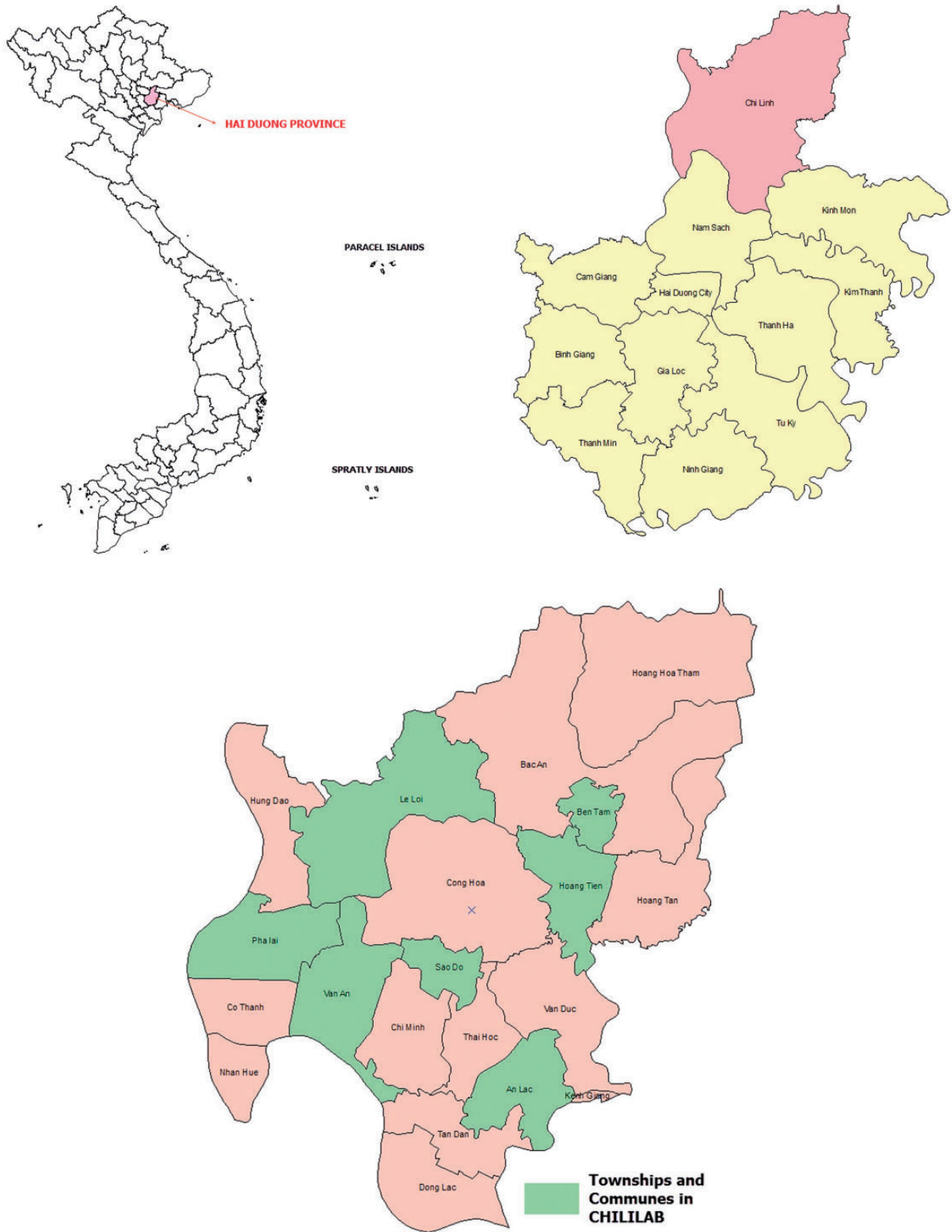


Figure 2 Maps of Vietnam, Hai Duong province and Chi Linh town

The contents of HDSS questionnaires at baseline and for the update rounds of surveillance have remained unchanged since their development.

Where is the HDSS area?

Chi Linh is a mountainous district of Hai Duong province in northern Vietnam. The Chi Linh district covers an area of ~300 square kilometres, contains 17 communes and 3 towns (Figure 2), and as of December 31 2010 had a population of 142 278 (50.3% female, 49.7% male). A number of ethnic minority groups live in the district. The population density varies across the district, with a higher density in lowland communes. Approximately 25% of the total population lives in urban areas. Much of the land in Chi Linh is used for agriculture. The district also contains two thermal power plants, a medical glass plant, a refractory soil mine, and a leather-shoe-making plant.

