HEALTH EQUITY IN VIET NAM A SITUATIONAL ANALYSIS FOCUSED ON MATERNAL AND CHILD MORTALITY

By James C. Knowles Sarah Bales Le Quang Cuong Tran Thi Mai Oanh Duong Huy Luong

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Executive Summary

This situational analysis provides estimates of the degree of inequality in both maternal and child mortality and other high-level maternal and child health outcomes causally related to maternal and child mortality, including child morbidity, children's nutritional status and fertility. Estimates are also provided for several key intermediate health outcomes causally related to maternal and child mortality, including family planning, antenatal care, obstetric delivery care, immunization and curative care. Both early estimates for 1992/93 and recent estimates for 2006 of inequality are presented and compared. The main data sources used in the situational analysis include three household surveys, i.e., the 1992/93 Vietnam Living Standards Survey (VLSS), the 2006 MICS III and the 2006 Viet Nam Household Living Standards Survey (VHLSS), and province-level data from the MOH Health Information System (HIS) and other sources. In addition to inequality estimates, the situational analysis presents the results of regression analysis used to identify the underlying factors, such as age, sex, education, income, urbanization and ethnicity that are most closely associated with these outcomes. The observed inequalities are also decomposed in order to quantify the contributions made by the various underlying factors to the observed inequality.

The report's conceptual framework focuses on four areas: high-level health outcomes (i.e., maternal and child mortality, morbidity, nutrition and fertility), key intermediate outcomes causally related to these high-level health outcomes (for example, family planning, antenatal care, obstetric delivery care, and immunization), related health services (including their physical proximity, quality and affordability), and underlying factors at both the community and individual/household levels (including both observed characteristics such as age, sex, education, ethnicity, income and location, and unobserved factors, such as historical experience, genetic factors and individual preferences) that affect the utilization of health services and high-level health outcomes directly.

The measurement of inequalities in health outcomes is a critical part of the situational analysis, which draws heavily for this purpose on a guide to health equity analysis recently published by the World Bank¹. The main analytical tools used to measure health inequalities in this report are: population-weighted quintiles, the concentration curve, the concentration index (CI) and living standards measures (LSM).

The main findings of the situational analysis are as follows:

The analysis suggests that there is a moderate degree of inequality in child mortality in Viet Nam disfavoring poorer women and their children that has persisted at least since 1992/93 (reflecting cumulative child mortality over several years) despite substantial reductions in overall infant mortality rates during this period. However, this conclusion is not definitive because the nature of the observed inequality in child mortality in 1992/93 (i.e., whether it favors the poor or the rich) is sensitive to choice of the LSM used to rank individuals. The factors that contribute to the observed inequality in child mortality in in both 1992/93 and 2006 include: schooling (both the highest level of schooling completed by any adult household member and, increasingly, the woman's own level of schooling), ethnicity, and the wealth index. The relatively important contribution of the wealth index to inequality in child mortality stems not from being strongly related to child mortality (its

¹ Owen O'Donnell, Eddy van Doorslaer, Adam Wagstaff and Magnus Lindelow, Analyzing Health Equity Using Household Survey Data, World Bank Institute Learning Resources Series. The World Bank, Washington DC (2007).

estimated coefficient is statistically insignificant in all of the regression models estimated with both the 1992/93 and 2006 household survey data) but rather from its own relatively high CI (since the contribution of a variable to the CI for any health variable is the product of the variable's estimated elasticity with the health variable and its own CI). The distribution of province-level estimates of infant mortality (which are indirect estimates based on the large annual surveys of Population Change and Family Planning) suggests more inequality in child mortality than indicated by the household survey data. Household income, ethnicity and malaria incidence account for most of the observed inequality in infant mortality among provinces.

Unfortunately, there is very limited information available on the degree of inequality in maternal mortality in Viet Nam and even less about how it may have changed over time. However, the limited available data analyzed in the situational analysis suggest that maternal mortality is unequally distributed, favoring the rich, as is the case with child mortality.

The available data on morbidity among children under 5 in 1992/93 indicate that there was virtually no inequality in general morbidity (i.e., any illness or injury during the past 4 weeks or during the past 12 months) and only a small and insignificant degree of inequality in diarrhea morbidity during the past 4 weeks. However, the 2006 data suggest that there may be substantial inequality disfavoring the poor in the incidence of diarrhea among children under 5, but not for other types of common childhood diseases. The schooling of adult household members is a consistently important contributor to the inequalities in child morbidity observed in 2006 while mother's schooling consistently offsets this contribution. Unfortunately, likely serious underreporting of under-5 morbidity in household surveys also makes it impossible to conclude whether changes have occurred over time in the degree of inequality in under-5 morbidity.

Province-level analysis of malaria morbidity (malaria incidence) in the general population found that there is a high degree of inequality in malaria morbidity disfavoring poorer provinces and that the main contributing factors to the observed inequality are household income and ethnicity. Although urbanization was found to partially offset these two contributions, it is suspected that this may reflect under-reporting of malaria cases in rural areas.

There was moderate inequality in malnutrition among children under 5 in 1992/93, which has increased substantially by 2006, even as average rates of child malnutrition have declined during the same period. Growing inequality in household incomes appears to have been the main factor contributing to the increased inequality in child malnutrition over time, while unobserved commune level factors also contribute substantially to the prevalence of moderate underweight status and moderate wasting. Province level analysis indicates that income differences between provinces account for most of the inequality observed in 2005 in both moderate stunting and moderate underweight status in children under 5.

There is still a moderate degree of inequality in fertility disfavoring the poor in Viet Nam that does not appear to have changed during the period 1992/93 to 2006. During the same period, however, total fertility rates have continued to fall from 3.3 children per woman during the period 1989-1994 to near-replacement fertility levels by 2004. That inequality in fertility appears not to have changed over time is surprising because Viet Nam has had a strong and apparently effective family planning program during this period. The main factors explaining the inequality in cumulative fertility observed in 1992/93 are female education and commune-level fixed effects, while in 2006 they include these two factors as well as the schooling of all adult household members and the wealth index (as a proxy for a household's "permanent income"). The fixed effects in 1992/93 appear to represent mainly commune-level variation in average household "income." In 2006, however, average household "income" at the commune level is no longer an important factor explaining the estimated commune fixed effects. Instead, the proportion Catholic and the proportion ethnic Vietnamese or Chinese in a community are the main underlying factors explaining the estimated commune fixed effects, followed by average community levels of educational attainment and average community immunization rates (presumably proxying for the effectiveness of public health interventions). Region of residence is also important in explaining the estimated commune fixed effects in 2006, suggesting differing levels of effectiveness in implementing family planning policy in different regions. In 2004/05, the main factors contributing to the remaining inequality in fertility at the province level are income and infant mortality.

There have been significant changes over time in both the nature and magnitude of inequality in the current use of contraceptives during the period 1992/93 to 2006, and particularly with respect to modern contraceptives. What was formerly a moderate level of inequality favoring richer women in the current use of modern contraceptives has become inequality favoring poorer women (albeit smaller in magnitude). The role of socioeconomic factors in contributing to inequality in contraceptive use has also been reduced over time. These changes are what one would expect to observe with a strong and effective family planning program.

There have been impressive gains in women's average access to at least some antenatal care from a trained provider during the period 1992/93 to 2006, as well as reductions in the degree of inequality in this indicator (i.e., 91% of pregnant women reported receiving some antenatal care from a professionally trained provider in 2006, and the CI for this indicator decreased from 0.125 in 1992/93 to 0.059 in 2006). It is unclear, however, whether there has been equivalent progress in increasing the number of antenatal care visits received by a pregnant woman during this period (since the 2006 MICS III did not collect this information). That there is still significant inequality in the proportion of recently delivering women who have been fully immunized for tetanus suggests that there is still likely to be considerable inequality in the number of antenatal care visits. There is also a high degree of inequality in the quality of antenatal care received by pregnant women. For example, the CI for receiving a blood test was +0.331 (i.e., exceeding the degree of inequality in per capita consumption), while the CI for a urine test was +0.267 (by comparison, the CI was only +0.168 for an ultrasound). A household's "permanent income" accounts for most of the observed inequality in the quality of antenatal care received.

There is still considerable inequality in the distributions of most obstetric delivery care indicators, including "professionally assisted deliveries." Although there have been significant reductions in the degree of inequality in some indicators since 1992/93 (for example, in deliveries occurring in any type of health facility or in deliveries occurring in a hospital), there has been very little reduction in the degree of inequality in "professionally assisted deliveries." Commune fixed effects (which may also reflect fixed effects at higher levels) account for much of the inequality observed in the obstetric delivery care indicators (including about one-half of the inequality in "professionally assisted deliveries." Commune fixed effects may reflect variation in the accessibility and quality of locally available health services. Findings from key informant interviews confirm that geographic access to care, lack of knowledge of when care is needed, financial costs of medical care or of seeking care, and quality of reproductive services all contribute to inequalities in access to reproductive health services disfavoring the poor.

Despite significant improvements registered over time in the average levels of some key immunization indicators, there is still an important degree of inequality in these indicators, according to the available household survey data. On the demand side, income, ethnicity, and adult schooling (but to a lesser extent in the case of schooling in 2006 than in 1992/93) still account for much of the observed inequality in key immunization indicators, while on the supply side, the situational analysis finds some evidence that physical

access to health facilities and health providers is also important.

The data on curative care for both children under 5 and for women ages 15-49 indicate that there is very little inequality in whether those reported ill or injured obtain any type of inpatient or outpatient care. However, there is considerable inequality in the type of care obtained by both women and children. Both the outpatient and inpatient services of commune health stations (CHS) and regional polyclinics are used mainly by the poor (although the CHS and regional polyclinics account for only about 2% of inpatient admissions). Surprisingly, there is very little inequality in the use of hospital inpatient care in both 1992/93 and 2006. Self-treatment is used slightly more by richer women and somewhat more by richer children as a source of outpatient care, while both hospital and private outpatient care are used considerably more by richer women and children.

The main conclusions drawn from the situational analysis are as follows:

Firstly, the degree of inequality in key maternal and child health outcomes varies widely in Vietnam, both in 1992/93 and in 2006. Some indicators show very little inequality, including indicators of women's nutritional status in 1992/93, indicators of current contraceptive use in 2006 (any method or a modern method), most indicators of breastfeeding in 2006 (the exception is breastfeeding of children aged 20-23 months, in which there is substantial inequality favoring the poor), and whether children under 5 have received vitamin A supplements in 2006. Others show a moderate degree of inequality disfavoring the poor, including child mortality in both 1992/93 and 2006, maternal mortality (but based on limited data collected in 2006), children's nutritional status in both 1992/93 and 2006, cumulative fertility (i.e., CEB) in both 1992/93 and 2006, curative care consultations for women ages 15-49 in 1992/93 and for children under 5 reported to have been ill or injured during the past 4 weeks in 1992/93, and the proportion of children under 5 who have been completely vaccinated with 4 basic vaccines (i.e., DPT, measles, polio and BCG) in both 1992/93 and 2006.

However, a few maternal and child health indicators exhibit a high degree of inequality disfavoring the poor and approaching (or even exceeding) the degree of inequality in the living standards measures (LSM) themselves. This category includes several indicators of antenatal, obstetric delivery care and postnatal care (including the number of antenatal visits in 1992/93, the proportion of pregnant women receiving complete antenatal care in 2006, the proportion of obstetric deliveries assisted by a medical doctor in 1992/93, the proportion of obstetric deliveries occurring in a hospital in 1992/93 and 2006, and the proportion of women ages 15-49 who received a vitamin A supplement within two months of giving births in 2006), several more strictly defined immunization indicators in 2006 (for example, the proportion of children who were completely vaccinated during their first year), and whether or not a child under 5 that was reported to have had pneumonia symptoms during the past two weeks obtained care at a health facility in 2006.

Secondly, where comparable data are available for the same indicators in 1992/93 and 2006, there has been significant improvement in reducing the degree of inequality in some indicators, including current use of a modern contraceptive (from moderate inequality favoring the rich in 1992/93 to a small degree of inequality favoring the poor in 2006), any antenatal care by a trained provider, obstetric deliveries in any type of health facility or in a hospital, and in the proportion of children under 5 who have been completely vaccinated with 4 basic vaccines. However, there has been little or no change in the degree of inequality observed in several other key indicators, including child mortality, cumulative fertility, or the proportion of professionally assisted obstetric deliveries, despite impressive improvements in the average values of these indicators during the same period. Discouragingly, the degree of inequality in the nutritional status of children under 5 has increased between 1992/93 and 2006. At the same time, there are data gaps that prevent any assessment of changes over time in the degree of inequality in maternal mortality or in the number of antenatal care visits. In addition,

likely under-enumeration of both maternal and child morbidity in the 1992/93 VLSS makes it infeasible to assess changes over time in the degree of inequality in maternal and child morbidity.

Thirdly, the results of regression analysis indicate that the main underlying factors associated with maternal and child health outcomes are household living standards themselves, education, nutritional status, ethnicity and location. One important and re-assuring finding is that a child's sex is significantly related to only one of the many outcomes analyzed, i.e., diarrhea morbidity among children under 5 during the past 4 weeks in 1992/93 (and only at the 0.10 level of significance). Although schooling is an important underlying factor for most maternal and child health outcomes, the analysis found only a few cases where the woman's/mother's own level of schooling is significantly related to maternal and child health outcomes when a measure of the schooling of all adult household members is also included in the model (i.e., either the highest level of schooling completed by any adult household member, or in some cases, the mean level of schooling completed by all adult household members, including the woman). This finding, while surprising, is nevertheless robust.

The regression analysis also finds that most of the high-level maternal and child health outcomes are significantly related to measures of nutritional status in the 1992/93 VLSS. For example, child mortality is significantly related to mother's height (negatively), while morbidity among women ages 15-49 is significantly related to her BMI (negatively). Perhaps most interestingly, indicators of children's nutritional status (for example, height-for-age and weight-for-age z-scores) are significantly related to the mother's nutritional status (positively, to both her height and BMI) and to the father's nutritional status (positively to his BMI), suggesting that during the period 1987/88-1992/93 father's may have competed for scarce food supplies within the household with their children under 5. These findings support growing recognition of the importance of maternal and child nutrition as a factor affecting child mortality.

The regression analysis also finds that all of the maternal and child health outcomes analyzed are significantly related to the commune of residence, even with relevant household and individual socioeconomic characteristics held constant. Supplementary commune-level analysis suggests that location is likely to reflect both supply-side factors, such as physical proximity to health services and demand-side factors, such as community average levels of income and schooling (that may also proxy for the quality and cost of locally available health services).

Fourthly, the decomposition of the observed inequalities, which reflects not only the relationships estimated in the regression analysis but also the degree of inequality in the underlying factors themselves, finds that the main factors contributing to the observed inequality in maternal and child health outcomes are the living standards measures themselves and both observed and unobserved factors related to location. Other underlying factors that contribute importantly to inequality in some indicators include schooling and ethnicity.

Lastly, there are some important data gaps that will need to be addressed in order to provide an effective basis for monitoring inequalities in maternal and child health outcomes in Viet Nam. One important gap is in child mortality. Currently, the only ongoing household survey collecting data on complete birth histories is the DHS (the latest estimates are based on the 2002 DHS and refer to children born during the period 1992-2002). The aggregate child mortality data collected in the MICS supports indirect estimates at an aggregate level (for example, at the national level or by urban-rural area), but they do not support reliable estimates of the degree of inequality in recent child mortality. Another important data gap relates to women's/mother nutritional status. The last household survey that collected such information was the 2001/02 Viet Nam National Health Survey. Thirdly, data on sibling mortality related to pregnancy and childbirth are an important tool for

monitoring maternal mortality. Although data on sibling mortality are collected in the MICS, collecting such data in a larger survey would be helpful (for example, in the annual population change surveys). In addition to these three main examples, there are data gaps for some individual indicators, such as the number of antenatal care visits or obstetric deliveries assisted by a medical doctor, that should also be addressed (MICS). Lastly, the analysis of province-level data points to the limitations of routine health information system data for the assessment of health equity (due mainly to incomplete coverage in remote, rural areas and to the omission of information on private health services).

The findings of the situational analysis confirm that there is still an important and persistent degree of inequality in several high-level maternal and child health outcomes and that these inequalities are matched (or even exceeded in some cases) by the degree of inequality in several causally related intermediate outcomes (for example, immunization). The factors contributing to the observed inequality include both demand-side factors (i.e., the household's "permanent income," adult schooling, and ethnicity) and supply-side factors (i.e., the accessibility and quality of locally available health services). A reasonable conclusion, therefore, is that an effective strategy to address the remaining inequalities in maternal and child mortality should include both demand-side and supply-side interventions targeted to the poor, many of whom are ethnic minorities residing in remote localities.

In addition to existing demand-side interventions (i.e., free health care for children under six, for the poor and for ethnic minorities residing in mountainous areas), one possibility would be to provide conditional cash transfers to the poor and ethnic minorities residing in remote areas to motivate them to obtain cost-effective preventive health care for themselves and their children and to reimburse their transportation and related expenses when they are referred to hospitals for either outpatient or inpatient curative care.

On the supply side, an equally important and complementary set of interventions might include additional investments in commune and district-level facilities in poor districts, combined with adequate financial support for recurrent costs at these levels (possibly requiring a more pro-poor allocation of State Budget resources, along with earmarking or appropriate incentives to ensure that the additional resources are allocated by provinces to these areas) and innovative human resources interventions in the same localities to ensure that there are adequate numbers of appropriately trained health personnel working at the village, commune and district levels and that they are retained and motivated through an effective system of performance-based incentives. The progress in converting moderate inequality favoring the rich to a small degree of inequality favoring the poor in modern contraceptive use between 1992/93 and 2006 demonstrates how much can be achieved in Viet Nam when effective demand-side interventions are combined with effective supply-side interventions.

ABBREVIATIONS

BCG	Tuberculosis vaccine
BMI	Body mass index
CEB	Children ever born
CHS	Commune health station
CI	Concentration index
DHC	District Health Center
DHO	District Health Office
DHS	Demographic and Health Survey
DPT	Diphtheria Pertussis Tetanus
EPI	Expanded program on immunization
GDP	Gross Domestic Product
GSO	General Statistics Office
HIS	Health information system
IEC	Information, education and communication
IMR	Infant mortality rate
IUD	Intra-uterine device
LSM	Living standard measure
MCH	Maternal and child health
MDG	Millennium Development Goals
MICS	Multiple-Indicator Cluster Survey
MOF	Ministry of Finance
MOH	Ministry of Health
NZAID	New Zealand's International Aid and Development Agency
OLS	Ordinary least squares
PHD	Provincial Health Department
PPC	Provincial People's Committee
SPCFP	Survey of Population Change and Family Planning
ТВ	Tuberculosis
TDS	Ten District Survey
TFR	Total fertility rate
VHLSS	Vietnam Household Living Standards Survey
VHW	Village health worker
VLSS	Vietnam Living Standards Survey
VND	Vietnam Dong
VNHS	Vietnam National Health Survey
WHO	World Health Organization
WHS	World Health Survey

NTRODUCTION AND BACKGROUND

Introduction

Vietnam has been developing very rapidly during the past two decades, with an increased reliance on market-based mechanisms. Most social indicators, including poverty rates and key health outcomes, have also improved dramatically during this period. However, rapid development has been accompanied by increased inequality in household incomes, including but not limited to increasing inequality between the urban and rural populations. Inequalities also persist in key health outcomes, including infant and child mortality, nutrition and in the utilization of health care, and have even increased in some cases during the past 10-15 years.

Considerable attention has been given in the health equity literature to inequalities in out-of-pocket expenditure on curative care in Viet Nam as well as to inequalities in child mortality and child nutritional status. On the other hand, very little attention has been given to inequalities in other high-level health outcomes related to maternal and child mortality (for example, maternal mortality, maternal and child morbidity, maternal nutrition and fertility) or to inequalities in the intermediate outcomes causally related to these higher level outcomes, such as immunization, antenatal care, obstetric delivery care and family planning.

The purpose of this situational analysis is to assess the extent of inequalities in maternal and child mortality and in other key health outcomes causally related to maternal and child mortality, including how these inequalities have evolved during the past 10-15 years,

in order to understand why inequalities persist in these key health outcomes and what can be done to address them. Many of these same health outcomes figure importantly in Viet Nam's Development Goals.² However, unlike the Viet Nam Development Goals (and the MDGs), which focus on national averages, this situational analysis focuses on inequalities in key health outcomes that have tended to be masked by continued progress in national average outcomes. Of course, at some point, the persistence of inequalities can effectively constrain continued progress in national averages, and this may already be the case in some areas, such as maternal mortality and under-5 nutrition. However, persistent (and in some cases, increasing) inequality in key maternal and child health outcomes also implies that the poor are not sharing equitably in the benefits of rapid development, and this is the main concern that motivates this situational analysis.

The main report of the situational analysis is organized as follows. The balance of this introductory section includes a brief description of Viet Nam's health system. Section two discusses the methodology used in the situational analysis, including its conceptual framework. Section three discusses the data sources that are currently available in Viet Nam to analyze inequalities in health outcomes. Section four analyzes inequalities in higher level health outcomes, including maternal and child mortality, morbidity, nutrition, and fertility. Section five analyzes inequalities in some key intermediate outcomes that are causally related to maternal and child mortality, including family planning,

Viet Nam's Development Goals (the Vietnam version of the Millennium Development Goals) include goals for the following health and environmental outcomes: infant and under 5 mortality, maternal mortality, under 5 nutrition, birth weight, fertility, immunization and access to safe water and sanitation.

antenatal care, obstetric delivery care, immunization and curative care. Section six discusses and assesses the strengths and weaknesses of government programs (including donor-assisted initiatives) intended, at least in part, to address these inequalities. Section seven presents the conclusions of the situational analysis and identifies some areas where additional interventions may be needed to address persistent inequalities in maternal and child mortality. In addition to the main report, several annexes have also been prepared that include more detailed analysis of topics discussed in the main report, including living standards measures (Annex 1), a review of available data sources (Annex 2), analysis of the 1992/9³ Vietnam Living Standards Survey (Annex 3), analysis of the 2006 MICS III (Annex 4), and analysis of province-level data from the Health Information System (Annex 5).

Viet Nam's health sector³ Country context

Viet Nam is changing rapidly. Its real economic growth over the last decade has averaged more than 6% annually and the national poverty rate has fallen from 58.1% in 1993 to 15.5 % in 2006⁴. Although the country is still among the poorest in the world, its vital health statistics and key health services output indicators are comparable with those of middle-income countries. This impressive performance means it is on target to meet the MDGs by 2015 - and has achieved some of the goals, such as the poverty target, already.

However, despite the Government's commitment to equitable and inclusive growth - as set out in the Comprehensive Poverty Reduction and Growth Plan the benefits of economic reform have not been distributed evenly across the population. Economic and social disparities seem to be widening. And there is a threat that Viet Nam's health gains could be reversed if the current health system is not re-directed towards the provision of health services which are cost-effective, of good quality and accessible to all those who need them.

The health status of Viet Nam's 84.2 million people⁵ has continued to improve over the last few years, although a number of challenges remain. Life expectancy at birth has increased from 65 years in 1995 to 71.3 years in 2002. From 1995 to 2006⁶, infant mortality decreased from 45.1 to 16 per 1000 live births, under-five mortality reduced from 61.6 to 25.0 per 1000 live births and maternal mortality appears to have reduced from 110 per 100 000 live births to 75.1.⁷ Although childhood nutrition has significantly improved, 23.4% of children under five are still identified to be underweight and micronutrient deficiencies remain a significant problem.

The incidence of many communicable diseases has fallen overall over the last few decades. However, the incidence of new or re-emerging diseases, such as tuberculosis, HIV/AIDS, dengue fever and Japanese encephalitis, is increasing, Non-communicable diseases have increased, from 39.0% of total morbidity in 1986 to 61.6% in 2006, and from 41.8% to 61.6% of total mortality during the same period.

The health system

Administratively, the health system is divided into three levels: central (Ministry of Health); provincial (provincial health departments (PHDs), sometimes referred to as the provincial health offices or provincial health bureaus); and district level (district health offices, or DHOs). With respect to service delivery, four levels of organization officially exist: (a) central level (central and regional hospitals) managed directly by the Ministry of Health; (b) provincial level providers managed by PHDs; (c) district level providers, also managed by the PHDs; and (d) commune level providers managed by the DHOs.

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³ This section of the report is adapted from World Health Organization, "Rapid Health Assessment: Viet Nam," Ha Noi, May 2006.