The district public-health-care system in Chi Linh consists of a district health centre, a regional health clinic, and 20 commune health centres. These health centres are centrally located in the commune, making transport and access to health-care services convenient for the population.

Who is covered by the HDSS and how often they have been followed up?

The entire populations of 3 selected townships and 4 communes within the Chi Linh district have been invited to participate in the study. Through July 1 2012, CHILILAB included 57 161 participants from 17 993 households. A resident is defined as a person who has stayed or intends to stay in the study-area household for more than 3 months. To 'stay' means that the individual sleeps, eats, and lives at this household.

In December 2010 there were 18 402 households with 53 483 residents under CHILILAB surveillance; 22.4% of these residents were under 15 years old and 12.8% were more than 60 years of age. The male/female ratio was 94/100. The ratio of boys to girls alive at birth was 111/100 (Table 1). The demographic structure of the population did not vary markedly between 2004 and 2010.

Data were collected at both the household and individual levels. A list of the households in the district was made at the time of the original baseline survey. The baseline survey is repeated biennially. General household information, morbidity data, and general household socio-economic and demographic indicators have been collected. The periodic update surveys were conducted on a quarterly basis when the HDSS system was first set up, but since 2009 these surveys

Table 1 Demographic characteristics of CHILILAB, 2008–2010

| Index | Results |
|---|----------|
| Participants | 69 091 |
| Residents | 53 843 |
| Households | 18 402 |
| Population growth | 0.97% |
| Rural resident/urban resident | 88/100 |
| Male/female ratio | 94/100 |
| General Dependency Ratio (GDR) ^a | 55.2 |
| Sex ratio at birth (male/female) | 111/100 |
| Crude birth rate/1000 | 15.6 |
| General fertility rate | 55.2 |
| Average weight at birth | 3206 g |
| Total fertility rate | 2.0 |
| Crude death rate/1000 | 5.63 |
| Infant mortality ratio/1000 | 13.16 |
| Age under 5 years mortality ratio/1000 | 16.7 |
| Life expectancy at birth (male) | 71 years |
| Life expectancy at birth (female) | 83 years |
| Crude emigration rate/1000 | 111 |
| Crude immigration rate/1000 | 78 |

^aGeneral Dependency Ratio (GDR) = (number of people aged 0–14 and those aged 65 and over)/number of people aged 15–64 × 100

have been conducted biannually. General household information and demographic variables are collected and updated using a qualified set of data-collection instruments. Information collected in the periodic update surveys relates mainly to migration into and out of the surveyed townships and communes, outcomes of pregnancy, delivery, marriage and divorce, and morbidity and mortality.

Data for specialized research focused on adolescent health are collected biennially. In addition, other specific research, including observational studies and community-based interventions, has been conducted on the basis of the practical needs of the community as identified through HDSS data analysis. Data collected in these studies is linked with baseline data when necessary.

What has been measured and how have the HDSS databases been constructed?

The main categories of information collected by the surveillance system are: general population information, socio-economic and cultural information; marriage, pregnancy, and newborn delivery; morbidity

and mortality; injury; utilization of health-care services; and causes of death identified by verbal autopsy and categorised by International Classification of Diseases (ICD) group for estimating the burden of disease. Table 1 provides key indicators for the baseline and re-enumeration rounds of surveys.

It should be noted that the information collected during the baseline round of surveillance focuses mainly on general information, such as demographic characteristics. In the periodic re-enumeration rounds, other, more detailed information is collected, such as weight at birth. All of the data-entry systems in the CHILILAB HDSS link to a central server, and the data system is specified in MySQL software (Oracle,

Redwood Shores, CA, USA). Table 2 shows key measures for which data are collected by the HDSS.

Key findings and publications

In 2010, the total number of CHILILAB participants was 53 843, belonging to 18 402 households, of which 48.8% were men. The average number of people per participating household was 2.9. The population pyramid in 2010 (Figure 3) showed that CHILILAB is at the final stage of the population transition. The population structure in CHILILAB is young but is going through a rapid process of reduction in fertility.

Table 2 Information collected at baseline and at the re-enumeration round of the CHILILAB HDSS survey

| Items | Information | Baseline round | Re-enumeration round |
|-------------|---|----------------|----------------------|
| Homestead | Latitude, longitude | X | |
| | Number of square meters | X | |
| | Building and roof materials, and category (concrete, brick, metal, cement) | X | |
| | Floor materials: tiles | X | |
| | Grounded floor | X | |
| | Source of drinking water: drilled wells, deep wells, running water, river/pond/stream water | X | |
| | Toilet and bathroom | X | |
| Household | Household name | X | |
| | Household head | X | |
| | Household members | X | |
| | Household assets: bicycle, motorbikes, television, radio, cassette players, telephones, mobile phones | X | |
| | Household economic status | X | |
| Individuals | Name, sex, date of birth, ethnic group, education, occupation | X | |
| | Health insurance card | X | |
| Residents | Update of residency status (resident, died, emigrated) | | X |
| | Updated pregnancy status for women age 15–50 years | | X |
| | Recording of any new identification | | X |
| Births | Date of birth | | X |
| | Name, sex of child | | X |
| Deaths | Date of death | | X |
| | Causes | | X |
| | Verbal autopsy questionnaire | | X |
| Immigration | Date of immigration | | X |
| | Name, sex, and date of migration of migrant | | X |
| | Origin of migration episode | | X |
| | Previous residence within CHILILAB area | | X |
| Emigration | Date of emigration | | X |
| | Destination of migration | | X |
| Pregnancy | Outcome of existing pregnancy from records | | X |

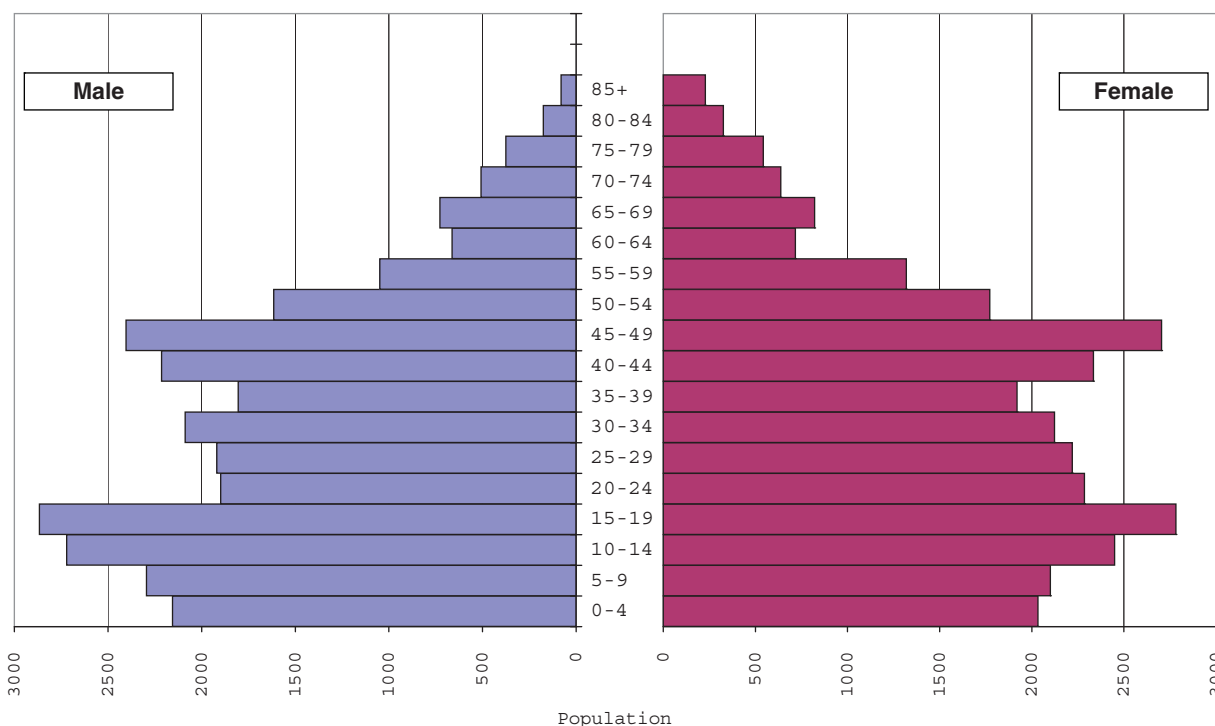


Figure 3 Population Pyramid of CHILILAB 2010

More information about CHILILAB, mainly in Vietnamese, is available on the website www.chililab.org.