⁴ 2006 figures are from General Statistics Office of the Ministry of Planning and Investment (2008), Summary results of the Vietnam Household Living Standards Survey 2006.

⁵ General Statistics Office, 2007, Statistical Yearbook of Vietnam 2006. Hanoi: Statistical Publishing House.

⁶ Latest estimates from General Statistics Office, 2003, Survey of Population change and family planning 1/4/2002. Hanoi: Statistical Publishing House.

⁷ Health Information and Statistics Division, Planning and Finance Department, Ministry of Health, 2007, Health Statistics Yearbook 2006, Hanoi: Ministry of Health

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Administrative Organization

The Ministry of Health is the governmental agency responsible for State management of the care and protection of the people's health. Responsibilities covered include preventive medicine, medical examination and treatment, functional rehabilitation, traditional medicine, human preventive and curative drugs, population and family planning (newly reassigned to the health sector), cosmetics affecting human health, food safety and hygiene, and medical equipment. The Ministry of Health is also responsible for State management of public services in the domains under its management and represents the owner interests of the State for capital investments in relevant enterprises.

Long-term policies and strategies for the health sector are expressed in periodic 5 and 10 year plans and strategies, as well as in decrees. Since the year 2000, the Ministry of Health has actively participated in developing new laws related to the health sector including: Law on the Protection, Care and Education of Children, Law on Pharmaceuticals, Law on HIV/AIDS control, Law on Organ Transplantation and Donation, Law on Control of Communicable Disease. Laws on Examination and Treatment and on Tobacco Control are currently being prepared.

Each of the 64 provinces (including 5 municipalities) has a provincial health department (PHD) which is part of the provincial government under the provincial people's committees (PPCs), including from a budgetary perspective. Only in poor provinces do PHDs depend on the national government for a large part of their funding. Consequently, poorer provinces have less flexibility in implementing MOH policies than richer provinces. A PPC can also allocate funds directly to a district or commune, by-passing the PHD.

PHDs are responsible for assisting the PPCs in health care management at the local level. The organization, full-time staffing and operation of PHDs are overseen and managed by the PPCs, while professional competence is supervised and monitored by the central Ministry of Health.

In addition, each district also now has a district health office (DHO). DHOs are professional agencies under the management of District People's Committees (DPC), performing the State management functions of protection, care and promotion of people's health within the districts.

The DHOs are responsible for all of commune health stations (CHS) in their districts. The district general hospital and the preventive health centers remain under the authority of the PHD but are expected to continue to provide professional mentoring at the commune level and in many cases also perform health insurance processing services for the communes. The head of the DHO reports both to the director of the provincial health department (PHD) and to the chairman of the DPC.

Service provision

There are some 50 hospitals, institutes and medical universities that are centrally administered by the Ministry of Health. This includes 13 general hospitals and 22 specialized hospitals.

In each province there is at least one general hospital with 200 to 1000 beds, usually divided into seven departments (internal medicine, obstetrics and gynecology, surgery, pediatrics, communicable diseases, traditional medicine, and an emergency ward). While this type of hospital is meant to be a referral hospital only, a number of patients get care at provincial hospitals without being referred from lower levels. Most provinces also have specialized centers or hospitals.

The ratio of provincial general hospitals to district hospitals is about 1:5. The per capita availability of hospital beds is in the middle range for the region, higher than India, Indonesia and the Philippines, but lower than China, Malaysia and Thailand.[®] The per capita provision of government hospitals and hospital beds is higher in the northern and central highlands, but access to hospital services in terms of travel time is still poor compared to other areas.

⁸ WHO Statistical Information System, 2008, accessed at http://www.who.int/whosis/en/ on 17/03/2008.

Primary care services are provided by CHSs which typically provide a range of basic services, such as MCH (including normal deliveries), family planning, infections, treatment for acute respiratory immunization and treatment of common ailments. Over the last thirty years Viet Nam has established an extensive network of CHSs throughout the country, based on population norms and geographical access. Mountainous and highland areas are allowed more CHSs, however some areas are still underserved, not only because of their difficult terrain, but also because of their inability to attract and retain health workers. In order to supply some very basic services to populations in remote areas, the Government has revived the village health worker strategy (members of the community with some basic health training).

The head of a CHS, normally a doctor but sometimes an assistant-doctor, is selected by the local commune people's committee and the DHO director. A study on the management capacity of heads of CHSs covering 10 provinces found that their planning and budgeting competencies were not in line with good practice. These findings might partly be explained by the fact that the heads of CHSs have virtually no control over their resources.

In addition to the facilities under the Ministry of Health, a number of public curative care and consultative facilities (41 hospitals (including two in Lao PDR) and 17 rehabilitation sanatoria and 5 health centers) have been established by other ministries and sectors, including Police, National Defense, Agriculture, Industry, Transport and Communications, Coal, Rubber, and Coffee. These facilities include dispensaries in factories, enterprises and plantations, as well as general hospitals, sanatoria and rehabilitation centers for the treatment of occupational diseases. Except those established under the Ministry of Police and the Ministry of National Defense, most hospitals of other sectors are equivalent to district level facilities of the Ministry of Health. During the past ten years, socio-economic and business management changes, and the integration of some ministries resulted in many changes in this group - some larger health facilities emerged, while in other cases facilities were transferred to the Ministry of Health, became

autonomous facilities, or were closed or changed into polyclinics.

Private sector

The decree on private practice allows staff working in public health facilities to have a private practice after working hours, providing they have at least five years experience in a public health facility. Hence many physicians working in the public sector see patients privately in the afternoons and evenings, typically in their own homes. Retired physicians can get licenses for full-time private health services. Physicians are allowed to charge fees for private health services, and they retain the fees that they charge. Nurses are allowed to work in a team led by a private physician or to apply for a license to provide some private services, such as injections and massage. These "after-hours" clinics have become increasingly popular with patients who wish to circumvent the inconveniences and what is often perceived to be a lower standard of care from public health facilities. By the mid-1990s, approximately 80% of publicly employed physicians also provided private health care. Private health facilities provide mainly curative services and, like public providers, are expected to operate according to existing laws and regulations.

Little is known about the total size of the private sector, especially since many private providers are not licensed. General practitioner's clinics constitute the largest proportion of private health facilities, apart from drug sellers. The number of private hospitals has grown to 62 with 4,456 beds in 2006 (compared to 998 public hospitals with 136,603 beds under the government health sector). It is estimated that about 70 % of private facilities are in urban areas. However, a 2001 community-based survey conducted in Hung Yen, a rural province with a moderate rate of poverty, showed that:

- the private sector is far bigger than stated by the government (double the size of the CHS system), but concentrates mainly on curative care and drug sales;
- The private workforce was 1.9 times higher than the CHS workforce; and
- 25% of all private providers are public health staff, including 37% of CHS staff.

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SECTION 2

METHODOLOGY

Conceptual framework

The report's conceptual framework focuses on four areas: high-level health outcomes (i.e., maternal and child mortality, morbidity, nutrition and fertility), key intermediate outcomes causally related to these highlevel health outcomes (for example, family planning, antenatal care, obstetric delivery care, and immunization), related health services (including their physical proximity, quality and affordability), and underlying factors at both the community and individual/household levels (including both observed characteristics such as age, sex, education, ethnicity, income and location, and unobserved factors, such as historical experience, genetic factors and individual preferences) that affect the utilization of health services and high-level health outcomes directly. The conceptual framework is presented in Figure 1.

Measurement of inequality

The measurement of inequalities in health outcomes is a critical part of the situational analysis, which draws heavily for this purpose on a guide to health equity analysis recently published by the World Bank.⁹ The main analytical tools used to measure health

Figure 1. Conceptual framework used in the situational analysis



______ Owen O'Donnell, Eddy van Doorslaer, Adam Wagstaff and Magnus Lindelow, Analyzing Health Equity Using Household Survey

Data, World Bank Institute Learning Resources Series. The World Bank, Washington DC (2007).

inequalities in this report are: population-weighted quintiles, the concentration curve, the concentration index and living standards measures. These are described briefly below, but they are described in considerably more detail in the World Bank guide. Population-weighted quintiles

A widely used methodology to characterize inequalities in health outcomes is the tabulation of outcomes by population-weighted quintiles. A quintile is 20% (onefifth) of the units in some group of interest (for example, individuals in a population), usually ranked (ordered) according to some measure of living standards, such as per capita household consumption or a wealth index. Quintiles can be defined for any unit, including individuals, households, births, deaths, women, children or even provinces. If the unit is all individuals in a population, the guintiles are populationweighted and refer to 20% of the total population. All quintiles used in this report are population-weighted quintiles, defined on the basis of the total population; and all are ranked by one of several possible living standards measures (for example, per capita household consumption or a wealth index). This report refers to the poorest 20% of the population as the population in the "poorest" quintile, the next poorest 20% of the population as the population in the "next poorest" quintile, and so forth.

The same population-based quintiles are used to analyze any outcome indicator. For example, when looking at how fertility varies by quintile, the quintiles are defined on the basis of the total population (both sexes and all ages), not on the basis of women in childbearing ages or the number of births. This implies that the relative frequencies across guintiles will vary depending on the variable being analyzed. For example, when tabulating the mean number of children ever born (CEB) to women ages 15-49 by population-weighted guintile, the number of women in each quintile is likely to vary across quintiles (i.e., 20% of the women will not be in each quintile). If alternative living standards measures (LSM) are used to define population-weighted quintiles, the number of women in each quintile will generally vary according to which LSM is used.

Concentration curve

Although quintile tabulations are very commonly used to characterize inequalities in health and other outcomes, they have certain limitations. Firstly, the results depend critically on which unit is used to form the quintiles, for example, the total population, households, or some other unit relevant to the variable being analyzed (for example, women in child-bearing ages, in the case of fertility). Secondly, use of alternative LSMs to define quintiles means that the individual units classified into a given quintile are likely to vary from one LSM to the next (as in the example provided above). This may not affect the results in some cases, but it is more likely to affect the results significantly if the variable being analyzed is highly skewed (for example, out-of-pocket expenditure on inpatient care) or if the variable being analyzed occurs infrequently (for example, maternal or child deaths).

Both of these limitations introduce instability into characterizations of inequality using quintiles. The concentration curve does not have these limitations because it does not require classifying individuals into groups (e.g., quintiles). The concentration curve depicts (on the y-axis) the cumulative distribution of a health outcome of interest (for example, the cumulative number of births reported by a woman) against (on the x-axis) the cumulative number of relevant individuals (the cumulative number of women in this example), with the individuals ordered from poorest to richest using some LSM (discussed below). An important requirement of the concentration curve is that the health outcome must be measured in units that can be aggregated across individuals (for example, number of births or whether or not a child has been completely vaccinated). Assuming that the health outcome has positive value (for example, the number of antenatal visits obtained for the most recent birth), the resulting distribution is said to favor the poor (or disfavor the rich) if the concentration curve lies above the 45⁻⁻ line of equality (implying in this example that poorer women obtain proportionately more antenatal visits than richer women) or to favor the rich (or disfavor the poor) if the concentration curve lies below the 45⁻ line of equality. The reverse is true if the health outcome has negative value, for example, death or

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malnutrition. The further the concentration curve lies from the line of equality, the more unequal is the distribution of the health outcome. If the concentration curve for a health outcome lies on the line of equality, there is no inequality in the distribution of that health outcome. Figure 36 provides an example of a set of concentration curves that depict inequality favoring the rich in three alternative indicators of antenatal care. Figure 58 provides an example of concentration curves that lie on (or at least very near to) the line of equality

Although the concentration curve is also affected by the choice of living standards measure used to rank individuals from poorest to richest, concentration curves are usually more stable than corresponding guintiles (since no instability arises from having to classify individuals into different quintiles). Comparisons between concentration curves can also usually be done visually, which is much easier than making comparisons between quintiles. The latter usually involves the use of arbitrary and sometimes misleading indicators, such as the ratio of the mean value in the richest quintile to that in the poorest quintile (thereby neglecting variations in other quintiles).

The concept of "dominance" is also important when interpreting one or more concentration curves. If one concentration curve lies everywhere above another concentration curve (except possibly at the extremes), that concentration curve is said to "dominate" the other concentration curve. The concept of dominance can be applied equally to the concentration curves of two different outcomes, of the same outcome at two different points in time (or in different countries), or of one outcome in relation to the line of equality or to the concentration curve of a living standards measure (i.e., a Lorenz curve). If one concentration curve dominates another, the ranking of the two curves in terms of their respective degrees of inequality is unambiguous. If, on the other hand, the two curves cross (as often occurs), their respective degrees of inequality are ambiguous. In this case, a summary measure, such as the concentration index (discussed below) must be used to compare their respective degrees of inequality, which necessitates a decision about how to weight inequality at different points along the distribution of the living standards measure. Dominance can also be

formally tested using procedures that are described in the previously referenced World Bank guide.

Concentration index

The concentration index (CI) is a summary measure of the degree of inequality in a health outcome. It is defined as twice the area between the concentration curve and the line of equality (the 45⁻⁻ line). If the concentration curve lies above the line of equality, the convention is to assign a negative value to the CI (and a positive value if the curve lies below the line of equality). If the concentration curve lies along the line of equality (i.e. no inequality), the CI has a value of zero. If the health outcome has positive value (for example, a woman's height), a CI with a negative value means that the distribution favors the poor, while a positive value would mean that the distribution favors the rich. If the health outcome has negative value (for example, morbidity), the opposite interpretations apply. The CI has some interesting properties, including:

- The CI is bounded between -1 and +1 as long as the health outcome (or any variable whose cumulative distribution is plotted on the y-axis) does not have negative values (it is not bounded otherwise, and if the health outcome has a zero mean, the CI is not even defined)
- The CI of a dichotomous variable (for example, complete immunization) is not bounded by -1 and +1 but is instead bounded (in large samples) by ?-1 and 1- ?, where ? is the mean of the dichotomous variable
- The CI is affected only by a change in the living standards measure that alters the rankings of individuals (i.e., a change in the distribution of the living standards measure will not affect the CI unless it changes the individual rankings)
- The CI can be zero because the concentration curve lies along the line of equality, but it may also be zero if the curve crosses the line of equality (for this reason, the CI and the concentration curve should be interpreted together)
- Multiplying the CI by 75 gives the percentage of the health outcome (when health inequality favors the rich) that would need to be redistributed (linearly) from the richer half of the distribution to the poorer half to arrive at a distribution with an index of zero.

Standard errors of the CI can be estimated, using procedures that are described in the World Bank guide.

Living standards measures

Choice of an appropriate LSM is a potentially important decision if multiple alternative living standards measures are available in a given survey, as is often the case. However, even if several alternative LSMs are not available, it is desirable to have some idea how the measure that is available (for example, the wealth index) is likely to affect the results.

The most desirable LSM would be a direct measure of the household's "permanent income" (i.e., the household's expected income over the long term, which in turn is a function of its human and physical capital, the social capital to which it has access, and the real interest rate). Unfortunately, "permanent income" is not directly observable, and it is necessary to use some observable proxy measure as an LSM. The most commonly used LSMs in health equity analysis are those based on directly measured household consumption (for example, per capita consumption or consumption per equivalent adult) and the wealth index (usually calculated as the first principal component of a set of indicators referring to housing characteristics and to the ownership of consumer durables). However, other LSMs may be available in some surveys, for example, LSMs based on direct measures of household income and/or wealth and/or indirect measures obtained as predicted values from an estimated regression function explaining variations in directly observed measures such as income, consumption or wealth (possibly estimated using data from another survey).

Annex 1 discusses the theoretical properties of alternative LSMs, compares their performance and assesses the extent to which the choice of an LSM makes a difference using data from the 1992/93 VLSS. The conclusion is that directly measured per capita consumption and the wealth index are the most reliable LSMs in the 1992/93 VLSS and that directly measured per capita income is the least reliable LSM. This is comforting since several of the surveys that provide recent data on a full range of health outcomes (as discussed in the following section) do not include any directly measured LSMs, but they do support a range of indirect measures, including the wealth index.

In addition to the choice of an appropriate LSM, in surveys where there is a choice, it is also necessary to decide whether and how to standardize the LSM for household size and composition. When an adjustment is made, the choice is between a per capita measure (i.e., dividing the LSM by household size) or some equivalence scale that reflects likely economies of scale in consumption and/or differences in consumption needs between adults and children (for example, the square root of household size). Estimating an appropriate equivalence scale can be tricky.¹⁰ Unfortunately, this has not been attempted (to our knowledge) for Vietnam. Instead, most of the Vietnamese poverty measurement, health equity and health financing literature uses per capita consumption as the LSM and a wealth index that is not adjusted for household size. We follow this practice in the situational analysis when using a directly measured LSM such as household consumption. However, to permit meaningful comparisons between surveys that do not all have direct LSMs, the situational analysis relies heavily on the wealth index, which is not normally adjusted for household size and composition (for reasons that are discussed in Annex 1).

Sources of inequality

It is important in this situational analysis not only to measure the extent of inequalities in key health outcomes and to assess how they have evolved over time but also to identify the factors that account for inequality or, in the case of little or no observed inequality, to see whether this is the result of offsetting factors (i.e., some working in the direction of increased inequality disfavoring the poor with others working in the opposite direction). We do this in two steps. Firstly, we use regression analysis to identify the underlying factors (Figure 1) that are most closely associated with each health outcome. We focus on the

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For a discussion of some of the issues, see Angus Deaton, The Analysis of Household Surveys: A Microeconometric Approach to Development Policy. Baltimore MD: Published for the World Bank by Johns Hopkins University Press, 1997.

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underlying factors because they play an important role both in determining high-level health outcomes directly and in affecting them indirectly via their direct effects on key intermediate outcomes. Secondly, we use the results from the regression analysis to decompose the CI to quantify the contribution made by each underlying factor to a given health outcome's inequality, taking into account not only the strength of the underlying factor's association with the health outcome but also the degree of inequality in the underlying factor's own distribution within the relevant population (i.e., its own CI).

Regression analysis

The regression analysis uses mainly linear regression models, including the linear probability model, because linear models are practical to use in the decomposition of the CI (discussed below). However, nonlinear regression models are also estimated for comparison purposes, including fixed effects logit models, grouped logit models, and fixed effects Poisson models.¹¹

The explanatory (right-side) variables used in the regression analysis are observed underlying factors, such as age, sex, education, income, ethnicity, religion and location (Figure 1). Intermediate outcome variables (for example, indicators of family planning use in the analysis of fertility) are not used as explanatory variables in the regression models explaining higherlevel outcomes for two reasons. Firstly, the intermediate outcomes are very likely "endogenous" variables (i.e., variables that are correlated with a model's random disturbance term and that therefore introduce bias into estimated relationships when included among the explanatory variables in a regression model), and the estimated relationships would therefore likely be biased and possibly misleading to policy makers. Secondly, their inclusion tends to mask relationships between higher level outcomes and the underlying factors because most intermediate outcomes are closely associated with the same underlying factors (as the analysis described below demonstrates).

A core set of right-side variables is included in all models, including age, sex, a woman's (or mother's) schooling, a summary measure of the schooling of all adult household members (including the woman's/mother's), ethnicity, an LSM (usually the wealth index), and a set of commune dummy variables to capture fixed effects at the commune level or above. Additional variables are included (for example, religion or household size) if they are statistically significant (at the 0.05 level) or if their omission affects the signs or significance levels of other explanatory variables.

Two alternative measures are used to characterize the schooling of adult household members, i.e., the highest grade of schooling completed by any adult household member (aged 15+) or the mean number of grades of schooling completed by all adult household members. Whichever of these two variables is most significant (i.e., has the largest estimated t-statistic) is included in a given model.

Ethnicity is represented by a dummy variable equal to one if the head of household's ethnicity is Vietnamese (Kinh), by far the dominant ethnic group in Vietnam, or Chinese (Hoa), a relatively small ethnic group that is also a traditionally privileged group. The ethnic dummy is equal to zero for all other ethnic groups.

Except where otherwise noted, the commune fixed effects are jointly significant in all models. Use of commune dummy variables to capture fixed effects has advantages and disadvantages. The main advantage is that they eliminate any bias that might otherwise be introduced into the regression estimates by unobserved factors at the commune level (or above). Examples of unobserved factors at the community level include local historical experience, the effectiveness of local leaders and mass organizations, and relative prices (including the prices of various types of health services). Unobserved factors also include the quality of available health services for which no information is collected in most household surveys.

¹¹ Nonlinear models can also be used to decompose a CI, but this requires use of a linear approximation to the nonlinear function at a given point (for example, at the sample means), which in most cases provides approximately the same results as using a linear model from the start. See O'Donnell et al. (2007), Chapter 11, for a discussion of the use of nonlinear models in health equity analysis.

The main disadvantage of including the commune dummies to control for fixed effects is that no other community-level variables (for example, a dummy variable indicating urban location or indicators of the physical proximity of health services located outside the commune) can be included in the model. However, we also do commune-level analysis of the estimated fixed effects to see which commune-level characteristics are most closely associated with the estimated fixed effects.¹² The explanatory variables in the commune-level analysis include selected indicators from commune questionnaires when available¹³ (for example, indicators of physical proximity to health services, access to roads, and information on natural catastrophes affecting the commune), commune-level sample means of selected household indicators (for example, per capita household consumption, level of adult schooling, Vietnamese/Chinese ethnicity, access to safe water and sanitation, housing quality, use of modern cooking fuels, and immunization of children under age 10), and indicators of geographical location (i.e., region and urban-rural location). In cases where multiple commune-level indicators are available for a particular characteristic (for example, access to safe water and sanitation, housing quality or use of modern cooking fuels), we use the first principal component of the available indicators as an index of the characteristic, changing the signs if necessary so that higher values of the index correspond to more desirable values.

When interpreting the results of the regression analysis it is important to appreciate its limitations. One important limitation is that the estimated regression coefficients are still susceptible to bias introduced by unobserved individual, household and village-level variables. For example, a significant relationship between a given health outcome and a woman's schooling does not necessarily imply that the relationship is causal, i.e., that a policy to increase women's schooling, even if successful, would have the estimated effect. Although a mother's/woman's schooling is clearly a "predetermined" variable in the context of maternal and child health outcomes, her schooling may have been determined by unobserved time-invariant factors (for example, genetic characteristics or individual preferences) that also directly affect maternal and child health outcomes. In other words, levels of schooling (as well as household income and even religion) may also be "endogenous" variables.

Decomposition of the concentration index

Decomposition of the CI, following procedures described in O'Donnell et al. (2007), is the final step in the analysis. It tells us which factors contribute most to the observed inequality in a given health outcome. The contribution of a given factor to the observed inequality (for example, a woman's schooling) depends on the product of its estimated elasticity with the health outcome at the sample means¹⁴ and the CI of the factor itself (i.e., the CI of the woman's schooling, in this example).¹⁵ Again, when interpreting the results of the decomposition of the Cl, it should be recognized that they do not necessarily reflect causal relationships (since some of the estimated coefficients from the regression analysis may be biased, as discussed above). In addition, the estimated contributions of individual factors to the observed inequality do not directly reflect their statistical significance, i.e., statistically insignificant factors in the regression analysis may make large estimated contributions to the CI if their estimated elasticities and/or CIs are relatively large in magnitude.

¹² The procedures for doing such commune-level analysis are discussed in O'Donnell et al. (2007).

¹³ In some of the household surveys (e.g., the 1992/93 VLSS and 2006 MICS III), the commune questionnaire was administered only in rural communes.

¹⁴ The estimated elasticity at the sample means is in turn equal to the product of the estimated coefficient in a linear regression model and the ratio of the sample mean of the factor to the sample mean of the health outcome)

¹⁵ The negative values of indexes of characteristics created using principal components analysis are transformed for purposes of the decomposition to remove negative values (i.e., the lowest negative value is subtracted from the index) to avoid working with concentration indexes that exceed the normal bounds of -1 and +1.

SECTION 3

DATA SOURCES

Household survey data

Viet Nam is relatively rich in household surveys, most of which have been conducted during the past 15 years and many of which include health data. The household surveys with health data include:

- 1992/93 Vietnam Living Standards Survey (1992/93 VLSS)
- 1997/98 Vietnam Living Standards Survey (1997/98 VLSS)
- 1997 Demographic and Health Survey (1997 DHS)
- 2002 Demographic and Health Survey (2002 DHS)
- 2000 Multiple Indicator Cluster Survey II (2000 MICS II)
- 2006 Multiple Indicator Cluster Survey III (2006 MICS III)
- 2001 Survey on the Situation of Women and Children in Ten Districts (2001 TDS)
- 2001/02 Viet Nam National Health Survey (2001/02 VNHS)
- 2002 World Health Survey (2002 WHS)
- 2002 Vietnam Household Living Standards Survey (2002 VHLSS)
- 2004 Vietnam Household Living Standards Survey (2004 VHLSS)
- 2006 Vietnam Household Living Standards Survey (2006 VHLSS)

In some cases, comparable surveys with health data have been repeated at regular intervals (for example, the VLSS, the VHLSS, the DHS and MICS surveys), and some provide panel (longitudinal) data (as discussed below). Several of these surveys provide data on a wide range of health and other variables relevant to the situational analysis. However, not all of the surveys include the same variables, and the characteristics of their samples also make some surveys more useful than others for the situational analysis. The available surveys are reviewed in Annex 2. The review focuses on the following characteristics of each survey:

- The sample
- Information on high-level health outcomes
- Availability of living standards measures
- Information on preventive health care utilization
- Information on curative care utilization
- Information to support regression analysis

The main findings of the review are summarized below (readers desiring more detail can refer to Annex 2).

Sample characteristics

Sample size is important because the situational analysis focuses on mothers (i.e., women in childbearing ages 15-49, and for some purposes only women who have recently given birth) and children (for most analyses, children under 5 but in some cases, even narrower age groups of children). Because these groups can be small sub-samples of the total sample, reliable health equity analysis requires relatively large samples. Some of the surveys have sample sizes that are too small and/or too narrow in geographical coverage to support meaningful health equity analysis (for example, the 2001 TDS covers a narrow geographical area, with primary sampling units (communes) that were selected purposively from the ten purposively selected districts).

In addition to sample size, it is also important to consider whether the samples include panel data (longitudinal data). Several of the surveys have panel data, i.e., the 1993 and 1998 VLSS and the 2002, 2004 and 2006 VHLSS. In addition, the 2000 MICS II and 2006 MICS III surveys were conducted in the same communes (although clusters and households within

the sample communes were randomly selected).

Information on high-level health outcomes

The situational analysis focuses on maternal and child mortality and closely related health outcomes. It is therefore important to consider the types of information available on the following high-level health outcomes: maternal and child mortality, morbidity, nutritional status and fertility. In terms of child mortality, complete birth histories are available in the 1993 and 1998 VLSS, the 1997 and 2002 DHS and in the 2002 WHS. Data on the number of CEB and on the number of surviving children are also available in the 2000 MICS II, the 2006 MICS III, and the 2001 TDS, while the 2001/02 VNHS provides data on all household deaths during the past three years. On the other hand, there are no data on infant/child mortality in the 2002, 2004 or 2006 VHLSS.

Direct data on maternal mortality are only available in the 2001/02 VNHS, which collected data on the death and cause of death of any household member during the previous three years. However, although the 2001/02 VNHS has the largest sample of the surveys reviewed (i.e., 36,000 households), only 7 maternal deaths were reported. Sibling mortality data were also collected in the 2000 MICS II and 2006 MICS III and in the 2002 WHS.

The 1992/93 and 1997/98 VLSS and the 2001/02 VNHS collected anthropometric data (i.e., height and weight) for most household members, including women and children. In addition, the 2000 MICS II collected anthropometric data for children under 5. Although no anthropometric data were collected in the 2006 VHLSS, the National Institute of Nutrition collected anthropometric data separately for children under 5 in the 2006 VHLSS sample households and the datasets can be linked to analyze inequalities in child nutrition.

Most of the household surveys also collected some morbidity data, i.e., usually information on illnesses

and injuries during the past 4 weeks. The exception is the 2002 VHLSS, which did not collect any data on morbidity. The 1997 and 2002 DHS and the 2000 MICS II and 2006 MICS III collected morbidity data only for children under 5 during the past 2 weeks (and limited to diarrhea, cough and fever).

Availability of living standards measures

Several of the household surveys with health data provide data on direct measures of living standards, including household income, consumption and the net value of household assets (i.e., the 1993 and 1998 VLSS, the 2002, 2004 and 2006 VHLSS). No direct measures of living standards are available in either the 1997 or 2002 DHS or in the 2000 MICS II or 2006 MICS III. However, these surveys collected at least some data on household consumer durable ownership and housing characteristics, thereby permitting estimation of a "wealth index." In addition, most of the surveys collected some data on other correlates of household income, so it is also possible to develop indirect estimates of the LSMs, as was done in the analysis of the 2001/02 VNHS.¹⁶

Information on preventive health care

The available household surveys with health data vary considerably in their coverage of preventive health care. The most comprehensive data on preventive health care are available in the 2000 MICS II, the 2006 MICS III and in the 2001/02 VNHS, followed by the 1992/93 and 1997/98 VLSS, the 1997 and 2002 DHS, the 2001 TDS and the 2002 WHS. Unfortunately, there are no data on preventive health care in the 2002, 2004 or 2006 VHLSS. Most of the surveys with any data on preventive health care provide at least some data on antenatal care, obstetric delivery care, breastfeeding, weaning foods and immunization for a woman's lastborn child, as well as information on current use of family planning. In contrast, information on neonatal care is limited to the child's weight at birth and (in some surveys) delay in initiating breastfeeding, while information on nutritional supplements is limited to

¹⁶ See Sarah Bales, "Technical documentation for the Viet Nam National Health Survey 2001-02," SCB Statistics Sweden International Consulting Office, Hanoi, September 2003.

vitamin A supplements (usually for the last born child but also for pregnant women in some surveys). Only the 2001/022 VNHS collected data on postnatal care (i.e., whether the mother had a postnatal checkup within 42 days of giving birth), while only the 2001/02 VNHS, the 2002 WHS and the 2006 MICS III collected data on the availability and use of insecticide-treated mosquito nets for malaria prevention.

Information on curative care

Most of the surveys collected some information on curative health care utilization for both children under 5 and for women ages 15-49. However, several of the surveys collected data only on curative care provided to children under 5 in connection with diarrhea, a cough or fever (i.e., the 1997 and 2002 DHS, the 2000 MICS II and the 2006 MICS III). Data on outpatient care collected in the 2002 and 2004 VHLSS appear to be seriously under-enumerated. Several of the selected surveys also collected data on out-of-pocket expenditure on curative health care. The most detailed data were collected in the 2001/02 VNHS, followed by the 2006 VHLSS. However, no expenditure data were collected in either the 1997 or 2002 DHS or in the 2000 MICS II or 2006 MICS III, and the out-of-pocket expenditure data collected in the 2001 TDS refer to aggregate household expenditure (i.e., not for individual household members).

Information to support regression analysis

Most of the surveys (except the 2002 WHS) collected some community data (usually information on the characteristics of the sample commune, including distance and/or travel time to the nearest health facilities/providers of various types), and several also collected data directly from health facilities (i.e., the 1998 VLSS, the 1997 and 2002 DHS, the 2002 VNHS and the 2006 VHLSS). In addition, several surveys collected data on health insurance coverage (i.e., the 1998 VLSS, the 2002 VNHS, the 2002 WHS and the 2004 and 2006 VHLSS). Most of the surveys also collected data on a wide range of other characteristics associated with maternal and infant/child health outcomes and utilization of MCH preventive care. However, the 2000 MICS II and 2006 MICS III and the 1997 and 2002 DHS collected less information of this type.

Conclusions regarding household survey data

The 2006 MICS III provides the most up-to-date data on a broad range of infant/child and maternal health outcomes and related preventive health services. Its main disadvantages are the absence of direct living standards measures, limited data on morbidity and curative care, and the absence of data on nutritional status (i.e., anthropometric data). However, the MICS III includes many variables to support the estimation of indirect living standards measures such as a wealth index or indirectly estimated levels of household per capita consumption (the main missing information relates to employment and occupation). These indirect living standards measures can be estimated (and validated) using the direct measures of living standards available in the 2006 VHLSS, which also has extensive data on morbidity and curative care utilization and anthropometric data collected separately by the National Institute of Nutrition. Accordingly, the 2006 MICS III and the 2006 VHLSS in combination provide a comprehensive source of recent data for the situational analysis.

For purposes of estimating trends over time in the inequality of maternal and child mortality and related health outcomes, the data in the 1992/93 VLSS are used to obtain early estimates of inequality in child mortality, maternal and child nutritional status, maternal and child morbidity, antenatal care, obstetric delivery care, immunization and family planning.¹⁷

Administrative data

Province-level health equity analysis can also be done in Viet Nam using a wide range of routinely collected administrative data. The main source of these data is the Ministry of Health (MOH) Health Information System (HIS).¹⁸ Much of this information is published

¹⁷ Other surveys conducted between 1992/93 and 2006 also provide similar data. However, limited time did not permit the analysis of these other data sets.

¹⁸ For a detailed description of the MOH HIS, see Ministry of Heath, Viet Nam Health Information System Review and Assessment, Department of Planning and Finance, Hanoi (December 2006).

annually in the MOH Health Statistics Yearbooks, where it is supplemented with data from such additional sources as the Ministry of Finance (MOF) and the General Statistical Organization (GSO). The main issues with respect to these routinely collected administrative data are accuracy and coverage. Accuracy suffers because many health workers do not have enough time and motivation to ensure that their statistics are complete and accurate and, in some cases, they have incentives to misreport data on the level of services provided. Coverage is partial in some cases because provinces have to report to the MOH before they may have received reports from all their districts (and similarly, districts may have to report to provinces before they have received reports from all their communes). Coverage is also partial because many health services are provided in the private sector and are therefore not included in the HIS.

Province-level health equity analysis also requires a province-level measure of living standards. Annual province-level estimates of GDP per capita in constant VND are available. However, there are large differences between GDP per capita and average household incomes in some provinces (for example, in the main oil-producing province of Ba Ria Vung Tau). Accordingly, it is desirable to adjust the annual province-level estimates of GDP per capita by the 2002 estimates of mean household income per capita that can be obtained from the relatively large 2002 VHLSS.¹⁹

¹⁹ Although data on both household income and consumption were collected for a limited sample of 30,000 households in the 2002 VHLSS, income data were collected for an additional 45,000 households (i.e., for 75,000 households in total). This sample is sufficiently large to provide reliable province-level estimates of mean household income in 2002.

SECTION 4

NEQUALITIES IN HIGH-LEVEL HEALTH OUTCOMES

This section of the situational analysis estimates and analyzes inequalities in maternal and child mortality, child morbidity, children's nutritional status and fertility. The discussion below summarizes the main findings of a more detailed analysis that is presented in Annex 3 (for the 1992/93 VLSS), Annex 4 (for the 2006 MICS III) and Annex 6 (for the 2006 VHLSS). In addition to the higher level outcomes discussed below, the morbidity of women ages 15-49 is analyzed further in Annex 3 and Annex 6, while the nutritional status of women ages 15-49 is also analyzed in Annex 3 (but not discussed here because very little inequality was observed in this outcome).

Child mortality

Although infant and child mortality is not nearly as rare an event as maternal mortality, increasingly large household surveys are required to obtain reliable estimates of under-5 mortality in Viet Nam for two reasons. Firstly, the number of births per woman in childbearing ages (15-49) has decreased sharply during the past two decades as Viet Nam has attained replacement-level fertility (i.e., a TFR of 2.1 currently). Secondly, infant and child mortality ratios have decreased even more sharply during the same time period. This has two implications for health equity analysis based on household survey data. Firstly, except with very large surveys, it is not practical to disaggregate the analysis by age at death, for example, to analyze separately neonatal, infant and child mortality, or to confine the estimates to a recent time period, for example, during the past year. Instead, the analysis below focuses either on under 5 mortality over a 10-year period or on the ratio of child deaths at any age to the number of CEB (although province-level analysis of indirect estimates of infant mortality during the past 12 months based on large population surveys conducted annually by GSO is also provided). Secondly, even when an extended period is used, estimates of the degree (and even the qualitative nature) of inequality in the distribution of child mortality are quite unstable with respect to the living standards measure used to rank households.

Early estimates

Early estimates of child mortality are obtained from the 1992/93 VLSS, which collected a complete birth history for 6,059 women ages 15-49 from 4,800 sample households, 2,987 of whom reported one or more births.

Inequality estimates

Figure 2 shows concentration curves for the number of children born during the 10-year period 1982/83-

Figure 2. Concentration curves for under-5 mortality among children born during the past 10 years (1982/83-1992/93) to women ages 15-49 using two alternative LSMs, 1992/93 VLSS



Source: 1992/93 VLSS

1992/93 who died before reaching age 5, constructed using two widely used alternative living standards measures (LSM), i.e., directly measured per capita consumption and the wealth index. The concentration curves indicate that in this case the choice of LSM makes a critical difference. Using per capita consumption as the LSM yields a concentration curve that lies below the 45° line of equality (proportionality) from approximately the 10th to 80th percentiles of births and is otherwise on or near to the line of equality. In this case, there is limited inequality in under 5 mortality disfavoring middle-income children (the concentration index (CI) = +0.063). However, if the wealth index is used as the LSM, the concentration curve lies above the line of equality from about the 20th percentile to the 90th percentile of births, in this case favoring middle-income children (the CI = -0.103).²⁰ These differences in the CI between LSMs are statistically significant at the 0.05

Figure 3. Concentration curve for the proportion of children ever born who have died at any age among women ages 15-49 with at least one birth using alternative LSMs, 1992/93 VLSS



Source: 1992/93 VLSS

level.²¹ Unfortunately, there is no solid basis for determining which set of estimates is more reliable.

For comparability and because the MICS does not collect a complete birth history, but only the cumulative numbers of births (CEB) and the cumulative number of child deaths at any age for women ages 15-49, we also present the corresponding concentration curves for the proportion of CEB who died at any age (Figure 3). These concentration curves are obtained by weighting the sample of women by the number of their CEB. They also indicate that the choice of LSM is critical, i.e., there is very little inequality in child mortality if per capita consumption is used as the LSM (CI = +0.010), whereas there is a significant degree of inequality favoring richer children if the wealth index is used as the LSM (CI = -0.151). The difference between the two CIs is also statistically significant in this case.

Regression analysis

Regression analysis can be used to identify the underlying factors associated with child mortality in Viet Nam at this time. We focus the regression analysis on the proportion of children ever born who have died at any age in order to obtain comparable results to those obtained using the 2006 MICS III data.²² Two alternative model specifications are used in the regression analysis: one that includes indicators of the woman's nutritional status (i.e., her height and body mass index (BMI)), and one that does not include the woman's nutritional status indicators (since adult nutritional status indicators are not available in the MICS). The other explanatory variables in the model are the woman's age, the highest grade of schooling completed by the woman, the highest grade of schooling completed by any household member aged 15+, a dummy variable indicating whether the head of household's ethnicity is Vietnamese or Chinese, an LSM (i.e., either the wealth index or directly measured per capita consumption), and commune dummy variables to capture fixed effects at the commune level

²⁰ The instability in the estimates of inequality in child mortality is probably due to the fact that child mortality is a relatively rare event. Consequently, even limited changes in the rankings of individual households can have a significant effect on the estimate of inequality.

²¹ Unless otherwise indicated, "statistical significance" means significant at the 0.05 level in this report

²² It would be preferable to apply a duration model to the individual birth data from the complete birth history that is available in the 1992/93 VLSS, but this type of analysis is not possible with the MICS data.

or above. Two alternative statistical models are used, i.e., a linear regression model with the proportion of CEB who have died as the left-side variable and using ordinary-least-squares (OLS) estimation and the cumulative number of each woman's births as a frequency weight (the 199293 VLSS sample is self-weighting) and a grouped logit model with the number of child deaths at any age as the number of "positive responses" and CEB as the "total population." A total of eight models are estimated (i.e., two alternative model specifications, two alternative LSMs and two alternative statistical models).

The results indicate that the mortality ratio is significantly related to the woman's age (positively) in all models, as expected (since the woman's age proxies for children's exposure to the risk of death), to the woman's height (negatively, but only at the 0.10 level in 3 of the 4 models in which this variable is included), to the highest grade of schooling completed by any household member (negatively) in all models, to

Vietnamese or Chinese ethnicity (negative, but only in the linear regression model and only at the 0.10 level), and to the woman's own schooling (but only in the grouped logit model with per capita consumption as the LSM and only in the specification that does not include indicators of the woman's nutritional status). It is surprising that the woman's own schooling is statistically significant in only one of the eight models estimated, whereas the highest grade of schooling completed by any adult household member is significant in all eight models. This suggests that in Viet Nam child mortality analysis that considers only the mother's schooling may provide misleading results.²³ Another unexpected finding is that neither LSM is statistically significant at even the 0.10 level in any of the eight models estimated.

Decomposition of the inequality in child mortality at any age

The estimated linear regression models that do not include indicators of the woman's nutritional status (for





Source: Annex 3, Tables 4 and 5

²³ If the highest grade of schooling completed by any household member aged 15+ is omitted from the model (unreported regression), the estimated coefficient of the woman's own schooling becomes significant in all four models, while retaining its negative sign.

comparability with the MICS III) are used to decompose the CI for the proportion of CEB who have died at any age based on two alternative LSMs (directly measured per capita consumption and the wealth index). The results are summarized in Figure 4, which shows the contributions of each factor to the observed inequality. With the CI based on the wealth index, the largest absolute contributions (negative, since the CI in the estimation sample is -0.120) are from the wealth index and the highest grade of schooling completed by any adult household member, followed by Vietnamese or Chinese ethnicity. These negative contributions are partially offset by positive contributions from the commune fixed effects and the woman's age. These results are a bit surprising in light of the results of the regression analysis on which they are based (for example, the statistical insignificance of the wealth index in the regression models). However, the estimated contribution of a variable to the CI depends not only on the magnitude of its estimated elasticity (which reflects its statistical significance) but also on the level of its own CI (for example, the CI of the wealth index itself). The decomposition of the CI using per capita consumption as the LSM is less satisfactory, as evidenced by the large estimated "residual" contribution offsetting the almost equally large contribution of the commune fixed effects. However, except for the markedly different contributions of the LSMs themselves, Figure 4 indicates that the two decompositions are similar.

Commune-level analysis of the estimated fixed effects from the regression models using both the wealth index and per capita consumption as the living standards measure is not very informative. Two models were used: one for all sample communes (N=150) that did not include any indicators from the commune questionnaire (which was administered in rural communes only) and one for rural communes (N=111). The explanatory variables in the first model (for all sample communes) include commune sample mean levels of (1) per capita consumption, (2) adult schooling (mean number of grades completed by persons aged 15+), (3) annual malaria incidence per capita, (4) the proportion of the population in households headed by an ethnic Vietnamese or Chinese, (5) the proportion of children under 10 that were completely vaccinated (4 vaccines), (6) the

proportion of the population using gas, electricity or kerosene as their main cooking fuel, commune-level indexes of (7) access to safe water and sanitation and (8) the quantity and quality of housing, and dummy variables indicating whether or not (9) the commune is urban and the (10) the region in which the commune is located. The second model (for rural communes only) included all of the explanatory variables in the first model plus (11) the number of disasters in the commune during the past 5 years, (12) whether or not malaria was cited first as a main health problem facing the commune, and commune-level indexes of (13) access to health services and (14) access to roads. The explanatory variables together account for only 12-15 percent of the variation in the estimated commune fixed effects. None of the explanatory variables is statistically significant at the 0.05 level, and the estimated coefficients of the dummy variables referring to geographical regions are also jointly insignificant.

Recent estimates 2006 MICS III

The 2006 MICS III collected data for 9,471 women ages 15-49 in 6,843 households. Of these women, 6,283 reported one or more births, and for them, information was collected on the number of their children ever born (CEB) and on the number of their children who died at any age. Unlike the 1992/93 and 1997/98 VLSS and the 1997 and 2002 DHS, the MICS III did not collect a complete birth history.

Inequality estimates

Figure 5 shows the concentration curves for the number of CEB who have died at any age using 4 alternative LSMs (all indirect). All of the concentration curves lie above the 45⁻⁻ line of equality (proportionality), indicating that poorer women are more disadvantaged by child mortality. The CIs range from -0.108 (predicted per capita wealth) to -0.155 (the wealth index). However, most of the differences between the CIs are not statistically significant.

The CIs for the proportion of CEB who have died at any age, using the wealth index as the LSM, are almost exactly the same for the 2006 MICS III and the 1992/93 VLSS (-0.155 and -0.151 respectively). Under

Figure 5. Concentration curves for the proportion of children ever born to women ages 15-49 with at least one birth who have died at any age, using alternative LSMs, 2006 MICS III



Source: 2006 MICS III

these circumstances, it would be difficult to argue that there has been an overall change in the degree of inequality in child mortality during the intervening 15 years. However, the nature of the inequality appears to have changed to some extent. Figure 6 shows the concentration curves for child mortality at any age for 1992/93 and 2006. Although the curve for 2006 does not "dominate" the curve for 1992/93, it indicates slightly more inequality in child mortality among the poor and the rich.

Regression analysis

The 2006 MICS III data can be used to estimate linear regression models to identify the underlying factors most closely associated with child mortality. The left-hand side variable is the proportion of CEB that have died. The estimation sample is woman ages 15-49 with at least one birth, and the women are weighted by their CEB. The explanatory variables include the woman's age, her age squared, the highest grade of schooling completed by the woman, the highest grade of schooling completed by any household member aged 15+, a dummy variable indicating whether the head of household is ethnic Vietnamese or Chinese, an

LSM (either the wealth index or the predicted level of per capita consumption), and commune dummy variables to capture fixed effects at the commune level or above. The results indicate that the proportion of CEB who have died at any age is significantly related to the woman's age (positively), to the highest grade of schooling completed by the woman (negatively), to the highest grade of schooling completed by any household member aged 15+ (negatively) and to Vietnamese or Chinese ethnicity (negatively, but only at the 0.10 level). Most of these results are as expected and are similar to those obtained using the 1992/93 VLSS data. However, the woman's own level of schooling is negative and statistically significant in both models estimated with the 2006 MICS III (it was negative, but not significant, in any of the eight models estimated with the 1992/93 VLSS). Several factors could explain this change, including unobserved correlates of women's schooling but also including the possibility that more health education has been targeted to women in recent years that has been more effective among women with additional schooling. The

Figure 6. Concentration curves for the proportion of children ever born to women ages 15-49 with at least one birth who have died at any age, using the wealth index as the LSM, 1992/93 VLSS and 2006 MICS III



Source: 1992/93 VLSS and 2006 MICS III

one surprising result, which is nevertheless consistent with the results for 1992/93, is that neither of the LSMs is statistically significant (although both of the estimated coefficients are negative).

Decomposition of inequality

The estimated linear regression models are used to decompose the CIs for the proportion of CEB who died at any age. The results are summarized in Figure 7. They are broadly consistent with the 1992/93 decompositions depicted in Figure 4. The main difference is the larger relative contribution of the woman's own schooling and the smaller relative contributions of the LSMs and the commune fixed effects. The fact that the decompositions are similar for the two periods suggests that the degree of inequality has probably not changed much over time, as the CIs based on the wealth index indicate.

Province data

Inequality estimates

Figure 8 presents a concentration curve for provincelevel indirect estimates of infant mortality obtained with data from the April 2005 and April 2006 Surveys of Population Change and Family Planning (SPCFP). These surveys have been conducted annually by GSO since 2001 and utilize very large samples that support many types of province-level demographic estimates. The province-level indirect estimates of the IMR are considered to be relatively reliable compared to the direct estimates obtained from most household surveys (with the possible exception of the Demographic and Health Surveys). The living standards measure (LSM) used to rank provinces is mean monthly per capita household income in 2005. The province-level concentration curves in Figure 8 show a higher degree of inequality disfavoring the poor than the household survey estimates of child deaths in Figure 6 (the estimated CIs are -0.201 and -0.198 for 2005 and 2006 respectively, compared to -0.155 in Figure 6). This is surprising because measures of inequality among provinces reflect only inequality between provinces, not inequality within provinces.

Regression analysis

Province-level regression analysis of the indirect estimates of the infant mortality ratio (IMR) for 2005 and 2006 was also done. The right-side variables are: monthly per capita household income in 2005, the

Figure 7. Decomposition of concentration index (LSM=wealth index and indirect consumption) for proportion of children who have died at any age, 2006 MICS III



Source: Annex 4, Tables 3 and 4
Figure 8. Concentration curves (LSM=2005 mean monthly per capita household income) for infant mortality in 64 provinces, 2004/05 and 2005/06



Source: 2005, 2006 Surveys of Population Change and Family Planning (GSO)

mean number of grades of schooling completed by persons aged 20-29 in 2006 (obtained from the 2006 SPCFP), the ethnic minority population as a proportion of the total population in 1999 (from the 1999 Census), annual malaria incidence per 100,000 persons in 2005 (from the MOH Health Information System), population density in 2005 (based on population projections prepared by GSO) and the proportion of the population that resides in urban areas (from the same source). The results indicate that the province-level estimates of the IMR are significantly related to the proportion of the population that are ethnic minorities (positively), to the annual incidence of malaria (positively) and to per capita household income (negatively).