Analysis of data from 34 921 survey respondents of labouring age (15–60 years of age) showed that the greatest proportion (40%) were farmers, followed by traders/service personnel (32%). The unemployment rate was 0.6%. Nearly 100% of households in the CHILILAB area had houses with roofs made of concrete, brick, metal, or cement. Nearly 80% of households had drilled wells as their source of drinking water, with another 12.7% of households using running water. More than 3% of households still did not have toilets, and about 12% of households had no bathrooms.

From 2007–2010, the ratio of boys to girls at birth was high in CHILILAB as compared to the normal biological ratio of 105 boys per 100 girls. The crude birth rate was 15.6 per 1000, which was equal to the corresponding national figure for 2002 (15 births per 1000 population). The general fertility rate was approximately 55.2 babies born per 1000 women 15–49 years of age, which was lower than the national figure for Vietnam in 2002. The total fertility rate (TFR) in 2010 was 2.0, which was equal to the TFR for Vietnam in 2009.²

At present, mortality data for analysis are available in CHILILAB for the 7-year period from July 1 2004 to June 30, 2011. The crude death rate during this period was 5.6 per 1000, which was lower than the national figure for Vietnam in 2009. Mortality for children under 1 year of age, or the infant mortality

rate (IMR), was measured through direct methods with an unadjusted numerator/denominator. The IMR in CHILILAB was 13.16 per 1000, which was lower than the national figure of 16 per 1000 in 2009, and the mortality among children under 5 years of age was 16.0 per 1000.

In addition to those done as part of the CHILILAB HDSS system, several studies have been conducted over the past several years. Research on different health topics, and especially on adolescent health, has been conducted with the HDSS system being used to link specific project data with demographic data from the HDSS. In particular, CHILILAB has longitudinal data on various issues of adolescent health, including risk factors and protective factors of particular salience to adolescents. Other topics of research have included reproductive health (ectopic pregnancy and risk factors for it), child health (the relationship between involvement of the father and child development), non-communicable diseases (risk factors), infectious disease (avian flu, HIV/AIDS), environmental health (air pollution from biomass smoke and its health risks, trends in the use of drinking water and latrines). Details of the completed key projects have been reported bilingually by CHILILAB¹ and in a special issue of the *Vietnam Journal of Public Health* published in 2012 and devoted to CHILILAB studies. The following sections provide some of the key findings in those studies.

A study by Nguyen and colleagues³ was designed to estimate the burden of disease causing premature death, using data from the CHILILAB database

analysed with and without the discount rate and weighting for age. In 2008, the total burden of disease, which is assessed as years of life lost (YLL) from premature death, was about 1763 years without discounting and age weighting; 4451 years lost without discounting but with age weighting; 5778 years lost with discounting and without age weighting, and 4139 years lost with discounting and age weighting. In general, non-communicable diseases, such as cancer or cardiovascular disease, and unintentional injuries, are the leading causes of premature death.

A number of studies focused on the involvement of fathers in childrens' development have been conducted in CHILILAB. Among these were an study that applied a quasi-experimental, pre-test/post-test design to an intervention designed to educate fathers on the benefits of breast-feeding. After the intervention, fathers in the intervention group had greater knowledge of breast-feeding than fathers in the control group. The study highlighted the need to maintain and replicate the education model in the local context.⁴

A recent cross-sectional study was conducted to identify specific causes of death according to sex and age group in CHILILAB during 2008–2010 using verbal autopsy, and to compare the results of this with causes of death reported in CHILILAB HDSS.⁵ Verbal autopsy interviews were used to ascertain causes of death from representatives of 896 CHILILAB participants who had died. The study found that the leading causes of death in CHILILAB were non-communicable diseases (NCDs) and road-traffic injuries. The main causes of death differed by age group. Male mortality was higher than female mortality, and the leading cause of death in men was cancer while that in women was stroke. There were differences between the causes of death ascertained by verbal autopsy as compared with those in the HDSS records.