Decomposition of inequality

Figure 9 summarizes the results of the decomposition of the CI using 2005 mean monthly per capita household income as the LSM and the estimated province-level regressions discussed above. The results indicate that household income and ethnicity make the largest contributions to the observed inequality (disfavoring the poor), followed by malaria incidence. In contrast, schooling, population density

Figure 9. Decomposition of the CI (LSM=2005 monthly per capita household income) for infant mortality, 2005 and 2006



Source: Annex 5, Tables 2 and 3.

and urbanization contribute relatively little to the observed province-level inequality in infant mortality.

Conclusions

The available data suggest that there is a moderate degree of inequality in child mortality in Viet Nam disfavoring poorer women and their children that has persisted at least since 1992/93 (reflecting cumulative child mortality over several years) despite substantial reductions in overall infant mortality rates during this period. However, this conclusion is not definitive because of the fact that the choice of the LSM used with the 1992/93 data affects whether the distribution favors of disfavors the poor. The factors that contribute to the inequality in both years include: schooling (both the highest level of schooling completed by any adult household member and, increasingly, the woman's own level of schooling), ethnicity, and the wealth index. The relatively important contribution of the wealth index to inequality in child mortality stems not from being strongly related to child mortality (its estimated coefficient is statistically insignificant in all of the regression models estimated with both the 1992/93 and 2006 household survey data) but rather from its own relatively high CI (since the contribution of a variable to the CI for any health variable is the product of the variable's estimated elasticity with the health variable and its own CI). The distribution of province-level estimates of infant mortality (which are indirect estimates based on the large annual surveys of Population Change and Family Planning) suggests that there may be even more inequality in infant mortality than indicated by the household survey data. Household income, ethnicity and malaria incidence account for most of the observed inequality in infant mortality among provinces.

Maternal mortality

Maternal mortality is a notoriously difficult indicator to analyze because it is a relatively rare event, even in a developing country such as Viet Nam. As with infant and child mortality, the number of maternal deaths has also decreased sharply over time in Vietnam, due not only to sharp decreases in birth rates (which determine exposure to the risk of maternal death) but also due to decreases in the maternal mortality ratio, i.e., the number of maternal deaths per 100,000 live births. The usual approach (which is followed in this situational analysis) is to focus either on (crude) proxies for maternal mortality (as in this section of the report) or on its proximate determinants, for example, the type of obstetric delivery care obtained.

Early estimates

There are no reliable data on which to base early estimates of the degree of inequality in maternal mortality. For example, none of the household surveys conducted during the 1990s collected data on sibling mortality related to pregnancies and childbirth. Although the 1992/93 and 1997/98 VLSS did collect data on the mortality of mothers (without collecting any information on the cause of death), the number of maternal deaths among children 0-17 is too small to yield reliable estimates even of the distribution of maternal deaths from any cause.

Figure 10. Concentration curves for the proportion of sisters of household members aged 15+ who died during pregnancy, childbirth or within 6 weeks of childbirth by population-weighted quintile defined according to alternative LSMs (referring to the respondent), 2006 MICS III



Source: 2006 MICS III

Recent estimates

Inequality estimates

The 2006 MICS III collected data on sisters aged 15+ who died during pregnancy, delivery or within 6 weeks of having given birth. Concentration curves for the proportion of siblings who have died during pregnancy, childbirth or within 6 weeks of childbirth based on alternative LSMs are presented in Figure 10. These data indicate that there is probably some inequality in the distribution of maternal mortality disfavoring poorer women. However, the estimated CIs vary with the LSM used, from -0.029 (predicted per capita wealth) to -0.126 (the wealth index), and because of relatively large estimated standard errors (i.e., in the range of 0.06 to 0.07, stemming from the rarity of maternal deaths), none of the estimated CIs is statistically significant. Moreover, the LSMs used to construct the CIs refer to the respondent's household at the time of interview, not to the sibling's household at the time of death. Accordingly, there is an implicit assumption underlying the concentration curves in Figure 10 that a sibling's LSM ranking at the time of death is the same





Source: 2006 MICS III

as the respondent's LSM ranking at the time of interview, and this is a very strong assumption.

Figure 11 presents concentration curves for the proportion of children aged 0-17 whose mother is no longer living using alternative LSMs. These data are again suggestive of inequality in maternal deaths disfavoring poorer women. However, there is no information in these data about the cause of death (many of the deaths are undoubtedly due to infectious diseases and injuries), and the LSMs refer to the respondent's household at the time of interview, not to the mother's household at the time of death.

Regression analysis

It is not possible to apply regression analysis to sibling mortality or to children 0-17 whose mothers have died because the MICS understandably do not collect data on sibling characteristics or on the characteristics of deceased household members (for example, their age, income, education and location of residence at the time of their death).

Decomposition of inequality in maternal mortality

Decomposition of CIs for sibling mortality cannot be done in the absence of regression analysis.

Conclusions

There is very limited information available on the degree of inequality in maternal mortality in Viet Nam and even less about how it may have changed over time. However, the limited available information suggests that maternal mortality is unequally distributed, favoring the rich, as is the case with child mortality.

Morbidity in children under 5

Many infectious diseases (notably, pneumonia and other serious respiratory diseases, diarrhea and malaria) lead directly to infant and child deaths, although this has certainly become less common in Viet Nam. In addition, infectious diseases (and particularly diarrhea) are an important determinant of child "stunting" (i.e., low height for age) and of child "wasting" (low weight for height), both of which are important underlying causes of infant and child mortality.²⁴ In this section, we analyze inequality in several indicators of morbidity in children under 5. In the following section, we analyze inequality in indicators of children's nutritional status.

Early estimates

Inequality estimates

The 1992/93 VLSS collected data on up to one illness and injury for each household member during the previous 4 weeks, and if none was reported, during the previous 12 months. Information was also collected on the type of disease. However, the disease classifications are relatively crude and do not include many types of diseases common in children under 5. Although the disease categories do include diarrhea and dysentery, there appears to be substantial underreporting of diarrhea and dysentery that may well vary with household "income" (only 3.7% of children under 5 were reported to have been ill with diarrhea or dysentery during the past 4 weeks, compared to 7% of children under 5 who were reported to have had diarrhea during the past 2 weeks in the 2006 MICS III).

Figure 12 presents concentration curves (using the wealth index as LSM) for the reported incidence of diarrhea among children under 5 during the past 4 weeks and for any reported illness or injury among children under 5 during the previous 4 weeks and during the previous 12 months. The concentration curves indicate that there was a small (and statistically insignificant) degree of inequality disfavoring middleincome children in reported diarrhea during the past 4 weeks (CI = +0.04) but practically no inequality in the other two morbidity indicators. However, it is likely that there is a serious degree of under-reporting as well in the general morbidity of children under 5 (i.e., about 35% of children under 5 were reported to have been ill or injured during the past 4 weeks in the 1992/93 VLSS, compared to 55% in the 2001/02 VNHS in which a diary was used to record morbidity during the past 4 weeks). Accordingly, these results should be cautiously interpreted.







Regression analysis

Regression analysis is used to identify the underlying factors most closely associated with the three indicators of morbidity in children under 5 (i.e., diarrhea during the past 4 weeks, any illness or injury during the past 4 weeks and any illness or injury during the past 12 months). Two alternative model specifications are used: one that includes indicators of the mother's nutritional status (i.e., her height and body mass index) and one that does not include these indicators (for comparability with the MICS, which did not collect data on adult nutritional status). Two alternative statistical models are also used: a linear probability model and a fixed effects logit model.

The results indicate that under 5 morbidity is significantly related to the child's age (nonlinearly, including a sharp increase in reported morbidity during the first 12-15 months), to the child's sex (female children are significantly more likely to have reported

²⁴ See, for example, Robert Black et al., "Maternal and child undernutrition: global and regional exposures and health consequences," The Lancet, Vol 371 (January 19, 2008).

diarrhea or dysentery), to the mother's body mass index (negatively, but only significantly for any type of reported illness or injury during the past 4 weeks) and to the wealth index (negatively, but only significantly at the 0.05 level for any type of illness or injury during the past 12 months and at the 0.10 level for any type of illness or injury during the past 4 weeks). None of the other explanatory variables, including the child's sex, ethnicity, mother's schooling, or indicators of the father's nutritional status, is statistically significant in any model. The same results in terms of signs and significance levels were obtained using a fixed-effects logit model (unreported regressions).

Decomposition of the inequality in under 5 morbidity

Figure 13 summarizes the results of decompositions of the CIs for the three under-5 morbidity indicators. The results indicate that the wealth index and commune fixed effects are the main factors contributing to the CIs for all three morbidity indicators and that these two factors partly offset one another. However, the contribution of commune fixed effects is very large in the case of morbidity due to diarrhea and dysentery, contributing +0.112 to the estimated CI of +0.041. Accordingly, it is useful to do commune-level analysis of the estimated commune fixed effects to see what they may represent.

Unfortunately, the results of commune-level regression analysis of the estimated commune fixed effects for all three child morbidity indicators are not very informative, even in the case of diarrhea morbidity. The R-squares are low, few of the estimated coefficients are statistically significant, and among these few, there are several with unexpected or inconsistent signs.

Recent estimates The 2006 MICS III

Inequality estimates

The 2006 MICS III collected data for children under 5 on the incidence of diarrhea, cough, pneumonia symptoms (i.e., cough, difficulty breathing in chest), and a fever during the past two weeks. Figure 14 shows concentration curves for these morbidity

Figure 13. Decomposition of the concentration index (LSM=wealth index) for two under-5 morbidity indicators, 1992/93 VLSS



Source: Annex 3, Tables 11-13

Figure 14. Concentration curves (LSM=wealth index) for the proportions of children under 5 reported to have illnesses of various types during the past 2 weeks, 2006 MICS III



Source: 2006 MICS III

indicators, using the wealth index as the LSM. These concentration curves indicate that there is more inequality, disfavoring the poor, in the incidence of reported diarrhea than in the incidence of other diseases. For example, the estimated CIs for diarrhea incidence range from -0.136 to -0.192, depending on the LSM, and are all statistically significant, whereas none of the CIs for cough, pneumonia symptoms or a fever is statistically significant. However, the reported incidence of pneumonia and (to a lesser extent) fever is lower among the poorest quintiles, higher in the third and fourth quintile, then much lower in the highest quintile. This results in a bulge in the concentration curves for these indicators towards the upper income ranges.

The data on under 5 morbidity in the 2006 MICS III are not directly comparable with those in the 1992/93 VLSS (for example, the types of illnesses reported in the MICS can be overlapping, while there is reason to believe that the morbidity data in the VLSS are seriously under-reported).²⁵ Accordingly, there is no sound basis for inferring whether there has been any change in the degree of inequality in under 5 morbidity over time.

Regression analysis

Regression analysis (linear probability models) is used to identify the underlying factors most closely associated with reported under-5 morbidity in the 2006 MICS III. The four left-side variables are dichotomous variables, i.e., whether a child under 5 was reported to have had: diarrhea during the past two weeks, a cough during the past two weeks, pneumonia symptoms during the past two weeks, or a fever during the past two weeks. The explanatory variables include: the child's age (in months), the child's sex, the highest grade of schooling completed by the child's mother, the highest grade of schooling completed by any household member aged 15+, a dummy variable indicating whether the head's is ethnic Vietnamese or Chinese, the wealth index (as a measure of "permanent income") and commune dummy variables to capture fixed effects at the commune level and above. Variables indicating religion were dropped as they were not found to be significant.

The results indicate that reported under-5 morbidity is significantly related to the child's age (positively), to the highest grade of schooling completed by any adult household member (negatively, but only for diarrhea during the past two weeks), to Vietnamese or Chinese ethnicity (negatively, but only for diarrhea during the past two weeks), and to the wealth index (negatively, but only for fever in the past two weeks).

Decomposition of inequality

The estimated regression models were used to decompose the CIs for the four under 5 morbidity indicators, using the wealth index as the LSM. The results are summarized in Figure 15. They indicate that there is considerable variability in the factors contributing to inequality in the four under-5 morbidity indicators. In the case of diarrhea, the main

²⁵ For example, reported morbidity of all types during the past 4 weeks was reported for only 35% of children under 5 in the VLSS, whereas a cough alone was reported for 28% of children under 5 during only the past 2 weeks in the MICS.



Figure 15. Decomposition of concentration indexes for under-5 morbidity, 2006 MICS III

Source: Annex 3, Tables 11-13

contributors to inequality disfavoring poorer children are the highest grade of schooling among adult household members and ethnicity, although these contributions are partly offset by the contributions of the mother's schooling and by commune fixed effects. In the case of cough, pneumonia and fever, the main contributor to inequality disfavoring poorer children is the wealth index. However, its contributions are offset by commune fixed effects and (in the case of cough and pneumonia) by ethnicity and (in the case of fever) by a large "residual" contribution.

The 2006 VHLSS

Inequality estimates

The 2006 VHLSS collected data for each household member on any illness or injury, diarrhea or cough and fever in the past 4 weeks, and on any illness in the past 12 months. The proportion of children under age 5 suffering from diarrhea (5.9%) or cough and fever (18.1%) are comparable to the proportions found in the VNHS 2001-02 which are considered to be reliable as a diary was kept for all illnesses over a 4 week period. However, there is a fair degree of underreporting of general illness or injury in the past 4 weeks and

Figure 16. Concentration curves (LSM=wealth index) for four indicators of morbidity among children under 5, 2006 VHLSS





especially over the past 12 months when recall tends to be poorer (i.e., about 33.4% of children under 5

were reported to have general illness or injury during the past 4 weeks in the 2006 VHLSS, compared to 52.4% in the 2001/02 VNHS in which a diary was used to record morbidity during the past 4 weeks).

Figure 16 presents concentration curves (using the wealth index as LSM) for the reported incidence of diarrhea and cough with fever among children under 5 during the past 4 weeks and for any reported illness or injury among children under 5 during the previous 4 weeks and during the previous 12 months. The concentration curves indicate that there was a relatively large (but statistically insignificant) degree of inequality disfavoring poor children in reported diarrhea during the past 4 weeks (CI = -0.105). However, there was, practically no inequality in the incidence of a cough with fever (CI = +0.046) or any illness/injury in the past 4 weeks (CI = +0.028) or past 12 months (CI = +0.051). These are generally consistent with results from the 2006 MICS III which had a shorter recall period. However, the results on general morbidity should be cautiously interpreted because of the underreporting found in these indicators.

Regression analysis

Regression analysis is used to identify the underlying factors most closely associated with the four indicators of morbidity in children under 5 (i.e., diarrhea or cough with fever during the past 4 weeks, any illness or injury during the past 4 weeks and any illness or injury during the past 12 months).

The results indicate that under 5 morbidity is significantly related to the child's age (nonlinearly, including a sharp increase in reported morbidity during the first 12-15 months for all diseases except cough with fever), to mean number of grades of schooling completed by adult household members (negatively and only for general illness or injury in the past 4 weeks), to household size (negatively and only for general illness in the past 12 months), and to the wealth index (positively and only for reported illness in the past 4 weeks). None of the other explanatory variables, including the child's sex, ethnicity or mother's schooling is statistically significant in any model. No information was available on religion in the 2006

Figure 17. Decomposition of the concentration index (LSM=wealth index) for four under-5 morbidity indicators, 2006 VHLSS



Source: Annex 4, Tables 10-13

VHLSS so its influence could not be analyzed. These results contrast somewhat with the 2006 MICS III which found that ethnicity and schooling of adults in the household were also important factors related to diarrhea and that incidence of respiratory infection was related to age of the child.

Decomposition of the inequality in under 5 morbidity

Figure 17 summarizes the results of decompositions of the CIs for the four under-5 morbidity indicators. Recall that diarrhea incidence disfavors the poor (i.e. incidence is higher among the poor). Schooling of adult household members contributes the most to the CI, followed by commune fixed effects. These factors are partially offset by schooling of mothers (proxied by mean schooling of ever-married women ages 15-49 in the household), and by being ethnic Vietnamese or Chinese, factors that reduce the extent to which diarrhea incidence disfavors the poor. The LSM (wealth index) appears to have little influence on the CI.

In contrast, reported incidence of cough with fever and general illness/injury in the past 4 weeks appears to disfavor the middle or higher income groups, although the level of inequality is minor. The wealth index and mother's schooling contribute the most to the CI for reported cough with fever and general illness/injury in the past 4 weeks, and are offset slightly by mean schooling of adult household members and ethnicity which would tend to bring the confidence interval closer to equality. The contribution of commune fixed effects is not very large for any of the morbidity indicators.

Province data

Inequality estimates

There are no province-level data on general morbidity in children under 5, apart from the data collected in household surveys. However, the MOH Health Information System reports the incidence of malaria and TB for the general population. Because of the importance of malaria to maternal and child mortality, the analysis focuses on the reported malaria morbidity. Figure 18 presents a concentration curve for the number of malaria cases in 64 provinces during 2005,

using 2005 monthly per capita household income as the LSM. The results indicate that the residents of poorer provinces are very heavily disadvantaged by malaria (the CI = -0.468).

Regression analysis

Province-level regression analysis of the annual number of malaria cases per 100,000 persons indicates that malaria incidence is significantly related to income (negatively), to the proportion of the population that are ethnic minorities (positively), and to the proportion of the population that is urban (positively). The positive relationship of malaria incidence with urbanization is puzzling since one would normally expect malaria control to be more effective in relatively urbanized provinces. One possible explanation is that malaria morbidity is more completely reported in urban areas because the urban population is more likely to seek treatment for a fever at a public health facility (the source of the information in the MOH HIS) and because urban health facilities are better equipped to make a definitive diagnosis of malaria.





Source: MOH HIS (Health Statistics Yearbook 2005)



Figure 19. Decomposition of the CI for malaria incidence (LSM=2005 monthly household income), 2005

Source: Annex 5, Table 5

Decomposition of inequality

Figure 19 summarizes the results of decomposition of the CI for malaria morbidity. The results indicate that large negative contributions of income and ethnicity (disfavoring the poor) are partially offset by a large positive contribution of urbanization (favoring the poor). However, the large positive contribution of urbanization may be due to more complete reporting of malaria morbidity in urban areas (as discussed above).

Conclusions

The data on morbidity among children under 5 in the 1992/93 VLSS indicate that there was virtually no inequality in general morbidity (i.e., any illness or injury during the past 4 weeks or during the past 12 months) and only a small and insignificant degree of inequality in diarrhea morbidity during the past 4 weeks. However, the data in the 2006 MICS III and 2006 VHLSS suggest that there may be substantial inequality disfavoring the poor in the incidence of diarrhea among children under 5, but not for other types of common childhood diseases. The schooling of adult household members consistently contributed to the inequalities in both the VHLSS and MICS III while

mother's schooling consistently offsets this effect. For other factors, the contribution to inequality is mixed. Ethnicity was found to contribute strongly to inequalities with the MICS III data, but to offset the effect of other variables in the VHLSS data. Commune fixed effects were found to contribute to inequalities with the 2006 VHLSS, but to offset the effect of schooling and ethnicity with the 2006 MICS III data. These results make it difficult to draw conclusions about the main factors contributing to inequality in diarrhea. Unfortunately, likely serious under-reporting of under 5 morbidity in household surveys also makes it impossible to conclude whether changes have occurred over time in the distribution of under-5 morbidity.

Province-level analysis of malaria morbidity (malaria incidence) found that there is a high degree of inequality in malaria morbidity disfavoring poorer provinces and that the main contributing factors to the observed inequality are household income and ethnicity. Although urbanization was found to partially offset these two contributions, it is suspected that this may reflect under-reporting of malaria cases in rural areas.

Nutritional status of children under 5

According to a recent review of the international literature,²⁶ maternal and child undernutrition is the underlying cause of 3.5 million deaths, 35 percent of the disease burden in children under 5 and 11 percent of the total global disease burden. Stunting, severe wasting and intrauterine growth restriction alone are estimated to account for 2.2 million child deaths (about 20% of the total). In addition to its importance as an underlying cause of child mortality, the nutritional status of children under 5 has been shown to be critically important to the development of human capital. For example, height for age at two years is the best predictor of educational attainment, adult labor productivity, and, in the case of women, of the likelihood that they will bear low birthweight children.²⁷

Early estimates

Inequality estimates

The 1992/93 VLSS collected anthropometric data for all household members (or at least for those who were available to be measured and weighed at the time of the survey). The height and weight of children under 5 years of age were converted to z-scores (i.e., agestandardized values) using the 2006 WHO international child growth standards. A moderately "stunted" child is one whose height-for-age z-score is more than two standard deviations below the international standards, a moderately "underweight" child is one whose weightfor-age z-score is more than two standard deviations below the international standards, while a moderately "wasted" child is one whose weight for height/length is more than two standard deviations below international standards. Results of the 1992/93 VLSS indicate very high rates of moderate stunting (62%) and underweight (37%), but a relatively low rate of wasting (7%). Figure 20 presents concentration curves for these three indicators of children's nutritional status using the wealth index as the LSM. These concentration curves indicate that there was inequality

Figure 20. Concentration curves (LSM=wealth index) for moderately stunted, moderately underweight and moderately wasted children under 5, 1992/93 VLSS



Source: MOH HIS (Health Statistics Yearbook 2005)

in two of the indicators (i.e., moderate stunting and moderate underweight status) disfavoring the poor (the CIs are -0.059 and -0.093 respectively and both are statistically significant). The concentration curve for wasting crosses the line of proportionality at about the 40th percentile, implying that wasting disfavors proportionately more middle-income children than poor or near-poor children.

Regression analysis

Regression analysis is used to identify the factors most closely associated with the negative of the z-scores for the three anthropometric indicators (using the negative of the z-scores as the left-side variable means that positive coefficients in the regression can be interpreted as being associated with malnutrition). Two alternative model specifications were used: one that includes indicators of parents' nutritional status and one that does not. The model without indicators of parents' nutritional status is used to provide

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Robert Black et al., Op cit..

²⁷ Cesar Victora et al., "Maternal and child undernutrition: consequences for adult health and human capital," The Lancet, Vol 371 (January 19, 2008).

comparable results with those from the 2006 VHLSS, which did not collect data on adult nutritional status.

The results are mostly consistent with prior expectations based on similar analyses in Vietnam as well as internationally, although there are a few surprises.²⁸ The child's age is highly significant because children's nutritional status deteriorates sharply in Viet Nam during the first year of life, relative to the international standards used to calculate the zscores (i.e., in this case, the 2006 WHO standards). This period coincides with the introduction of complementary foods in addition to breast milk. Malnutrition among children under 5 is also significantly and negatively related to the mother's height (except in the case of weight for length/height), to her body mass index (BMI), to the father's height (except in the case of weight for age), to the highest grade of schooling completed by any household member aged 15+ (but significantly only for height for age and weight for age in models including indicators of parents' nutritional status), to Vietnamese or Chinese ethnicity (but only in the case of height for age and weight for age with indictors of parents' nutritional status included) and to the wealth index (but not significantly in the case of weight for length with indicators of parents' nutritional status included). In contrast, malnutrition among children is positively and significantly related to the father's BMI in all three models in which it is included, a finding that is at least consistent with the possibility that father's may have "competed" with children under 5 for limited food supplies during this period (1987/88-1992/93).²⁹ One surprising result, compared to other studies, is that mother's schooling is not significantly related to children's malnutrition in any of the models.³⁰ Instead,

Figure 21. Decomposition of the CI (LSM=wealth index) for height-for-age, weight-for-age and weight for height/length z-scores among children under 5, 1992/93 VLSS



Source: Annex 3, Tables 28-30

²⁸ For references to some of the international literature, see O'Donnell et al. 2007, Chapters 4 and 10.

²⁹ One would expect a relationship between's father's height and children's height for age on the basis of genetic factors, but one would not expect any biological relationship between father's BMI and children's height or weight for age. The results are consistent with these expectations.

³⁰ The variables referring to the mother's schooling and to the highest level of schooling completed by any adult household member are jointly significant at the 0.05 level in cols 1, 2 and 4 and at the 0.10 level in col 3.

there is a negative relationship between the maximum level of adult schooling in the household (usually, but not always the father's) and children's malnutrition that is statistically significant for height for age and weight for age in models including indicators of the parents' nutritional status.

Decomposition of inequality in children's nutritional status

Figure 21 summarizes the results of decomposition of the CIs for all three z-scores using the estimated regression functions that do not include indicators of parents' nutritional status (for comparability with the 2006 MICS III analysis). The results indicate that the wealth index makes the largest contribution (negative) to the observed inequality, which is partly offset (especially in the case of the weight-for-height/length z-score) by the commune fixed effects.

Commune-level analysis of the estimated fixed effects found that the same set of explanatory variables used in the commune-level analysis of under-5 mortality explains 31-44 percent of the variation in the estimated fixed effects in the models for height-for-age and weight-for-age z-scores (compared to only 9-15 percent for the weight-for-height/length z-scores) and that the regional dummies are statistically significant in the models for height-for-age and weight-for-age zscores. In addition, the estimated fixed effects are negatively associated in all models with the sample proportion of children under 10 completely vaccinated (and significantly in the models for weight-for-age) and with the index of access to safe water and sanitation (but not significantly in any model).

Recent estimates 2006 VHLSS

Inequality estimates

Detailed analysis of the nutritional status of children under 5 was undertaken using anthropometric data collected by the National Institute of Nutrition that can be linked to the 2006 VHLSS. The height and weight of children under 5 years of age were converted to zscores (i.e., age-standardized values) using the 2006 WHO international child growth standards, the same standards used for analysis of the 1992/93 VLSS.





Note: Severe stunting is defined as having a z-score below -3. **Source:** 2006VHLSS

While the 2006 anthropometric data indicate that malnutrition remains high (34% of children under 5 are stunted, while 21% are underweight), this represents a substantial decline from the rates in 1992/93. Analysis below focuses on the inequalities in these indicators in 2006.

Figure 22 presents concentration curves for four indicators of children's nutritional status using the wealth index as the LSM. These concentration curves indicate that there was substantial inequality in two of the indicators (i.e., moderate stunting and moderate underweight status) disfavoring the poor (the CIs are - 0.186 and -0.198 respectively and both are statistically significant). Comparing Figures 20 and 22, the data also indicate that the degree of moderate stunting and moderate underweight status increased between 1992/93 and 2006.

Regression analysis

Regression analysis is used to identify the factors most closely associated with the negative of the z-scores for

the three anthropometric indicators (using the negative of the z-scores as the left-side variable means that positive coefficients in the regression can be interpreted as being associated with malnutrition).

The results indicate a strong deterioration in nutritional status during the first year of life, then a leveling off of the influence of the child's age. Malnutrition among children under 5 is also significantly and negatively related to the wealth index (but not significantly in the case of weight for length). Child's gender, mother's schooling, schooling of other adult household members and ethnicity were not statistically significant factors influencing any of the child malnutrition indicators. It was not possible to examine the relationship with adult malnutrition indicators because anthropometric measurements are not available for adults in the 2006 National Institute of Nutrition data. No information was available on religion in the 2006 VHLSS so its influence could not be analyzed.

Decomposition of inequality in children's nutritional status

Figure 21 Figure 23 summarizes the results of

decomposition of the CIs for all three z-scores using the estimated regression functions discussed above. The results indicate that the wealth index makes a large contribution to the observed inequality for height for age and weight for age, followed by mean schooling of adults in the household and commune fixed effects (for weight for age). For weight for height z-scores, commune fixed effects contribute by far the most of all observed factors. Mother's schooling partially offsets these other factors in the case of weight for height and weight for age z-scores.

Province data

Inequality estimates

Figure 24 presents concentration curves for three anthropometric indicators among children under 5 in 64 provinces in 2005. The province-level data on children's nutritional status are based on the national survey of children's nutritional status conducted annually by the National Institute of Nutrition. The concentration curves indicate that there is a moderate degree of inequality disfavoring poor children in all three indicators, although the degree of inequality is less in the case of moderate wasting (CI = -0.071

Figure 23. Decomposition of the CI (LSM=wealth index) for height-for-age, weight-for-age and weight for height/length z-scores among children under 5, 2006 VHLSS



Source: Annex 4, Tables 22-24

Figure 24. Concentration curves (LSM=2005 monthly per capita household income) for moderate stunting, moderate underweight and moderate wasting among children under 5 in 64 provinces, 2005



Source: National Institute of Nutrition (Health Statistics Yearbook 2005)

versus -0.136 and -0.122 for stunting and underweight respectively). When interpreting the province-level estimates of inequality in nutritional status, it is important to consider that they reflect only inequality between provinces, not inequality within provinces, whereas the estimates of inequality based on household survey data reflect both sources of inequality.

Regression analysis

Province-level regression analysis of the three anthropometric indicators indicates that moderate stunting and moderate underweight status are significantly related to mean per capita household income (negatively), to the proportion of the population that are ethnic minorities (positively, but significant at only the 0.10 level for stunting), to annual malaria incidence (positively, but only at the 0.10 level for moderate underweight status), and to population density (negatively, but only significant for stunting and only at the 0.10 level). All of these results are consistent with prior expectations. In contrast, none of the individual explanatory variables is significantly related to moderate wasting (although income and urbanization are jointly significant). The only surprise is

Figure 25. Decomposition of the CI (LSM=2005 monthly per capita household income) for three anthropometric indicators, 2005



Source: Annex 5, Tables 7-9

that none of the anthropometric indicators is significantly related to the level of schooling among adults aged 20-29 (although the estimated relationship is negative for all three indicators).

Decomposition of inequality

Decomposition of the province-level CIs for the three anthropometric indicators (Figure 25) indicates that income makes the largest contribution to the observed inequality in all three indicators, followed by population density, urbanization (except for moderate underweight status), ethnicity and malaria incidence (except for moderate wasting).

Conclusions

There was moderate inequality in malnutrition among children under 5 in 1992/93, which has increased substantially by 2006, even as average rates of child malnutrition have declined. Inequality in household incomes appears to have been the main factor contributing to this inequality in the past and is still the case today, while commune level factors also contribute substantially to the prevalence of moderate underweight status and moderate wasting. Province level analysis for 2005 indicates that income differences between provinces account for most of the inequality observed moderate stunting and underweight status in children under 5.

Fertility

Fertility is critically important as a determinant of maternal mortality because it determines a woman's exposure to the risk of maternal mortality. This important relationship is often forgotten because most discussions of maternal mortality focus on the maternal mortality ratio, which is conditional on fertility.³¹ Many behavioral studies have also found a significant association between infant mortality and birth spacing. However, a causal relationship between birth spacing and infant mortality has not yet been established.

Early estimates

Inequality estimates

As previously mentioned, the 1992/93 VLSS collected a complete birth history for women ages 15-49. However, the MICS III collected data only on the number of children ever born (CEB). Accordingly, in the interest of comparability, the discussion here focuses on CEB. Figure 26 presents concentration curves for the number of CEB to currently married women ages 15-49 based on two alternative LSMs (i.e., directly measured per capita consumption and the wealth index). These concentration curves indicate that there was only a small degree of inequality in cumulative fertility in 1992/93, disfavoring the poor (i.e., fertility was somewhat higher among the poor).³² The corresponding CIs are -0.065 (per capita consumption) and -0.079 (the wealth index). Both are statistically significant, but their

Figure 26.

26. Concentration curves for the number of children ever born (CEB)to currently married women ages 15-49 using two alternative LSMs, 1992/93 VLSS



Source: 1992/93 VLSS

³¹ See, for example, Oona Campbell et al., "Strategies for reducing maternal mortality: getting on with what works," The Lancet (September 28, 2006).

³² It is assumed that a higher level of fertility "disfavors the poor," both because it increases exposure to the risk of maternal mortality and because higher levels of fertility in lower income groups contribute to poverty over time.

difference is not. Using the wealth index to define population-based quintiles, mean CEB was 3.1 births in the poorest quintile in 1992/93 versus 2.5 births in the richest quintile, a difference of only 0.6 births.

Regression analysis

Regression analysis is used to identify the main underlying factors associated with a currently married woman's cumulative fertility (i.e., the number of children ever born, or CEB). CEB is a count variable (i.e., CEB=0, 1, 2, 3, 0), and models with left-side variables of this type are usually analyzed using nonlinear statistical models such as Poisson regression or negative binomial regression. However, a linear regression model (or a linear approximation to a nonlinear model) is required for decomposition. Consequently, two alternative statistical models are used: a linear regression model and a fixed effects Poisson model. The explanatory variables include the woman's age, the highest grade of schooling completed by the woman, the mean number of grades of schooling completed by household members aged 15+, a dummy variable indicating whether the head is ethnic Vietnamese or Chinese, the wealth index (as a

measure of "permanent income"), and commune dummy variables to capture fixed effects at the commune level or above. Variables referring to the religion of the head of household are not included in the model because they were consistently insignificant and their inclusion did not affect the signs or significance levels of the other estimated coefficients.

The results with the linear regression model indicate that CEB is significantly related to a currently married woman's age, as expected (positively, with the slope decreasing with age) and to a woman's level of schooling (negatively). CEB is not significantly related to the wealth index, to the schooling of other adult household members, or to ethnicity. The estimated marginal effects with the fixed effects Poisson regression model, which are comparable with the estimated coefficients in the linear regression model, are similar in most respects. However, the estimated marginal effect at the sample means of the woman's schooling is considerably lower in magnitude than the corresponding estimated coefficient in the linear regression model. Under these circumstances, it is best to view the decomposition below as exploratory.

Figure 27. Decomposition of the CI (LSM=wealth index) for the number of children ever born (CEB) to currently married women ages 15-49, 1992/93 VLSS



Source: Annex 3, Table 41

Decomposition of inequality in fertility

The decomposition of the CI for CEB was done using the estimated linear regression model and the wealth index as the LSM. The results of the decomposition are summarized in Figure 27. They indicate that commune fixed effects and the woman's own schooling level make the largest contributions to the CI (negative), which are partly offset by the positive contributions of the woman's age and the wealth index.

The fact that the contributions of commune fixed effects reinforce, rather than offset, the contributions of the woman's schooling is a bit surprising in Viet Nam, given its strong family planning program at this time (although there is only limited information available about the effectiveness of the family planning program prior to the 1990s). However, commune-level regression analysis of the estimated fixed effects is informative in this case. The explanatory variables used include the commune sample mean value of the wealth index, the commune sample mean proportion of the population in households headed by an ethnic Vietnamese or Chinese, the commune sample mean number of grades of schooling completed by adults aged 15+, the commune sample proportion of children who have died, an index of proximity to health services (available for rural communes only) and dummy variables for urban commune and region. The explanatory variables explain 55 percent of the variation in the estimated fixed effects for all sample communes (N=150) and 35 percent in rural communes (N=113). The results both for all sample communes and for rural communes only indicate that fertility is significantly related to the wealth index (negatively), to Vietnamese/Chinese ethnicity (positively), and to child mortality (positively), to urbanization (negatively), and to region (higher in all regions other than the Red River Delta and Mekong Delta). Surprisingly, the estimated commune fixed effects are not significantly related to adult schooling or to the index of access to health services in rural communes.

Recent estimates 2006 MICS III

The 2006 MICS III also collected data on the number of CEB to 6,250 women ages 15-49. Figure 28

Figure 28. Concentration curve for the number of children ever born (CEB) to women ages 15-49 using alternative LSMs, 2006 MICS III



Source: 2006 MICS III

presents concentration curves for the number of CEB using four alternative LSMs. These data indicate that there was moderate inequality in the distribution of CEB in 2006, disfavoring the poor (as in 1992/93). The estimated CIs range from -0.061 to -0.074 and are all statistically significant. The CIs based on the wealth index are almost identical in the 1992/93 VLSS and the 2006 MICS III (i.e., -0.079 and -0.074 respectively), suggesting that there has not been any significant change in the degree of inequality in cumulative fertility during the period 1992/93-2006.

Regression analysis

Regression analysis is used to identify the main underlying factors associated with a currently married woman's cumulative fertility as was done with the 1992/93 VLSS. A linear regression model was used to allow for decomposition of the inequality.

The results with the linear regression model indicate that CEB is significantly related to a currently married woman's age (positively), to a woman's level of schooling (negatively), to the schooling of adult household members (positively), and to the wealth index (negatively).



Figure 29. Decomposition of the CI (LSM=wealth index) for the number of children ever born (CEB) to currently married women ages 15-49, 2006 MICS III

Source: Annex 4, Table 17

Decomposition of inequality in fertility

The decomposition of the CI for CEB was done using the estimated linear regression model and the wealth index as the LSM. The results of the decomposition are summarized in Figure 29. They indicate that commune fixed effects, the wealth index and the woman's own schooling level make the largest contributions to the CI (negative), and that the contributions of these factors are partly offset by the positive contributions of the woman's age and the schooling of adult household members.

Commune-level regression analysis of the estimated fixed effects provides some interesting insights. The explanatory variables used included the commune sample mean value of the wealth index, various indices of living conditions (water, sanitation, housing space, cooking fuel), the commune sample mean proportion of the population in households headed by an ethnic Vietnamese or Chinese, the commune sample mean number of grades of schooling completed by adults aged 15+, the commune sample proportion of children who have been fully immunized, the commune sample mean proportion of households headed by a Catholic, or by a Buddhist, and dummy variables for urban commune and region. In rural areas additional variables indicating proximity to health services and road access to the commune were also included. These variables explain 57 to 62 percent of the variation in the estimated fixed effects (depending on the sample-all sample communes or rural communes). The results indicate that commune fixed effects for fertility are most strongly related to a high share of Catholics in the commune and a high share of ethnic Vietnamese or Chinese in the commune. Regional factors were also important.

Province data

Inequality estimates

Figure 30 presents a concentration curve for the number of births in 2004/05 in 64 provinces. Estimates of the number of births are indirect estimates obtained using data from the 2005 Survey of Population Change and Family Planning. The figure indicates that there was only a moderate degree of

Figure 30. Concentration curve (LSM=2005 mean monthly per capita household income) for fertility in 64 provinces, 2004/05



Source: 2005 Survey of Population Change and Family Planning (GSO)

inequality in fertility at the province level disfavoring the poor in 2005 (CI = -0.079).

Regression analysis

Province-level regression analysis of the total fertility rate (TFR) in 2005 indicates that the TFR is significantly related to the 2005 infant mortality ratio (positively), to mean monthly per capita household income (negatively), to mean years of schooling among adults aged 20-29 (positively, but only at the 0.10 level of significance), and to the proportion of the population that is urban (positively, but only at the 0.10 level). The positive relationship between fertility and urbanization is surprising.

Decomposition of inequality

Figure 31 summarizes the results of decomposition of the CI for the number of births in 64 provinces during 2004/05. The results indicate that income and infant mortality are the main contributors to inequality in fertility (disfavoring the poor) and that their negative contributions are partially offset by positive contributions from urbanization.

Figure 31. Decomposition of the CI (LSM=2005 mean monthly per capita household income) for fertility, 2005



Source: Annex 5, Table 11

Conclusions

There is a moderate degree of inequality in fertility disfavoring the poor in Viet Nam that does not appear to have changed during the period 1992/93 to 2006. During the same period, total fertility rates have continued to fall from 3.3 children per woman for the period 1989-1994 to near replacement fertility levels by 2004. That inequality in fertility appears not to have changed over time is surprising because Viet Nam has had a strong and apparently effective family planning program during this period. The main factors explaining the inequality in cumulative fertility observed in 1992/93 are female education and commune-level fixed effects while in 2006 they include these two factors as well as the schooling of all adult household members and the wealth index. The

fixed effects in 1992/93 appear to represent mainly commune-level variation in average household "income." In 2006, the average household "income" at the commune level was no longer an important factor explaining commune fixed effects. In fact, the proportion Catholic and the proportion ethnic Vietnamese or Chinese in a community explained these commune fixed effects to a large extent with offsetting factors being the average educational attainment in the community and immunization rates (proxying for effectiveness of public health interventions). Region of residence was also important in explaining commune fixed effects suggesting differing levels of effectiveness of the family planning policy in different regions. In 2004/05, at the province level, the main factors contributing to inequality are income and infant mortality.

INEQUALITIES IN KEY NTERMEDIATE OUTCOMES

This section of the situational analysis discusses inequalities in key intermediate outcomes causally related to maternal and child mortality. More detailed information on all of the analysis discussed in this section is available in Annex 3 (for the 1992/93 VLSS), in Annex 4 (for the MICS III) and in Annex 6 (for the 2006 VHLSS). We focus the discussion here on those intermediate outcomes for which there are comparable data in the 1992/93 VLSS and in either the 2006 MICS III or 2006 VHLSS, i.e., family planning, antenatal care, obstetric delivery care, immunization, and curative care. We do not discuss several other intermediate outcomes for the following reasons:

Breastfeeding and other infant feeding practices.

There are no comparable data in the 1992/93 VLSS, and the sample sizes tend to be guite small for most breastfeeding indicators, even in the 2006 MICS III. The MICS III data indicate that there is a small degree of inequality, favoring poorer infants, in whether breastfeeding was initiated within 1 hour (CI = -0.035); a small degree of inequality favoring richer infants in whether a child 0-5 months of age was exclusively breastfed (CI = +0.017); a very small degree of inequality favoring poorer infants in whether a child 6-8 months of age received both breastmilk and complementary food at least twice during the preceding 24 hours (CI = -0.004), and a very small degree of inequality favoring richer infants in whether a child aged 0-11 months was "appropriately fed" (CI = +0.002).33 The most unequally distributed infant feeding indicator, favoring poorer children, is whether children aged 20-23 months are continuing to breastfeed, as recommended (CI = -0.162).

Vitamin A supplements.

There are no comparable data in the 1992/93 VLSS. The 2006 MICS III data indicate that there is a high degree of inequality favoring richer women in whether or not a woman ages 15-49 received vitamin A supplementation within 2 months of giving birth during the past two years (CI = +0.180, using the wealth index). The 2006 MICS III data indicate that there is only a small degree of inequality favoring richer children in whether a child under age 5 ever received vitamin A supplementation (CI = +0.029, based on the wealth index) or in whether a child under age 5 received vitamin A supplementation during the past 12 months (Cl = +0.049). The difference may be explained by the fact that vitamin A supplementation is provided through the national immunization program, whereas there is no corresponding program to provide postnatal vitamin A supplements.

Malaria prevention.

There are no comparable data in the 1992/93 VLSS. The 2006 MICS III data indicate that the number of mosquito nets per household member is unequally distributed, favoring the poor (CI = -0.283). However, this may reflect the fact that mainly poorer people live in areas in which malaria is still prevalent. It is difficult to interpret the degree of inequality in the other malaria prevention indicators for the same reason.

Family planning

Family planning is an important proximate determinant of fertility, which in turn determines a woman's lifetime risk to maternal mortality. Family planning, together with access to safe abortion, are considered

³³ Appropriate feeding was defined as receiving only breastmilk, if 0-5 months of age, breastmilk and complementary food at least twice daily if 6-8 months of age, and breastmilk and complementary food at least 3 times per day if 9-11 months of age.

among the most cost-effective interventions to prevent maternal deaths in settings in which large numbers of births are unwanted.³⁴ It was also once widely believed that family planning is important to child mortality and nutritional status because of its ability to reduce the number of births at relatively high-risk ages (for example, under 18 or over 35) and to increase the length of intervals between births. However, these relationships are no longer considered to be very important from the standpoint of either maternal or child mortality.

Early estimates

Inequality estimates

Figure 32 presents concentration curves for the current use of any family planning method and of a modern family planning method in 1992/93 for currently married women ages 15-49, using the wealth index as LSM. These concentration curves indicate that current family planning utilization in 1992/93 was moderately

Figure 32. Concentration curves (LSM=wealth index) for current use of contraceptives (any method versus a modern method), 1992/93 VLSS



Source: 1992/93 VLSS

unequal, favoring richer women, and that the degree of inequality was not very different between current use of any method and current use of a modern method at this time (the estimated CIs are 0.091 and 0.102 respectively and are statistically significant).

Regression analysis

Regression analysis is used to identify the underlying factors that are most closely associated with current use of family planning by currently married women ages 15-49. The two left-side variables are binary (i.e., whether or not the woman is currently using any family planning method or a modern method), and the explanatory variables are: the woman's age, the highest grade of schooling completed by the woman, the mean number of grades of schooling completed by all household members aged 15+, a dummy variable indicating whether the head is ethnic Vietnamese or Chinese, the wealth index (as a measure of "permanent income"), and commune dummies to capture fixed effects at the commune and higher levels. Two alternative statistical models are estimated: a linear probability model and a fixed effects logit model.

The results indicate that current use of family planning is significantly related to a woman's age (nonlinearly, increasing until about age 40 and declining thereafter), to the mean number of grades of schooling completed by all household members aged 15+ (positively) and to the head of household's religion (women in households headed by a Christian are significantly less likely to be current users of a modern method). Surprisingly, current use of family planning is not significantly related to the woman's own level of schooling (in fact, the observed relationship is negative).³⁵ None of the other explanatory variables is statistically significant, including the wealth index and ethnicity. The same results in terms of signs and significance levels were obtained using a fixed effects logit model (unreported regressions). It is interesting to note that although current use of a modern contraceptive is significantly related to the head of household's religion, current use of any method (and fertility) are not significantly related to the head of household's religion.

³⁴ Oona Campbell et al., Op. cit..

³⁵ If the mean level of adult schooling is omitted from the model (unreported regressions), the woman's level of schooling becomes significant in the model for current use of any method, but not in the model for current use of a modern method



Figure 33. Decomposition of the concentration index (LSM=wealth index) for current use of family planning (any method versus a modern method), 1992/93

Decomposition of inequality in family planning

The CIs for both family planning indicators are decomposed, using the estimated linear probability model and the wealth index as LSM. The results are summarized in Figure 33. They indicate that the main factors contributing to the CI for current contraceptive use are the woman's age, the mean level of adult schooling in the household, and commune fixed effects. The only factor partially offsetting these contributions is the woman's own level of schooling (surprisingly), but this contributes only -0.007 to the CI for current use of any method and only -0.008 to the CI for current use of a modern method. Religion does not contribute importantly to inequality because there are relatively few Christians in Vietnam (i.e., less than 10 percent; 89 percent of Vietnamese reported either no religious affiliation or affiliation with the Buddhist religion).

Commune-level regression analysis of the estimated fixed effects (using the same set of explanatory variables as used in the analysis of the estimated fixed effects for fertility) provides some interesting insights. The explanatory variables explain 26-39 percent of the variation in the estimated fixed effects (depending on the indicator of current contraceptive use-any method versus a modern method-and on the sample-all sample communes or rural communes). The results indicate that current contraceptive use is significantly and positively related to the commune sample mean number of grades of schooling completed by adults aged 15+ for both indicators and both samples. In addition, current use of any contraceptive method is also significantly related to region, but not to urban location, whereas current use of a modern method is significantly related (negatively) to urban location but not to region. The significant negative relationship between current use of a modern method and urban location is surprising (although it is consistent with the significant positive relationship between fertility and urbanization at the province level discussed above).

Recent estimates 2006 MICS III Inequality estimates

Figure 34 presents concentration curves for current

Source: Annex 3, Tables 46 and 47

use of any family planning method and of a modern method in 2006 by currently married women ages 15-49, using the wealth index as LSM. These data indicate that there is a small degree of inequality favoring poorer women in current use of a modern method, but practically no inequality in current use of any method. The estimated CI for use of a modern method is -0.036 and is statistically significant, whereas the estimated CI for use of any contraceptive method is only-0.008 and is statistically insignificant. Still, the most recent estimates indicate that there has been a significant change since 1992/93 in the degree of inequality in the use of both a modern method, i.e., from inequality favoring the rich to inequality (albeit smaller) favoring the poor. The change in inequality has been less in the case of current use of any contraceptive method, but it is still statistically significant. The reduction in inequality between 1992/93 and 2006 is what would be expected, given Vietnam's strong and effective family planning program because effective public health programs tend to reduce or even eliminate socioeconomic inequalities in the utilization of services.

Figure 34. Concentration curves (LSM=wealth index) for current use of contraceptives (any method versus a modern method), 2006 MICS III



Source: 2006 MICS III

Regression analysis

Regression analysis is used to identify the underlying factors that are associated with current contraceptive use among currently married women in 2006. A linear probability model is estimated with two alternative binary left-side variables indicating whether the woman is currently using any contraceptive method or currently using a modern method. The explanatory variables are the woman's age, the highest grade of schooling completed by the woman, the highest grade of schooling completed by all household members aged 15+, the wealth index (as a measure of "permanent income"), and commune dummy variables to capture fixed effects at the commune level or above. The results indicate that current family planning use is significantly related to age (nonlinearly, peaking at about age 40 and declining thereafter), to the highest grade of schooling completed by any adult household member (negatively, but only significant at the 0.10 level and only for current use of a modern method), and to the wealth index (positively, but only for current use of any method). Current contraceptive use is not significantly related to the woman's own level of schooling or to ethnicity. These results are similar in some respects to those obtained with the 1992/93 VLSS data. However, the relationship between contraceptive use and schooling (particularly the schooling of other household members) is no longer significant, a result that is also expected with a strong and effective family planning program. Variables referring to the religion of the head of household are not included in the model because they were consistently insignificant and their inclusion does not affect the signs or significance levels of the other estimated coefficients.