Sex ratio at birth is a topic of interest in CHILILAB. A study conducted to accurately determine the sex ratio at birth of newborn babies in Chi Linh district in 2005, and to describe the factors that influenced the sex ratio within the HDSS area in 2006 and 2007, used secondary data from the CHILILAB system, as well as data collected through a structured questionnaire. Participants included 262 mothers randomly selected from the 804 mothers in Chi Linh who gave birth in 2005, and 8 women who had abortions during the first 6 months of 2006. The study found a sex ratio at birth in 2005 in CHILILAB of 106.4 boys/100 girls. Most couples expected to have two children, one boy and one girl. Couples did not consider the sex of the first baby to be very important. However, this was not the case for the second birth. The study found that 22.5% of the women who participated knew about sex-selection methods and that 18.5% of those women reported applying these methods. Among expectant mothers, 84.4% knew the sex of their infants before birth through ultrasound examination. The study highlighted the need for programmes to promote gender equality and to

strengthen implementation of the policy in Vietnam that prohibits identification of the sex of a foetus.

Future analysis plans?

To examine changes in the demographic and health characteristics of its area, CHILILAB has plans to analyze longitudinal data from the HDSS (17 rounds of data collection up to 2012). To examine the risk and protective factors for adolescent health, CHILILAB-linked data from a large scale longitudinal study of adolescent health conducted over the past 7 years, will be analysed. In addition, CHILILAB has shared data and is involved in collaborative data analyses within the INDEPTH network. Further analyses are planned of other data from specialized studies, especially those on verbal autopsy, fathers' involvement in child health, and the burdens posed by diseases, particularly non-communicable diseases (NCDs).

What are the main strengths and weaknesses?

The key strength of the CHILILAB system is the continuous observation for the past 8 years of demographic indicators and events at the household and individual levels. This has provided longitudinal data that CHILILAB to monitor the health problems of the community across a period of time. Focuses of CHILILAB have been studies and intervention programmes among adolescents directed at health interventions, HIV/AIDS prevention, breast-feeding, and reducing alcohol consumption. These linked data projects, and the many other health topics that have also been studied within the CHILILAB HDSS, help to provide comprehensive and in-depth understanding of health issues in the area that CHILILAB serves, and to plan interventions that will help with these issues.

Efforts have been made in CHILILAB to apply new approaches. For instance, it uses the STEPs approach to surveillance for risk factors for NCDs. In this approach, the recommended surveillance measures are categorized according to the levels of complexity of obtaining the data. The levels of complexity equate to whether questionnaires alone are used (Step 1), physical measures are recorded in the field (Step 2), or laboratory measurements that require external expertise are involved (Step 3). Importantly, standardized questionnaires are used in the STEPs approach, allowing international comparisons.⁶

It is important to note that the HDSS covers the entire population of 3 selected townships and 4 communes, accounting for 40% of the total district population of the Chi Linh district. This means that although CHILILAB does not cover the entire population, its findings may, with caution, be used for making health plans for the whole district.

As mentioned earlier, most findings so far provided by CHILILAB research have been published in a monograph (studies from 2004–2006) that is available in both Vietnamese and English, and in a special issue of the *Vietnam Journal of Public Health* (studies from 2006 onward) in Vietnamese with English abstracts. It should also be noted that despite the large number of studies so far based on CHILILAB, there is a lack of international publications. This indicates the importance of building research and publication capacity among CHILILAB researchers.

Currently, one significant gap exists in the information being collected by CHILILAB HDSS: little emphasis has so far been placed on monitoring the health risks and behaviours that are frequently associated with urbanization, such as smoking, illicit drug use, unsafe sexual behaviours and changing food and dietary patterns.

Data sharing and collaboration

Data collected from the sample population in the CHILILAB area is stored in the CHILILAB database at HSPH. Periodic updates of demographic and socio-economic information and of health conditions are extracted from the database for analysis. Findings are then disseminated to the community and policy makers at annual workshops with local authorities, through manuscripts, and through fact sheets published in both Vietnamese and English. Individual and household CHILILAB data can be made available. Requests for data use should be sent to the CHILILAB

director for consideration. The contact person for data sharing is the director of CHILILAB (E-mail: thb@hsph.edu.vn).

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Conflict of interest: None declared.

KEY MESSAGES

- CHILILAB is the first field laboratory in an urbanizing area of Vietnam.
- The goal of CHILILAB is to collect basic demographic and health indicators on a regular basis. This field site links public-health training with research and interventions.
- A unique feature of CHILILAB is that it is the only HDSS in Vietnam and only the second field laboratory within the INDEPTH network to focus on adolescent health. In addition to collecting longitudinal data on adolescent health (e.g. disease patterns, protective behaviours, and risk-related behaviours), CHILILAB has conducted interventions to reduce the incidence of disease.

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