Decomposition of inequality in family planning

The estimated linear probability function is used to decompose the CIs for current use of any contraceptive and for current use of a modern contraceptive, using the wealth index as LSM. The results of the decomposition are summarized in Figure 35. They indicate that commune fixed effects are the main contributor to inequality in both indicators, followed by mean adult schooling. However, the large negative contributions of commune fixed effects and

Figure 35. Decomposition of the concentration indexes (LSM=wealth index) for current use of any contraceptive method and of a modern method among currently married women ages 15-49, 2006 MICS III



Source: Annex 4, Tables 22-23

mean adult schooling are offset to a large extent by large positive contributions of the wealth index, followed by those of the woman's age and her own schooling. The net contribution is small for both indicators. The results of the decomposition for 2006 are quite different from those for 1992/93 (compare Figure 35 to Figure 33). In particular, the relative contributions of woman's age, schooling, ethnicity and the wealth index have all been reduced, which is what one would expect to observe with a strong and effective family planning program.

Commune-level regression analysis of the estimated fixed effects (using the same set of explanatory variables as used in the analysis of the estimated fixed effects for fertility) provides some interesting insights. The explanatory variables explain 35-49 percent of the variation in the estimated fixed effects (depending on the indicator of current contraceptive use-any method versus a modern method-and on the sample-all sample communes or rural communes). The results indicate that current use of any contraceptive and current use of modern contraceptives are both strongly and significantly related to the proportion of people in the commune with a Catholic head of household, residence in the South Central Coast and Central Highlands regions or in the rural Northwest. The average share of children completely vaccinated in the commune, residence in the Southeast and Mekong Delta regions and having a road into a rural commune are also strongly related to commune fixed effects for any contraceptive use, but not for use of modern contraceptives. Other factors had only small coefficients or were insignificant.

Conclusions

There have been significant changes over time in both the nature and magnitude of inequality in the current use of contraceptives during the period 1992/93 to 2006, and particularly with respect to modern contraceptives. What was formerly a moderate level of inequality favoring richer women in the current use of modern contraceptives has become inequality favoring poorer women (albeit smaller in magnitude). The role of socioeconomic factors in contributing to inequality in contraceptive use has also been reduced over time. These changes are what one would expect to observe with a strong and effective family planning program.

Antenatal care

Antenatal care can be an important factor in reducing maternal mortality (for example, providing an opportunity to make concrete plans for obstetric deliveries), but it is currently considered to be less important in this regard than once was the case.³⁶ However, antenatal care is still considered to be an important intervention to reduce neonatal mortality because of the opportunity it provides to immunize pregnant women against tetanus, to provide them with critical micronutrient supplements and to instruct them in the care of their infants (for example, about the importance of immunizations and correct infant feeding practices). Consequently, the current international consensus is that women should obtain 4-5 antenatal care visits during their pregnancies.

Both the 1992/93 VLSS and the 2006 MICS III obtained data on antenatal care, with the MICS III collecting considerably more detailed information than the 1992/93 VLSS. Unfortunately, the information collected in the two surveys is not comparable in many respects. For example, the 1992/93 VLSS did not obtain information on the type of provider consulted for antenatal care or on the type of antenatal services obtained, while the 2006 MICS III did not collect information on the number of antenatal visits obtained.

Early estimates

Inequality estimates

The 1992/93 VLSS asked all women who reported one or more births whether they had gone "for prenatal consultations at a maternity home or other clinic" and if so, the respondent was asked "How many times?" Unfortunately, as mentioned above, no information was collected on the type of health provider consulted (although it is reasonable to assume that only trained providers provide antenatal care at a maternity home or clinic) or on the scope of services received (for example, weight, blood pressure, urine test, blood test). Figure 36 presents concentration curves, using the wealth index as the LSM, for three indicators of





Source: 2006 MICS III

antenatal care for the last-born child of women ages 15-49: whether any antenatal consultation was obtained from a trained provider, the number of antenatal visits obtained, and whether the minimum recommended number in Viet Nam of three or more (3+) antenatal care visits were obtained. These concentration curves point to several conclusions. Firstly, the degree of inequality in these three indicators of antenatal care, all of which favor richer women, is relatively high compared to most other maternal and child health indicators analyzed in this situational analysis. Secondly, the level of inequality varies importantly depending on the choice of indicator. For example, using the wealth index as LSM, the CI for any antenatal care is 0.125, the CI for the number of antenatal visits is 0.221, and the CI for 3+ antenatal visits is 0.305 (about the same as the CI for directly measured per capita consumption in 1992/93, which is +0.329).

Regression analysis

Regression analysis is used to identify the underlying

factors that are most closely related to two of the antenatal care indicators: whether any antenatal care was obtained for the last-born child and whether 3+ antenatal care visits were obtained for the last-born child (the number of visits obtained is a count variable, like the number of CEB, and therefore considerably more complex to analyze).37 The explanatory variables are the woman's age, the highest grade of schooling completed by the woman, the mean number of grades of schooling completed by all household members aged 15+, a dummy variable indicating whether the head is ethnic Vietnamese or Chinese, the wealth index (as a measure of "permanent income"), and commune dummy variables to capture fixed effects at the commune level or above. Two alternative statistical models are used: a linear probability model and a fixed effects logit model.

The estimation results with both statistical models indicate that antenatal care is significantly related to the mean number of grades of schooling completed by adult household members (positively) and to the wealth index (positively, but only at the 0.10 level for the 3+ visits indicator). Surprisingly, neither indicator is significantly related to the woman's own level of schooling (unless the variable referring to the schooling of all adult household members is omitted from the model, in which case the woman's own schooling is positively and significantly related to both antenatal care indicators).

Decomposition of inequality in antenatal care

The CIs for the two antenatal care indicators are decomposed using the estimated linear probability model and the wealth index as LSM. The results of the decomposition are summarized in

Figure 37. They indicate that the wealth index, commune fixed effects and the schooling of adult household members contribute most to the Cl for any antenatal care (which is equal to 0.125), with the wealth index contributing the largest share (+0.046). The same factors also contribute most to the Cl for 3+ antenatal care visits (which is equal to +0.305), but in this case the largest contribution (+0.182) is made by commune fixed effects.

Figure 37. Decomposition of concentration index (LSM=wealth index) for antenatal care obtained for last-born child under age 5, 1992/93 VLSS



Source: Annex 3, Tables 53 and 54

³⁷ See discussion of the analysis of count variables in O'Donnell et al. (2007), Op cit., pp. 142-145.

Commune-level analysis of the estimated fixed effects was also done, using the following explanatory variables: the commune sample mean of the wealth index, the commune sample mean proportion of the population in households headed by an ethnic Vietnamese or Chinese, the commune sample mean number of grades of schooling completed by adults aged 15+, an index of access to health services (rural communes only), an index of access to roads (rural communes only), and dummy variables indicating urban location and region. The results indicate that the explanatory variables together explain 17-42 percent of the total variation in the estimated fixed effects, depending on the indicator and sample. The results also indicate that antenatal care is significantly related to the commune sample mean of the wealth index (positively, but significant only for the 3+ visit indicator), to the mean level of adult schooling (positively and significant only for any antenatal care), to proximity to health services (positively) and to region (higher in the Mekong Delta region, and jointly significant in all estimated regressions except for 3+ visits in rural communes where it is significant at only the 0.10 level).





Recent estimates 2006 MICS III

Inequality estimates

The 2006 MICS III collected detailed information on the type of antenatal care obtained from a trained provider for the last-born child, if born during the past two years. Figure 38 shows concentration curves for the proportion of women who obtained any antenatal care for their last-born child within the past two years using the alternative LSMs (all indirect) that are available in the MICS III. The concentration curves indicate that there was only a moderate degree of inequality in this antenatal care indicator in 2006, favoring richer women (the CIs range from +0.059 to +0.066). This indicator is directly comparable with the indicator of any antenatal care in the 1992/93 VLSS, and it would appear that the degree of inequality decreased during the period 1992/93 to 2006 (for example, the CI based on the wealth index decreased from 0.125 in 1992/93 to 0.059 in 2006). Figure 39 shows the concentration curves for any antenatal care for 1992/93 and 2006. The curve for 2006 "dominates"

Figure 39. Concentration curves (LSM=wealth index) for any antenatal care obtained for the most recent birth, 1992/93 VLSS and 2006 MICS III



Source: 2006 MICS III

Source: 2006 MICS III

Figure 40. Proportion of women ages 15-49 who delivered a baby in the past 2 years who were fully immunized against tetanus during or before the latest pregnancy by population-weighted quintile defined according to two alternative living standards measures, 2006 MICS III



Source: Annex 4, Table 34

the curve for 1992/93, i.e., there is significantly less inequality in this indicator in 2006 than in 1992/93 at the 0.05 level of significance, using the "multiple comparison approach" to testing for dominance.³⁸

Unfortunately, the 2006 MICS III did not collect data on the number of antenatal care visits received. However, it did collect data on whether or not women who delivered a baby during the past two years were fully immunized against tetanus, an indicator that is usually closely related to the number of antenatal care visits.

Figure 40 shows the proportion of women who were fully immunized against tetanus by quintile, using two alternative indirect LSMs to define the quintiles (i.e., indirectly estimated per capita consumption and the wealth index). These data indicate that there was still considerable inequality favoring richer women in the proportion of fully immunized women as recently as 2006 (the estimated CIs are +0.102 and +0.085 respectively), suggesting that many poorer women are not obtaining the recommended number of antenatal

Figure 41. Concentration curves for having a complete antenatal exam for the last-born child under 2 years of age using alternative LSMs, 2006 MICS III



Source: 2006 MICS III

³⁸ However, non-dominance is not rejected at the 0.05 level if the stricter criterion of the intersection union principle is used. See O'Donnell et al., Op cit., p. 88.

care visits (or alternatively, that the quality of the care they are receiving is poor).

Figure 41 shows concentrations curves (using alternative LSMs) for a complete antenatal examination for the last-born child under two years of age based on data from the 2006 MICS III. A complete antenatal examination is defined as including weighing the woman, taking her blood pressure, giving her urine and blood tests, an ultrasound and counseling about HIV). The concentration curves indicate that there is a high-level of inequality in this indicator, favoring richer women (the CIs range from 0.418 for LSM=indirect wealth to 0.497 for LSM=wealth index, with the differences between LSMs not statistically significant). Figure 42 shows concentration curves (using the wealth index as LSM) for several of the individual services included in a complete antenatal examination. These concentration curves indicate that inequalities in the distributions of all services favor richer women and that the service with the highest inequality is a blood test (CI = +0.331, using the wealth index as LSM), followed by HIV counseling (CI = +0.255), an ultrasound (Cl = +0.168) and being weighed (CI = +0.103) (not shown is a urine test, CI = +0.267). It is indeed surprising that the distribution of ultrasounds is less unequally distributed than having a blood test, a urine test or receiving HIV counseling. Unfortunately, there are no comparable data on the types of services received during an antenatal examination in the 1992/93 VLSS, so it is not possible to determine whether this type of inequality has increased or decreased over time.

Regression analysis

Regression analysis (using a linear probability model) is used to identify the underlying factors that are most closely related to two of the antenatal care indicators: whether the woman received any antenatal care from a professionally trained provider and whether she received complete antenatal care (as defined above). The explanatory variables are the woman's age, the highest grade of schooling completed by the woman, the highest grade of schooling completed by any household member aged 15+, a dummy variable indicating whether the head of household is ethnic Vietnamese or Chinese, the wealth index (as a measure of "permanent income"), and commune





Source: 2006 MICS III

dummy variables to capture fixed effects at the commune level or above.

The results indicate that none of the explanatory variables is significantly related to whether the woman received any antenatal care from a professionally trained provider, although this indicator is significantly related at the 0.10 level to the highest grade of schooling completed by any adult household (positively). However, this result is not too surprising, given that 91% of women reported having received some antenatal care from a professionally trained provider (up from only 60% in 1992/93). Whether the woman received complete antenatal care is positively related to her age (but only at the 0.10 level) and to the wealth index (positively), but not to either of the schooling indicators or to ethnicity.

Decomposition of inequality in antenatal care

The CIs for the two antenatal care indicators are decomposed using the estimated linear probability models and the wealth index as LSM. The results are summarized in Figure 43. They indicate that almost all of the moderate inequality in the any antenatal care



Figure 43. Decomposition of concentration index (LSM=wealth index) for antenatal care of last-born child under age 2, 2006 MICS III

Source: Annex 4, Tables 36 and 37

indicator is accounted for by commune fixed effects. This situation is quite different from 1992/93 when both the wealth index and the mean schooling of adults also contributed importantly to the observed inequality in any antenatal care. In the case of full antenatal care, the wealth index contributes the largest share to the CI, followed by mother's schooling and commune fixed effects (and partially offset by ethnicity). As previously mentioned, there is no corresponding indicator available in the 1992/93 VLSS.

Province data

Inequality estimates

Figure 44 presents a concentration curve for the province-level HIS indicator of antenatal care in 2005 that is reported in the MOH Health Statistics Yearbook (i.e., number of pregnancies in which 3 or more antenatal care visits were obtained). The results indicate that there is a very small degree of inequality favoring richer women (CI = +0.013). Unfortunately, there are no comparable household survey data available for approximately the same period. However, the number of pregnancies may be under-reported in some localities (which would bias the antenatal care







indicator upwards) because of the reported tendency of some commune health stations (CHS) to register

pregnancies only for women who obtain antenatal care at the CHS.

Regression analysis

Province-level regression analysis of the proportion of pregnant women who obtained 3+ antenatal care visits indicates that antenatal care is significantly related to the proportion of the population that are ethnic minorities (negatively), to the proportion of the population that is urban (negatively, but only at the 0.10 level), and to the mean number of grades of schooling completed by adults aged 20-29 (positively, but only at the 0.10 level). The negative relationship between antenatal care and urbanization is surprising. However, it may be explained by the greater tendency for pregnant women in urban areas to obtain antenatal care from private providers, which would usually not be reported in the MOH HIS. Interestingly also, antenatal care is not significantly related to either household income or to population density (as a proxy for proximity to primary health providers).

Decomposition of inequality

Figure 45 summarizes the decomposition of the

province-level CI for antenatal care. The results indicate that ethnicity, schooling and the "residual factor" contribute positively to the CI (i.e., increase the level of inequality favoring richer women), whereas urbanization, population density and income have the opposite effects. The result of these offsetting contributions (which are nevertheless relatively small in magnitude) is the small degree of inequality depicted in Figure 44.

Conclusions

There have clearly been impressive gains in women's average access to at least some antenatal care from a trained provider during the period 1992/93 to 2006, as well as in reducing the degree of inequality in this indicator (i.e., 91% of pregnant women reported receiving some antenatal care from a professionally trained provider in 2006, and the CI for this indicator decreased from 0.125 in 1992/93 to 0.059 in 2006). It is unclear, however, whether there has been equivalent progress in increasing the number of antenatal care visits received by a pregnant woman during this period (since the 2006 MICS III did not collect this information). That there was still significant

Figure 45. Decomposition of the CI (LSM=2005 monthly per capita household income) for antenatal care (3+ visits), 2005



Source: Annex 5, Table 14

inequality in 2006 in the proportion of recently delivering women who had been fully immunized for tetanus suggests that there is still likely to be considerable inequality in the number of antenatal care visits. Data from the 2006 MICS III also indicate that there is still a high degree of inequality in the quality of antenatal care received by pregnant women. For example, the CI for receiving a blood test was +0.331, while the CI for a urine test was +0.267 (by comparison, the CI was only +0.168 for an ultrasound). A household's "permanent income" accounts for most of the observed inequality in the quality of antenatal care received.

Obstetric delivery care

Obstetric delivery care is important both for maternal mortality and for neonatal mortality. The current international consensus is that the most important indicators are probably whether the delivery was attended by a professionally trained health provider and whether the delivery occurred in a health facility.³⁹ Less importance is currently attached to whether or not the delivery was attended by a medical doctor (as opposed to a professionally trained midwife) or whether it occurred in a hospital (as opposed to a health center, as long as the health center can access emergency obstetric care if needed on a timely basis).

Early estimates

Inequality estimates

Figure 46 shows the concentration curves for professionally assisted and doctor-assisted obstetric deliveries for a woman's last-born child under age 5 in 1992/93, using the wealth index as LSM. These concentration curves indicate that the distribution of professionally assisted births was moderately unequal in 1992/93, favoring richer women (CI = +0.115 using the wealth index as LSM), whereas the distribution for doctor-assisted births was highly unequal, also favoring richer women (CI = +0.399). In fact, the CI for doctor-assisted births was more unequally distributed than directly measured per capita consumption in 1992/93 (CI = +0.329).





Source: 1992/93 VLSS

Figure 47 shows concentration curves for obstetric deliveries occurring in any type of health facility and obstetric deliveries occurring in a hospital for the lastborn child under age 5, using the wealth index as LSM. These concentration curves indicate that there was a high degree of inequality in health facility-based obstetric deliveries in 1992/93, favoring richer women (CI = +0.194, using the wealth index as LSM), and an even higher degree of inequality in births occurring in a hospital (CI = +0.360), also favoring richer women and exceeding the degree of inequality in directly measured per capita consumption in 1992/93.

Regression analysis

Regression analysis is used to identify the factors associated with the four obstetric delivery indicators. Two statistical models are used, a linear probability model and a fixed effects logit model. The explanatory variables include the woman's age, the highest grade of schooling completed by the woman, the highest

³⁹ Oona Campbell et al., Op. cit..

Figure 47. Concentration curves for obstetric deliveries occurring in health facilities and in hospitals for last born child during the past 5 years, 1992/93 VLSS



Source: 1992/93 VLSS

grade of schooling completed by any household member aged 15+, a set of dummy variables characterizing the head of household's religious affiliation (Buddhist, Christian, Other, None), a dummy variable indicating whether the head of household is an ethnic Vietnamese or Chinese, the wealth index (as a measure of the household's "permanent income"), and commune dummy variables to capture fixed effects at the commune level or above.

The results with both statistical models indicate that obstetric delivery care is significantly related to the woman's age (nonlinearly, but only significantly for professionally assisted deliveries and for deliveries occurring in any type of health facility), to the woman's own level of schooling (positively, but significantly only for professionally assisted deliveries), to the highest grade of schooling completed by any household member (positively, for all four indicators), to religion (Christians and those affiliated with other religions, except Buddhism, are less likely to have professionally assisted deliveries or facility-based deliveries, although religion is not jointly significant for deliveries occurring in a hospital), and to Vietnamese or Chinese ethnicity (positively, but only for professionally assisted deliveries and deliveries occurring in any type of health facility, i.e., not for doctor-assisted deliveries or deliveries occurring in a hospital). Surprisingly, none of the obstetric care indicators is significantly related to the wealth index, despite the substantial income inequality that is observed for these indicators, implying that one or more correlates of income account for the observed income inequality.

Decomposition of inequality in obstetric delivery care

The estimated linear probability models were used to decompose the CIs for two of the obstetric care indicators: professionally assisted deliveries and deliveries occurring in any type of health facility. The results are summarized in Figure 48. They indicate that the main factor contributing to inequality in both indicators is the commune fixed effects. Other relatively minor contributions are made by the woman's schooling, by the highest level of schooling among adult household members and by ethnicity. There are no significant offsetting factors for either indicator.

Commune-level analysis of the estimated fixed effects identify the was done to commune-level characteristics that are most closely related to the estimated fixed effects for professionally assisted and facility-based deliveries. The explanatory variables are the same as those used for the commune-level analysis of the estimated fixed effects for antenatal care. The results are quite informative. The explanatory variables together account for 38-55 percent of the total variation in the estimated fixed effects, depending on the indicator (professionally attended deliveries or facility-based deliveries) and sample (all sample communes or rural communes). The estimated fixed effects for professionally assisted deliveries are significantly related to the commune sample mean number of grades of schooling completed by adults aged 15+ (positively) and (in the case of rural communes) to the index of proximity to health services (positively). The estimated fixed effects for facility-based deliveries are significantly related to the commune sample mean values of the wealth index (positively), to region (significantly lower in the North East, North West, North Central and Central Highlands





Source: Annex 3, Tables 61 and 62

regions, compared to the Red River Delta-the omitted category), and (in rural communes) to the index of access to roads (positively).

Recent estimates 2006 MICS III

Estimates of inequality in obstetric delivery care

Figure 49 shows concentration curves for obstetric deliveries during the past two years that were assisted by any type of trained medical worker or by a medical doctor or assistant doctor, based on data from the 2006 MICS III and using the wealth index as the LSM. These concentration curves indicate that there is still a considerable degree of inequality (favoring richer women) in professionally assisted deliveries in 2006 (CI = +0.096, using the wealth index as the LSM) and that there has been only a marginal reduction in the degree of inequality in this indicator since 1992/93, when the CI based on the wealth index was 0.115. An examination of changes in use of these services across quintiles indicates that there has, in fact, been almost

Figure 49. Concentration curves (LSM=wealth index) for obstetric deliveries of last born child under age 2 with assistance by any trained medical worker or by a doctor or assistant doctor, 2006 MICS III



Source: 2006 MICS III
no improvement in use of professional assistance for delivery in the poorest quintile since 1992/93, while there have been significant improvements for the middle three quintiles. Unfortunately, the MICS III did not collect data on deliveries assisted by medical doctors separately from assistant doctors, so no comparison can be made between 2006 and 1992/93 in deliveries assisted by a medical doctor.

Figure 50 shows concentration curves for obstetric deliveries in any type of health facility and in a hospital during the past two years, using the wealth index as LSM. These concentration curves indicate that there is still a moderate degree of inequality in obstetric deliveries occurring in any type of health facility, favoring richer women (CI = +0.116, using the wealth index as LSM). However, there has been a substantial reduction in the degree of inequality in this indicator since 1992/93, when the CI (also based on the wealth index) was equal to +0.194. Figure 50 shows that there is a much higher degree of inequality in obstetric deliveries occurring in a hospital, also favoring richer women (CI = +0.218). However, there has also been a considerable reduction in the degree of inequality in distetric

Figure 50. Concentration curves (LSM=wealth index) for obstetric deliveries in health facilities or hospitals for last born child during the past 2 years, 2006 MICS III



Source: 2006 MICS III

this indicator since 1992/93, when the CI (also based on the wealth index) was +0.360.

Regression analysis of obstetric delivery care

Regression analysis (using a linear probability model) was used to identify the underlying factors most closely related to the following four obstetric delivery care indicators: professionally assisted deliveries, doctor or assistant-doctor assisted deliveries, delivery in any type of health facility, and delivery in a hospital. The explanatory variables include the woman's age, the highest grade of schooling completed by the woman, the highest grade of schooling completed by any household member aged 15+, a dummy variable indicating whether the household head is ethnic Vietnamese or Chinese, the wealth index (as a measure of the household's "permanent income"), and commune dummy variables to capture fixed effects at the commune level or above.

The results indicate that obstetric delivery care is significantly related to the highest grade of schooling completed by any adult household member (positively, but only significantly for doctor or assistant doctorassisted deliveries and for deliveries occurring in a hospital and only at the 0.10 level for the latter), to Vietnamese or Chinese ethnicity (positively, but only for deliveries occurring in any type of health facility or in a hospital and only at the 0.10 level in the case of deliveries occurring in any type of health facility), and to the wealth index (positively, but only significantly in the case of deliveries occurring in a hospital).

Decomposition of inequality in obstetric delivery care

The estimated linear probability models are used to decompose the CIs for the four obstetric care indicators, using the wealth index as LSM. The results are summarized in Figure 51. They indicate that commune fixed effects account for the largest share of the observed inequality in all four indicators in 2006. The wealth index makes the second largest contribution for two of the indicators, i.e., deliveries in a hospital and doctor or assistant doctor-assisted deliveries, whereas ethnicity accounts for the second largest contributions for the remaining two indicators, i.e., deliveries assisted by any professionally trained



Figure 51. Decomposition of concentration index (LSM=wealth index) for professionally assisted and facility-based obstetric deliveries of last-born child under age 2, 2006 MICS III

Source: Annex 4, Tables 44-47

provider and deliveries occurring in any type of health facility. The dominant contribution of fixed effects is the same result obtained in the 1992/93 decomposition (Figure 48). However, the important contributions of the wealth index and of ethnicity were not obtained in the 1992/93 decomposition.

Commune-level analysis of the estimated fixed effects identify the was done to commune-level characteristics that are most closely related to the estimated fixed effects for professionally assisted and facility-based deliveries. The results are quite informative. The explanatory variables together account for some 46 to 50 percent of the total variation in the estimated fixed effects, depending on the indicator (professionally attended deliveries or facilitybased deliveries) and sample (all sample communes or rural communes). The estimated fixed effects for professionally assisted deliveries and facility-based deliveries are significantly related to an index of housing quality and quantity (negative), use of modern cooking fuel (negative), mean share of ethnic Vietnamese and Chinese in the commune (negative),

mean years of schooling of adults in households in the commune (positive), southern regions (positive) and the existence of a road into the commune (positive, only in rural areas and for professionally attended deliveries). For facility-based delivery in rural areas, there is a significant negative influence of being in the northern mountains regions and the Central Highlands.

Province data

Inequality estimates

Figure 52 presents a concentration curve for obstetric deliveries attended by a professionally trained health provider in 64 provinces in 2005, based on data from the MOH Health Information System. These data indicate that there was only a small degree of inequality favoring richer women in professionally attended births (CI = +0.023), a much lower degree of inequality than indicated in the 2006 MICS III data (CI = +0.096 in

Figure 49). This difference may be due to the fact that the province-level concentration curve reflects only between-province inequality, whereas the Figure 52. Concentration curve (LSM=2005 monthly per capita household income) for deliveries attended by a professionally trained health provider in 64 provinces, 2005



Source: MOH Health Information System (Health Statistics Yearbook 2005)

corresponding concentration curve derived from household survey data reflects both inequality between provinces and within provinces. However, the difference may also reflect some reporting problems since the MOH HIS data indicate that 96 percent of deliveries in 2005 were professionally attended whereas the 2006 MICS III indicates that only 87 percent of deliveries during the previous two years were professionally assisted. In particular, the number of deliveries (the denominator in this HIS indicator) is likely to have been under-reported in poor, remote areas (since many of the deliveries in these areas still occur in women's homes).

Regression analysis

Province-level regression analysis of the proportion of deliveries that were attended by a professionally trained health worker indicates that professionally assisted deliveries are significantly related to the proportion of the population that are ethnic minorities (negatively), to monthly per capita household income (positively), and to the proportion of the population that is urban (negatively, but only at the 0.10 level). The negative

Figure 53. Decomposition of CI (LSM=2005 monthly per capita household income) for obstetric deliveries attended by a professionally trained health worker in 64 provinces, 2005



Source: Annex 5, Table 18

relationship with urbanization is surprising since urban populations generally have better access to health services than rural populations. However, this finding may be due to the higher use of private providers for obstetric delivery care in urban areas, which would not necessarily be recorded in the MOH HIS.

Decomposition of inequality

Figure 53 summarizes the results of a decomposition of the province-level CI for births attended by a health worker. The results indicate that income and ethnicity account for most of the observed inequality (small, in any case) and that their contributions are partially offset by urbanization (although urbanization is not statistically significant at even the 0.10 level in the regression analysis, its own CI is relatively large in absolute value, i.e., +0.306).

Conclusions

There is still considerable inequality in the distributions of most obstetric delivery care indicators, including "professionally assisted deliveries." Although there have been significant reductions in the degree of inequality in some indicators since 1992/93 (for example, in deliveries occurring in any type of health facility or in deliveries occurring in a hospital), there has been very little reduction in the degree of inequality for "professionally assisted deliveries." Commune fixed effects (which may also reflect fixed effects at higher levels) account for much of the inequality observed in the obstetric delivery indicators (including about onehalf of the inequality in "professionally assisted deliveries." Commune-level analysis of the estimated fixed effects suggests that the commune fixed effects may reflect variation in the accessibility and quality of locally available health services. The province-level HIS data on obstetric delivery care may not be reliable, due to suspected under-reporting of deliveries assisted by private providers and of home deliveries in remote, rural areas. Findings from key informant interviews confirm that geographic access to care, lack of knowledge of when care is needed, financial costs of medical care or of seeking care, and quality of reproductive services all contribute to inequalities in access to reproductive health services disfavoring the poor. Local experts also associate these inequalities in access to appropriate and timely care with higher risks

of complications or delays in seeking necessary care both for mother and child.

Immunization

Child immunization (and particularly immunization against measles) has long been considered to be among the most cost-effective interventions to reduce child mortality. Viet Nam has made considerable progress in child immunization during the past 15 years, as the analysis below indicates. However, child immunization is not yet universal in Viet Nam, and there is still an important degree of inequality in most immunization indicators.

Early estimates

Inequality estimates

Figure 54 shows concentration curves for surviving children under 5 who were completely vaccinated with 4 vaccines (i.e., DPT, measles, polio and BCG) and who received no vaccines (according to vaccination

Figure 54. Concentration curves (LSM=wealth index) for children under 5 who were completely vaccinated with 4 vaccines and who received no vaccinations (excludes deceased children), 1992/93 VLSS



Source: 1992/93 VLSS

cards and parents' reports), based on data from the 1992/93 VLSS and using the wealth index as LSM. The proportion of children under 5 who were completely vaccinated and the proportion with no vaccinations were 39% and 21% respectively in 1992/93. The concentration curves show a moderate to high degree of inequality in complete immunization, favoring richer children (CI = +0.147), and a high degree of inequality in children under 5 who have received no vaccinations, disfavoring poorer children (Cl = -0.262). Interestingly, the inequality in complete immunization is greater than the inequality observed in under-5 child mortality in 1992/93 (Figure 2), suggesting that inequality in immunization may have been an important factor contributing to the inequality in child mortality observed in 1992/93.

Regression analysis

Regression analysis was used to identify the underlying factors most closely associated with both complete immunization and no immunizations among surviving children under 5. Two alternative statistical models were used, a linear probability model and a fixed effects logit model. The explanatory variables include the child's age (in days), the child's sex, the highest grade of schooling completed by the mother, the mean number of years of schooling completed by all household members aged 15+ (including the mother), a dummy variable indicating whether the head of household is ethnic Vietnamese or Chinese, the wealth index (as a measure of the household's "permanent income"), and commune dummy variables to capture fixed effects at the commune level or above.

The results for the linear probability model indicate that a child's vaccination status is significantly related to his/her age (nonlinearly-in the case of complete vaccination, increasing sharply during the first two years and remaining at approximately the same level thereafter, with the reverse relationship for no vaccination), to the mean number of grades of schooling completed by household members aged 15+ (positively for complete vaccination and negatively for no vaccination), and to the wealth index (positively for complete vaccination, but only at the 0.10 level, and negatively for no vaccination). Surprisingly, a child's vaccination status is not significantly related to the mother's schooling,⁴⁰ nor is it significantly related to

Figure 55. Decomposition of the CI (LSM=wealth index) for complete vaccination and no vaccinations among children under 5, 1992/93 VLSS



Source: Annex 3, Tables 69 and 70

the child's sex or ethnicity. The results were similar using the fixed effects logit model (unreported regressions).⁴¹

Decomposition of inequality

The CIs for complete vaccination and no vaccinations were decomposed using the estimated linear probability models and the wealth index as LSM. The results are summarized in Figure 55 (the estimated contributions are expressed as percentages of each CI in this case in order to highlight the similarities in the results for both indicators despite that the estimated contributions have opposite signs). They show that the same factors account for the observed inequality in both indicators, with the largest contribution made by commune fixed effects, followed by the wealth index, mean adult schooling and ethnicity.

Commune-level analysis of the estimated fixed effects was also done, using the same commune-level explanatory variables as those used in the analysis of fixed effects for antenatal care. The explanatory variables account for 17-30 percent of the total variation in the estimated fixed effects, depending on the indicator (complete vaccination or no vaccination) and the sample (all sample communes or rural communes only). The estimated fixed effects for complete vaccination are significantly related to region (the dummy variables are jointly significant, with lower complete immunization rates in all regions except the South Central region compared to Red River Delta, the omitted category), and to the commune-level index of access to roads (positive, but the index is only available in rural communes). The estimated fixed effects for no vaccination are significantly related only to the commune sample mean proportion of the population that is in households headed by an ethnic Vietnamese or Chinese (negatively).

Recent estimates

2006 MICS III

Inequality estimates

Figure 56 shows concentration curves for several alternative definitions of complete vaccination among surviving children under age 5, using the wealth index as LSM. These concentration curves indicate that there is still a moderate to high degree of inequality in key immunization indicators favoring richer children and that the degree of inequality increases steadily as successively more restrictive definitions of "complete vaccination" are used, including the number of vaccines received and the age at which the vaccines were administered (all recommended during the child's first year). The most comparable indicator to

Figure 56. Concentration curves (LSM=wealth index) for proportion of surviving children under 5 reported to be completely vaccinated, using alternative definitions of complete vaccination, 2006 MICS III



Source: 2006 MICS III

⁴⁰ Surprisingly, a child's vaccination status is not significantly related to the mother's schooling when the mean schooling of adult household members is omitted from the model (unreported regressions).

⁴¹ The exception is that ethnicity is statistically significant in the complete vaccination models. However, this difference probably reflects changes in the estimation samples since 30-40 communes were dropped from each estimation sample due to lack of variability in the left-side variable.

one that is also available in the 1992/93 VLSS is the proportion of children under 5 who have received a full does of each of 4 vaccines. The CI for this indicator (using the wealth index as LSM) is +0.108 in 2006, compared to +0.147 in 1992/93. Accordingly, it would appear that some progress has been made in reducing inequality in this indicator. The mean proportion of children completely vaccinated according to this definition has also increased from 39% in 1992/93 to 62% in 2006, which also represents significant progress. The 2006 MICS III data indicate that less than 2% of children under 5 had not received any vaccination (down from 21% in 1992/93), including 5% in the poorest quintile (LSM=wealth index).

Regression analysis

Regression analysis (using a linear probability model) is used to identify the underlying factors that are most closely associated with three immunization indicators: complete vaccination with 4 vaccines (comparable to the indicator used with the 1992/93 VLSS), complete vaccination, including for Hepatitis B and with all doses administered during the first year of life, and no vaccinations received (which applies to less than 2% of children under 5, but to 5% of children in the poorest quintile). The explanatory variables are the child's age (in days), the child's sex, the highest grade of schooling completed by the mother, the highest grade of schooling completed by any household member aged 15+, a dummy variable indicating whether the head of household is ethnic Vietnamese or Chinese, the wealth index (as a measure of the household's "permanent income"), and commune dummy variables to capture fixed effects at the commune level or above.

The results indicate that a child's vaccination status is significantly related to his/her age (nonlinearly), to Vietnamese or Chinese ethnicity (positively, in the case of the complete vaccination indicator that is comparable to the one available in the 1992/93 VLSS, but only at the 0.10 level, and negatively to the "no vaccinations received" indicator), and to the wealth index (positively, but only for the two complete vaccination indicators, and only at the 0.10 level for the more restrictive definition). Surprisingly, the results indicate that a child's vaccination status is not significantly related to either the mother's schooling or

Figure 57. Decomposition of concentration index (LSM=wealth index) for complete and no vaccination of children under age 5, 2006 MICS III



Source: Annex 4, Tables 60-62

Figure 58. Concentration curves (LSM=2005 monthly per capita household income) for completely vaccinated children under 1 and for children under 1 vaccinated for measles in 64 provinces, 2005



Source: MOH HIS (Health Statistics Yearbook 2005).

that of other household members.

Decomposition of inequality

The estimated linear probability models were used to decompose the CIs for the three indicators, using the wealth index as LSM. The results are summarized in Figure 57. They indicate that the wealth index contributes the most to inequality in the complete immunization indicator comparable to the one used with the 1992/93 VLSS, followed by ethnicity and the commune fixed effects. These same three factors were also found to be the main contributors to inequality in complete immunization in 1992/93, together with adult schooling (which is no longer an important factor in 2006). The decomposition results also indicate that ethnicity is the most important contributor to inequality in the "no vaccinations received" indicator, following by commune fixed effects, the wealth index and the mother's level of schooling. The wealth index and commune fixed effects are the main factors contributing to inequality

in the more restrictive complete vaccination indicator.

Province data

Inequality estimates

Figure 58 presents concentration curves for two province-level immunization indicators for 2005 from the MOH Health Information System (i.e., the proportion of children under one year of age who were completely vaccinated with 4 vaccines and the proportion of children under one year of age who were vaccinated against measles). The concentration curves indicate that there is virtually no inequality in these two immunization indicators (CI = +0.0036 and +0.0043respectively), which is at variance with the immunization data collected in household surveys (compare to Figure 56). There is a large apparent difference in the means as well. For example, the MOH HIS reports that 98 percent of children under one year of age were completely vaccinated with 4 vaccines in 2005, whereas the 2006 MICS III reports that only 62 percent of children under 5 were completely vaccinated.

Regression analysis

Province-level regression analysis of the two child immunization indicators indicates that immunization is significantly related to adult schooling (positively, but only for complete vaccination) and to the proportion of the population that is urban (negatively, but only at the 0.10 level). The observed negative relationship with urbanization is surprising, given the relatively favorable access to health services enjoyed by urban populations. One possible explanation is that children in urban areas are more likely to obtain vaccinations from private providers and that these are underreported in the MOH HIS.

Decomposition of inequality

Figure 59 summarizes the results of decomposing the CIs for the two immunization indicators. The results indicate that positive contributions to inequality from household income and schooling (favoring richer children) are offset by negative contributions (favoring poorer children) from population density and urbanization (which are both negatively related to immunization in the regression analysis, although the





Source: Annex 5, Tables 13 and 14

estimated relationship with population density is not even significant at the 0.10 level).

Conclusions

Despite significant improvements registered over time in the average levels of some key immunization indicators, there is still an important degree of inequality in these same indicators, according to household survey data. On the demand side, income, ethnicity, and adult schooling (but to a lesser extent in the case of schooling in 2006 than in 1992/93) still account for much of the observed inequality in key immunization indicators, while on the supply side, there is some evidence that physical access to health facilities and health providers is also important.

Curative care

In addition to preventive health care, curative care provided to children under 5 and to women ages 15-49 also plays an important role in preventing maternal and child mortality, both directly and indirectly, in the case of children under 5, by helping to prevent malnutrition. The 1992/93 VLSS collected data on curative care

obtained by individual household members of all ages during the past 4 weeks. The 2006 VHLSS collected similar information on curative care during the past 4 weeks as well as during the past 12 months. The 2006 MICS III collected data on curative care only for children under 5 and only in connection with a limited number of diseases (i.e., diarrhea, respiratory infections and fevers).

Initial estimates Children under 5 Inequality estimates

Figure 60 presents concentration curves (using two alternative LSMs) for the proportion of children under 5 reported ill or injured during the past 4 weeks who consulted a health provider using data from the 1992/93 VLSS (N=1,017). These concentration curves indicate that there was a moderate degree of inequality in under 5 curative care consultations in 1992/93 favoring richer children. The CIs are statistically significant and range in value from 0.072 (LSM=directly measured per capita wealth) to 0.146

Figure 60. Concentration curves (LSM= directly measured per capita consumption and the wealth index) for a consultation with a health provider obtained by children under age 5 reported ill or injured during the past 4 weeks



Source: 1992/93 VLSS

(LSM=directly measured per capita consumption). However, the differences in the CIs across LSMs are not statistically significant.

Regression analysis

Regression analysis is used to identify the underlying factors associated with the use of curative care by children under 5 in 1992/93. A linear probability model was estimated with the left-side variable indicating whether or not a health provider was consulted by a child under 5 in connection with a reported illness or injury during the past 4 weeks. The results indicate that curative care consultations among children under 5 are significantly related only to the child's age (negatively) and to the child's sex (but only at the 0.10 level), i.e., female children are less likely to obtain a consultation when ill or injured with other factors held constant. Surprisingly, the mother's level of schooling

is not significantly related to whether or not a consultation was obtained by an ill child under 5, even in the absence of any measure of the schooling of other household members.⁴² The results using a fixed effects logit model are the same in terms of signs and significance levels (unreported regressions).

Decomposition of inequality

Figure 61 summarizes the decomposition of the CI for a curative care consultation obtained by an ill or injured child under 5, using the wealth index as LSM and the regression results discussed above. The results indicate that commune fixed effects are the main factor contributing to the CI, raising the possibility that physical access to health services may be mainly responsible for the moderate inequality observed in this indicator in 1992/93.

Commune-level regression analysis is used to identify the commune-level factors that are associated with the estimated fixed effects. The explanatory variables include commune sample mean values of the wealth index, the proportion of ethnic Vietnamese or Chinese individuals, and the number of grades of schooling completed by adults aged 15+; dummy variables indicating the commune's location in one of eight regions and whether the commune is urban; and (for rural communes only) indexes of the commune's proximity to health services and its access to roads (available for rural communes only). The explanatory variables account for 33% (all communes) and 31% (rural communes) of the variation in the estimated fixed effects. Vietnamese or Chinese ethnicity is significantly related (positively) to the estimated fixed effects in both specifications (and therefore, to the likelihood of a child under 5 visiting a health provider when ill or injured). In addition, the wealth index and urbanization are significantly related (positively) to the estimated fixed effects in the sample of all communes. The wealth index is also positively related to the estimated fixed effects in the sample of rural communes, but the relationship is not significant at even the 0.10 level (t=1.34). Lastly, the regional dummies are jointly significant at the 0.10 level in the

⁴² Neither the highest number of grades of schooling completed by any adult household member nor the mean number of grades of schooling completed by all household members aged 15+ is statistically significant when added to the model (unreported regressions), nor does their inclusion affect the signs or significance levels of any of the other variables in the model





Source: Annex 3, Table 74 (column 3).

sample of all communes, but not in the sample of rural communes. Since the quality of health services available in a given commune is probably related to the commune's average income level, to its ethnic composition and to whether or not it is an urban or rural commune, these results are at least consistent with an interpretation that variations in the quality of locally available health care plays an important role in determining whether children under 5 consult a health provider when ill or injured.

Women ages 15-49

Inequality estimates

Figure 62 shows concentration curves based on two alternative LSMs (directly measured per capita consumption and the wealth index) for the proportion of women ages 15-49 who were reported ill or injured during the past 4 weeks and who obtained a consultation with a health provider in 1992/93 (N=1,638). These concentration curves indicate that there was a low to moderate (and statistically significant) degree of inequality in this indicator in 1992/93, with the CIs ranging from ± 0.040





Source: 1992/93 VLSS

(LSM=directly measured per capita wealth) to +0.100 (LSM=directly measured per capita consumption).

Regression analysis

Regression analysis is used to identify the underlying factors most closely related to the use of curative care by women ages 15-49. A linear probability function is estimated. The left-side variable is a binary variable indicating whether or not a consultation was obtained by women ages 15-49 in connection with a reported illness or injury during the past 4 weeks. The results indicate that curative care consultations among women ages 15-49 are significantly related to the woman's age (nonlinearly, decreasing sharply from ages 15-20 and then remaining relatively constant thereafter) and to the highest grade of schooling completed by the woman (positively).⁴³ The results using a fixed effects logit model are the same in terms

of signs and significance levels (unreported regressions).

Decomposition of inequality

Figure 63 summarizes the decomposition of the CI for whether or not a consultation was obtained by women ages 15-49 reporting an illness or injury during the past 4 weeks, using the wealth index as LSM and the estimated regression discussed above. The results indicate that the wealth index and the woman's own schooling contribute most to the CI (i.e., accounting for +0.051 and +0.040 respectively of the CI, but offset to the extent of -0.020 by the commune fixed effects). The relatively large contribution of the wealth index is surprising, given its insignificance in the estimated regression. However, the wealth index itself is very unequally distributed in the sample of women ages 15-49, and the contribution of the wealth index to the CI

Figure 63. Decomposition of concentration index (LSM=wealth index) for consultation with a health provider by women ages 15-49 reported ill or injured during the past 4 weeks



Source: Annex 3, Table 78 (column 3).

⁴³ If the mean number of grades of schooling completed by household members aged 15+ is included in the model (unreported regression), its estimated coefficient is statistically insignificant, but its presence reduces the significance level of the woman's own schooling to borderline significance (p=0.052). If the highest grade of schooling completed by any household member aged 15+ is included in the model (unreported regression), its coefficient is also statistically insignificant, and its presence does not affect the signs or significance levels of any other variables.

is in this case the product of a low estimated elasticity (0.003) and a high CI (20.1).⁴⁴

Commune-level regression analysis is used to identify the commune-level factors that are associated with the estimated fixed effects. The same set of explanatory variables as used above to analyze the estimated commune fixed effects for curative care of children under 5 are used in this analysis. Unfortunately, the results are not very illuminating. In the model estimated with all sample communes (N=146), only the regional dummies are statistically significant (women in the South East and Mekong Delta regions are significantly more likely to consult a health provider when ill or injured than women in the Red River Delta region-the omitted category). In addition, women in urban communes are less likely to seek care than women in rural communes, holding other factors constant, but this relationship is significant at only the 0.10 level. There are no statistically significant relationships in the model estimated with rural communes only (N=108), apart from the dummy variable referring to the Mekong Delta region (i.e., rural women in the Mekong Delta region are significantly more likely to consult a health provider when ill or injured than rural women in the Red River Delta). Interestingly, neither the index of proximity to health services nor the index of access to roads is significantly related to the estimated fixed effects in the sample of rural communes (both estimated coefficients are positive, but they are both individually and jointly insignificant).

Recent estimates The 2006 MICS III

About 7% of children under 5 on average were reported to have suffered from diarrhea during a twoweek reference period. The 2006 MICS III asked about different remedies provided to children suffering from diarrhea to identify cases receiving appropriate care. There is a moderate degree of inequality favoring the rich in the provision of appropriate rehydration therapy to children under 5 (the CIs range from +0.122 to +0.152 depending on the LSM used to rank children). However, the small sample size of children reported ill during the past two weeks (N=196) makes these estimates somewhat unstable as indicated by an extremely low share of children in the next richest quintile receiving appropriate care.

About 6.5% of children under 5 were reported to have had pneumonia symptoms (cough, rapid breathing problem in the chest) during the two-week reference period. The 2006 MICS III asked several questions about the care provided to children suffering these symptoms, including whether any medical care was obtained and, if so, the type of care obtained. The data indicate that there is only a low degree of inequality in the proportion of children who sought care at a medical facility (the CIs range from +0.017 to +0.040 depending on the LSM used), in the proportion who took medicine (the CIs range from +0.010 to +0.033), in the proportion who took an antibiotic (the CIs range from +0.053 to +0.066) and in the proportion of children under 5 whose mothers could identify two or more danger signs of pneumonia (the CIs range from +0.001 to +0.008). In contrast, there is a relatively high degree of inequality favoring the rich in the proportion of children who obtained care at a hospital or medical center (the CIs range from +0.185 to +0.230).

The 2006 MICS III also included a series of questions on the treatment of possible malaria. The indicator for risk of malaria was illness with fever, which clearly includes a large number of other illnesses besides malaria. Results indicate that 16% of children under 5 reportedly had a fever during the two-week reference period. Among these children (N=445), the MICS III asked whether care was sought at a medical facility, and for those who visited a medical facility (N=279), whether medications were taken both prior to and following the consultation. For all of these indicators, the CIs indicate no significant level of inequality favoring the rich or the poor (the CIs range from +0.020 to +0.050 for care at a medical facility, from -0.008 to +0.003 for medications provided at a health facility, and from +0.010 to +0.044 for medications taken prior to visiting a medical facility).

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Because the wealth index has negative values, it is not constrained within the usual limits of ±1 that apply to the CIs of variables with only non-negative values.

Figure 64. Concentration curves (LSM=wealth index and direct consumption) for proportion of ill children who sought inpatient care (12 month reference period) or outpatient care (4 week reference period), 2006



Figure 65. Concentration curves (LSM=wealth index) for proportion of children ill who obtained outpatient care at a hospital, CHS, or private facility or who received "self treatment" (4 week reference period), 2006



Source: 2006 VHLSS

The 2006 VHLSS: Children under 5

Figure 64 presents concentration curves for (1) the proportion of children under 5 who were reported ill during the past 4 weeks and who obtained any type of outpatient care (N=644) and for (2) the proportion of children under 5 who were reported ill during the past 12 months and who obtained any inpatient care (N=1,229). These curves indicate that there is very little inequality in the proportion of ill children who obtained any type of outpatient or inpatient care. The CIs for any type of inpatient care are +0.024 for LSM=direct consumption or -0.029 for LSM=the wealth index, while the CI for any type of outpatient care is +0.004 for LSM=direct consumption or -0.002 for LSM=the wealth index. However, as discussed below, there is considerable inequality in the types of outpatient and inpatient care obtained by children under 5.

Figure 65 presents concentration curves for the proportions of children under 5 reported ill during the

Source: 2006 VHLSS

past 4 weeks who obtained outpatient care from several alternative sources (i.e., a hospital, a commune health station or regional polyclinic, a private facility/provider, self treatment). These or concentration curves, which are based on two alternative LSMs (directly measured per capita consumption or the wealth index), indicate that there is considerable inequality in the types of outpatient care obtained. The inequality disfavors the poor in the case of outpatient care obtained at a commune health station (CHS) or regional polyclinic (assuming that the quality of care is poorer at these commune-level facilties). The CI is -0.198 for LSM=direct consumption or -0.218 for LSM=the wealth index. On the other hand, inequality in "self treatment" (presumably, in this case, referring to treatment by one or more parents in the absence of a professional consultation) disfavors richer children (assuming that the quality of care is also poor in this case). The CIs for self treatment are +0.104 for LSM=direct consumption or +0.110 for LSM=the wealth index. In contrast, the substantial inequality in outpatient care from either a private Figure 66. Concentration curves (LSM=wealth index) for proportion of ill children who sought inpatient care at the CHS or at a hospital (12 month reference period), 2006



Source: 2006 VHLSS

facility/provider (CI=+0.238 for LSM=direct consumption or +0.205 for LSM=the wealth index) or from a hospital (CI=+0.195 for LSM=direct consumption or +0.191 for LSM=the wealth index) favors richer children.

Figure 66 presents concentration curves for the proportion of children under 5 reportedly ill during the past 12 months who obtained inpatient care at either a CHS or regional polyclinic or at a hospital. The concentration curves indicate that there is a substantial degree of inequality disfavoring the poor in the use of a CHS or regional polyclinic for inpatient care (assuming that the quality of inpatient care is poorer in these facilities, which account for only about 2% of the inpatient care obtained by children under 5). The Cl is -0.216 for LSM=direct consumption or -0.307 for LSM=the wealth index. There is only a moderate degree of inequality in the proportion of ill children who obtained inpatient care at a hospital (favoring the poor at lower income levels but favoring middle income groups to a greater extent). The CI is +0.069 for $\mathsf{LSM}\!=\!\mathsf{direct}$ consumption and +0.017 for $\mathsf{LSM}\!=\!\mathsf{the}$ wealth index.

The 2006 VHLSS: Women ages 15-49

Figure 67 presents concentration curves for (1) the proportion of women ages 15-49 who were reported ill during the past 4 weeks and who obtained any type of outpatient care (N=1,701) and (2) the proportion of women ages 15-49 who were reported ill during the past 12 months and who obtained any inpatient care (N=5,485). These curves, which are based on two alternative LSMs (directly measured per capita consumption and the wealth index), indicate that there is very little inequality in the proportion of ill women ages 15-49 who obtained any type of outpatient or inpatient care. For any type of outpatient care, the CI is +0.007 for LSM=direct consumption or -0.001 for LSM=the wealth index. For any type of inpatient care, the Cl is -0.021 for LSM=direct consumption or -0.056 for LSM=the wealth index. However, as discussed below, there is

Figure 67. Concentration curves (LSM=wealth index and direct consumption) for proportion of ill women aged 15-49 seeking inpatient (12 month reference period) or outpatient care (4 week reference period), 2006





considerable inequality in the types of outpatient and inpatient care obtained by women ages 15-49.

Figure 68 presents concentration curves for the proportions of women ages 15-49 reported ill during the past 4 weeks who obtained outpatient care from several alternative sources (i.e., a hospital, a commune health station or regional polyclinic, a private facility/provider, or self treatment). These curves indicate that there is considerable inequality in the types of outpatient care obtained. The inequality disfavors poorer women in the case of outpatient care obtained at a commune health station (CHS) or regional polyclinic (assuming that the quality of care is poorer at these commune-level facilities). The CI is -0.273 for LSM=direct consumption or -0.293 for LSM=the wealth index. On the other hand, inequality in "self treatment" disfavors richer children (assuming that the quality of care is also poor in this case). The CI=+0.056 for LSM=direct consumption of +0.057 for LSM=the wealth index. In contrast, there is considerable

Figure 68. Concentration curves (LSM=wealth index) for proportion of ill women aged 15-49 who sought outpatient care at the hospital, CHS, private facility or self-treated (4 week reference period), 2006 inequality in outpatient care from either a private facility/provider or from a hospital favoring richer women. For private outpatient care, the CI is +0.124 for LSM=direct consumption or +0.089 for LSM=the wealth index. For hospital outpatient care, the CI is +0.149 for LSM=direct consumption or +0.146 for LSM=the wealth index.

Figure 69 presents concentration curves for the proportion of women ages 15-49 reportedly ill during the past 12 months who obtained inpatient care at either a CHS or regional polyclinic or at a hospital. The concentration curves indicate that there is a substantial degree of inequality disfavoring poorer women in the use of a CHS or regional polyclinic for inpatient care (assuming that the quality of inpatient care is poorer in these facilities, which account for only about 2% of the inpatient care obtained by women ages 15-49). The CI is -0.462 for LSM=direct consumption or -0.466 for LSM=the wealth index. In contrast, there is practically no inequality in the proportion of ill women who







Source: 2006 VHLSS

Source: 2006 VHLSS

obtained inpatient care at a hospital (CI=0.039 for LSM=direct consumption or -0.008 for LSM=the wealth index)..

Conclusions

The data on curative care for both children under 5 and for women ages 15-49 indicate that there is very little inequality in whether those reported ill or injured obtain any type of inpatient or outpatient care. However, there is considerable inequality in the type of care obtained by both women and children. Commune health stations (CHS) and regional polyclinics are used mainly by the poor for both outpatient and inpatient care (although the CHS and regional polyclinics account for only about 2% of inpatient admissions). There is very little inequality in the use of hospital inpatient care. Self-treatment is used slightly more by richer women and somewhat more by richer children as a source of outpatient care, while both hospital and private outpatient care are used considerably more by richer women and children. **SECTION 6**

GOVERNMENT AND NON-GOVERNMENTAL INTERVENTIONS

Interventions in the area of primary health, and in particular of maternal and child health, have been the foundation of the Vietnamese health sector since the country gained its independence. These interventions include a widespread grassroots healthcare network in all communes and almost all villages throughout the country. In addition, a number of target programs focus on important interventions in maternal and child health. The intention of many of the programs and policies is to prioritize government efforts and resources in remote, mountainous, poor and ethnic minority areas.

Public health infrastructure

The Government has put in place an extensive health network with 100% of communes currently having commune health workers and 98% having a commune health station (CHS) and 65% having a medical doctor. In addition, by the end of 2006, 84% of all villages in the country had village health workers (VHWs), with higher proportions in most highland provinces. In 2002, Party Directive 06 gave detailed instructions on measures to strengthen commune health care to reach health equity objectives.

In 2002, the Minister of Health determined national benchmarks for commune healthcare. The CHS together with VHWs are intended to implement health education, prevent and control epidemics, implement national target programs in health, participate in school health programs, provide basic curative care including dispensing essential drugs, reproductive health services, community based rehabilitation, mental health, health services for the elderly and first aid. In particular, the CHS is the facility intended to implement basic child health programs including the expanded program on immunization (EPI), to provide Vitamin A supplements to children and mothers, to monitor child growth and nutrition, and to provide appropriate care for diarrhea, acute respiratory infection and intestinal parasites. In addition the CHS is the facility intended to provide basic reproductive health services including antenatal care, tetanus vaccination during pregnancy, assistance at delivery, post-natal care, contraceptive services, and gynecological exams.

The CHS requires certain basic conditions to be able to implement its functions including a facility meeting appropriate specifications, basic equipment, essential drugs, medical doctor or assistant doctor, midwife or obstetric-pediatric assistant doctor, nurse and staff person with some training in pharmacy. VHWs are expected to have at least 3 months of training to be able to implement basic IEC functions, assist with national target program implementation and in more remote areas to be able to provide clean and safe delivery services and basic curative care. In addition, the Government is supposed to ensure that the CHS has a minimum operating budget each year and that commune health workers are paid according to government salary regulations including contributions to social health insurance.

Despite these measures, poorer provinces have difficulties in recruiting doctors and other quality staff to work at the commune level as is evidenced by the much lower share of communes with a doctor in mountainous provinces (Figure 70). While the proportion of villages with a village health worker in disadvantaged provinces is higher (Figure 70), the 2001/02 VNHS indicated that a smaller share of VHWs in mountainous areas were former health workers with formal medical training and their responses on a test of basic knowledge of maternal and child health care **Figure 70.** Concentration curves (LSM=2005 mean monthly per capita household income) for indicators of access to health care at the commune and village levels, 2005



Figure 71. Concentration curves (LSM=2005 mean monthly per capita household income) for four indicators of local government expenditure on health care, 2005



Source: Annex 5 (MOH Health Statistics Yearbook 2005).

indicated lower knowledge of proper care.⁴⁵ Funds for commune health worker salaries and regular operating budgets often fall short in poorer provinces (Figure 71). A study in Lao Cai, for example, found that workers were still paid according to an outdated minimum wage and back contributions to social insurance had not yet been paid.⁴⁶ Perhaps more important is the poor physical access to health care of people living in scattered communities in large, remote communes, who are disproportionately the poor ethnic minorities.

Source: Annex 5 (MOH Health Statistics Yearbook 2005).

Specific measures to improve child survival

In Minister of Health Directive 04/2003/CT-BYT (10/10/2003) on strengthening infant care and reducing infant mortality, several measures were proposed to advance these objectives. In terms of obstetric care, there are direct calls for better

management of pregnancy especially for women at risk of premature delivery and including screening for control and treatment of vaginal infections. In addition, care of newborns, including guidance for mothers on breastfeeding immediately after birth and vitamin K injections for newborns were emphasized. Early screening of risks, abnormalities, and jaundice should be implemented in order to collaborate with the pediatricians for early intervention. The directive also calls for early intervention in the case of obstetric emergency care, including poor respiration, reduced body temperature, infection and other diseases present at birth. The directive also calls for strengthening of the quality of pediatric emergency care for babies who are underweight or who have abnormalities improving screening and and interventions for abnormalities in newborns. Collaboration with obstetrics specialists in training lower level health care facilities to improve the quality of emergency, resuscitation and newborn care is

⁴⁵ Ministry of Health and General Statistics Office, 2003, Report on Results of the National Health Survey 2001-02. Hanoi: Medical Publishing House.

⁴⁶ Vietnam Sweden Health Cooperation, 2006, Study on compensation at CHS in Lao Cai. CBHD. Unpublished.

strongly recommended. Lastly, the directive calls for better organization of emergency care and for timely and safe referrals for sick newborns.

Several international agencies and non-governmental organizations have provided assistance to support the objectives of this directive. For example, UNFPA has provided support to 12 provinces on clean and safe delivery, essential newborn practices, breastfeeding, prevention and management of low birthweight and prevention of mother to child transmission of HIV/AIDS.

Save the Children USA has been actively involved in efforts to improve child survival with a pilot project focused on ethnic minority populations in Quang Tri province. The project relied on local health personnel, priorities, plans and official government interventions, but attempted to strengthen outreach, improve quality of facility-based antenatal care and assistance at delivery and IEC for mothers. While the project did improve utilization of the standard MCH packages at the grassroots level, key informant interviews indicated difficulties in expanding the project to other areas and ensuring sustainability once the project ends.⁴⁷ Save the Children USA has also designed a commune and district-level intervention (currently being piloted in Thanh Hoa province) to improve newborn care by providing training to medical staff and IEC to families. Results of this pilot will be useful in directing development of national programs to reduce neonatal mortality nationally.

The Netherlands Government has just begun a fouryear project (2006-2010) in 10 Northern mountains provinces and 4 Central Highland provinces aimed at reducing maternal and newborn mortality. The intervention package consists of efforts to improve the quality of commune and village level MCH services, improve knowledge and awareness of the population about MCH and to support supervisory and managerial capacity of the province and districts to monitor and evaluate the results of project implementation.

Population and family planning program

The population and family planning program has been strongly promoted by the Government since the 1980s. The earlier policies focused almost exclusively on restricting fertility to reduce rapid population growth. Since the National Target Program for Population and Family Planning to the year 2005 was passed in 2002, objectives have expanded (as reflected in the Population Ordinance of 2003) to include improvement in the quality of the population (the term "population quality" in this context is roughly equivalent to "human development").

Since the 1980s, the Government has made major efforts to train training population cadres from the central to the village level. Methods to implement population policy objectives have included IEC on the need to limit fertility and about the methods available to do so, combined with strong state or community monitoring of contraceptive use and pregnancies among women in childbearing age, incentives for limiting fertility, and state-subsidized provision of contraceptives, primarily the IUD, but more recently, a broader range of contraceptives.

In order to achieve goals of improving population quality, greater efforts will be made to strengthen reproductive health services (including antenatal care, tetanus vaccinations, distribution of iron pills to pregnant women, treatment of reproductive tract infections and safe deliveries), to reduce maternal and child malnutrition and to implement genetic screening and early interventions to address genetic abnormalities.

Initial population policies did not contain any special measures to target poor people, ethnic minorities or remote areas. But by 2000 in the Government's Population Strategy 2001-2010, priority began to be placed on areas and groups with higher fertility, especially disadvantaged and poor areas. The Population Ordinance passed by the National

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Luong VK et al., 2007, Use of Maternal, Newborn and Child health. Interventions After a Five Year Child Survival Project. Hanoi

Assembly in 2003 also made clear that priority for funding, for reproductive health and family planning services and for measures to improve the quality of the population should be placed on disadvantaged areas and population groups, including ethnic minorities. The National Target Program for Population and Family Planning (2001-2005 and 2006-2010) and the 2005 Government Action Plan to continue promoting population and family planning policy are consistent with this ordinance by prioritizing funding allocations and interventions such as IEC, reproductive health and family planning services to areas that continue to have high fertility and to disadvantaged areas.

Reproductive health

The National Strategy for reproductive health care 2001-2010 approved by Prime Minister's Decision 136/2000/QD-TTG (28/11/2000) lays out many important measures to meet the objectives of improving reproductive health and reducing disparities between regions and demographic groups while satisfying the diverse needs for reproductive health, paying special attention to those of disadvantaged regions and groups. A National Plan on Safe Motherhood (2003-2010) was developed, although goals still only focus on reducing overall levels of maternal and child mortality and morbidity, rather than reducing inequalities.

A four-year Maternal and Child Health project supported by NZAID and UNFPA has provided important capacity building support for Binh Dinh province to improve the quality and utilization of maternal and child health care services provided by local health care networks with a focus on people who live in mountainous and remote areas, adolescent and ethnic minority groups. A key informant interview with the project secretary indicated high potential for sustainability of improvements from this project in terms of quality of care provided and knowledge and awareness of the population about these interventions.

Measures currently proposed to meet goals of improving reproductive health and reducing disparities

include providing additional IEC on reproductive health and improving the quality and breadth of reproductive health services. The National Health Target Program for the period 2006-2010 includes a Reproductive Health Program that focuses on screening for and treating reproductive tract infections, paying incentives to commune health workers in charge of reproductive health care in focal communes, paying stipends to VHWs in remote areas and developing effective models for providing reproductive health services.

National target programs

Since the 1980s, the Government has implemented the National Expanded Program on Immunization (EPI). Subsequently it established National Health Programs operating on 5-year cycles expanding to cover other areas with a maternal and child focus including control of iodine deficiency disorders, malnutrition (including vitamin A, iron deficiency anemia and intestinal parasite cleansing) and more recently a reproductive health program. The overall national health programs include health equity as one of the intended objectives. Funding comes from the State budget and ODA and spending norms are higher for remote, mountainous and isolated areas than for other areas.

Expanded Program on Immunization

While immunization has been part of Vietnam's primary health care for many years, a pilot of the Expanded Program on Immunization was initiated with assistance from UNICEF and WHO in 1981 to include vaccines against 6 childhood diseases (TB, diphtheria, pertussis, tetanus, polio and measles). The pilot program was expanded to all provinces during the period from 1985 to 1988 achieving 80% immunization rates by 1989. Elimination of polio was set as the goal for 1995 and finally achieved in 1997.⁴⁸ In 1998, the Government included EPI in the National Target Program for elimination of some social diseases and epidemics 1998-2000 with goals for elimination of neonatal tetanus (through immunizing pregnant women) and control of measles by 2000. Vaccines

⁴⁸ Directive of the Chairman of the Politburo number 132-CT dated 20/04/1991 on further promoting the EPI and eliminating polio in the whole country 1991-1995.

against hepatitis B, Japanese encephalitis B, typhoid and cholera were introduced into EPI during this period. In 1999, supplementary immunization campaigns were implemented in certain underserved areas (mountainous, remote, isolated, border and island areas) in an attempt to reach the ambitious goals for 2000 for polio, neonatal tetanus and measles.

The National Target Program to control some social diseases and dangerous epidemics and HIV/AIDS during the period 2001-2005 included the important goal of maintaining the overall immunization rate for 6 basic childhood diseases at over 90%, maintain the achievement of eliminating polio, continue reducing neonatal tetanus (through immunization of pregnant women), continue to expand coverage of immunizations against Hepatitis B, Japanese encephalitis B, typhoid and cholera and introduce the vaccine against Hemophilus Influenza B. In 2002 and 2003, a major campaign was implemented to provide a second measles vaccine to children aged 9 months to 10 years of age. The 2006-2010 National Health Target Program goals for EPI include defending the elimination of polio and neonatal tetanus, maintaining full immunization rates above 90% in all districts throughout the country (not just an overall rate), eliminating measles by 2010, continuing to expand coverage of immunization against Japanese encephalitis for all children under 5 years of age, and against typhoid and cholera in areas where the diseases are endemic, further reducing the incidence of diphtheria and pertussis through booster shots of DPT, and studying the introduction of other vaccines.

From the start, the Government allocated funds not only for purchase of materials, but also to pay incentives based on the number of children fully immunized to people involved in IEC about immunization and health workers actually administering the vaccines. Starting in 2000 the payments for implementing the program were set higher in mountainous than in lowland areas.

In 1999, the Government directive on strongly promoting activities to achieve the goals of eliminating polio and neonatal tetanus and controlling measles by

2000 noted that while important achievements had been made, there remained weaknesses in the program especially in remote, isolated, mountainous, border and island communities. A review of EPI from 2000-2005 also indicated that the quality of EPI implementation in mountainous, remote and isolated areas was poor and that immunization rates were low.⁴⁹ Recent annual reports of the program continue to complain about poorer implementation of the program in these disadvantaged areas. Results of this situational analysis are consistent with statements in annual reports of the program, with much lower immunization rates among children in disadvantaged areas. Methods currently being proposed to overcome these inequalities in implementation for disadvantaged areas include strengthening the supervision and support for implementation in disadvantaged provinces, immunizing not only pregnant women, but all women aged 15 to 39 and booster shots for tetanus in areas at high risk of neonatal tetanus.

A pilot UNICEF-funded project in 213 communes of the Central Highlands aims to show how to overcome weaknesses of implementing EPI in remote areas. The project aims to improve coverage and quality of immunizations consisting of training of preventive staff at all levels on IEC and immunization skills, recruitment of mobile teams to reach remote areas, IEC for ethnic minority populations in disadvantaged areas. An assessment of this project has found that quality and safety of immunization services is increasing, immunization rates in remote areas are increasing, however the poor quality and low number of health staff at the grassroots level, low population density and low awareness of the local populations are constraints affecting success and sustainability of this pilot program and its potential for expansion nationwide to serve disadvantaged communities.

Nutrition program

A child malnutrition control program was started in 1994 under the National Committee for the Protection and Care of Children with pilot sites in all provinces. From the start, the program funded activities for pregnant women who weren't gaining weight and medicines and food for severely to moderately

¹⁹ Luong VK et al., 2007, Use of Maternal, Newborn and Child health. Interventions After a Five Year Child Survival Project. Hanoi

malnourished children living in poor families. The 1995 National Nutrition Action Plan set out the objectives of eliminating food shortages and increasing caloric intake of the population; reducing malnutrition of children and adults, especially women in childbearing ages; and reducing micronutrient deficiencies including vitamin A, iodine and iron. In 1998, the child nutrition program was added to the National Health Target Program with the main targets for child malnutrition rates and proportions with low birth weight. The nutrition program continued to be part of the National Health Target Programs during the period 2001-2005 and has been combined with the IDD program during the period 2006-2010. The National Strategy for Nutrition 2001-2010 laid out more detailed goals and methods to achieve them including not only reducing child malnutrition and underweight births, but also reducing micronutrient deficiencies (vitamin A, iron, iodine) and chronic energy deficiency among women in childbearing ages.

The main interventions of the malnutrition program include child growth monitoring and interventions for malnourished children and pregnant women, ensuring food security in poor households, guidance for mothers on appropriate breastfeeding and food preparation for children under 2 years of age (the weaning period) and for mothers of malnourished children aged 2 to 5, supplementation of Vitamin A and iron and ensuring adequate supplies of iodized salt, ensuring food hygiene and safety, intestinal parasite controls in poor areas and development of appropriate models for child health care to prevent and treat early infectious disease.

As the program interventions are heavily dependent on nutrition volunteers, the main program expense is stipends for these volunteers to implement IEC and guidance on proper feeding practices and to implement growth monitoring. Funds of the program are also used to purchase feeding supplements for malnourished children and pregnant women, vitamin A and iron pills. In addition, monitoring studies including anthropometric measurements, blood tests to measure micro-nutrient deficiencies, and urine tests for the level of iodine are covered by the program.

Military Civilian medical cooperation

For many years, the military health establishment has collaborated with local commune health stations to provide medical services to civilian populations in times of distress such as war or natural disasters, and in remote, isolated, border and island areas. This collaboration has now been formalized and funded as one of the sub-programs of the National Health Target Programs for the cycle 2006-2010. This is one of the programs not aimed at any specific disease, but rather targeted at interventions for at-risk groups.

The program intends to provide assistance through supporting repairs or renovation of commune health stations in remote, isolated, border and island areas, training and practice of the health workforce to satisfy needs for rapid interventions in emergencies, spending on curative care (drugs, stipends, transportation) and epidemic control activities for the poor and policy beneficiaries; integrating curative care with mitigation efforts after natural disasters or enemy attacks. The program also includes ethnic minority language training for military medical workers. This program has potential for reaching out to remote and isolated communities unable to access civilian medical services, however it is unclear whether the training and expertise of military medical workers is appropriate for the provision of more general public health services, including maternal and child health services.

School health program

In 2000 a joint circular was issued by the Ministry of Health and the Ministry of Education on implementing measures for school health called for in various laws and in a decree on organization of health care in provinces.⁵⁰ The circular laid out responsibilities of school health activities including provision of basic first aid or initial care for illnesses of children participating in school activities, regular health checkups for pupils, collaboration with parents to prevent and treat child illness, and organization of health protection, care and

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² Joint Circular of the Ministry of Health and Ministry of Education number 03/2000/TTLT-BYT-BGDDT dated 01/03/2000 guiding implementation of school health care.

education activities. In addition school health services were instructed to include IEC on various health issues of relevance to schools including near-sightedness, scoliosis, instructions for teachers, pupils and students on control of various diseases such as malaria, HIV/AIDS, prevention of "social vices" (e.g., drug abuse and prostitution), and use of family planning. Schools are also called on to ensure a clean school environment and food hygiene and safety.

The circular requires all schools to have a staff-member in charge of school health who should have some basic training in health issues. Funding for school health is to come from health insurance fees collected from pupils at the school. If funds are inadequate from this source, additional funds can be collected from parents. Poorer areas where pupils are unable to pay for health insurance are likely to be under funded for these activities. No assessments have been done on the effectiveness of implementation of school health activities.

Targeted health financing

The policy on user fees, begun in 1989, called for exemptions or reductions for children under age 6. Later amendments to this legislation called for exemptions or reductions for other groups as well, including the poor. Nevertheless without adequate funding to reimburse facilities for care provided and without clear guidelines, implementation of these exemption policies was weak. In 2002, the Prime Minister promulgated Decision 139 which established health care funds for the poor and provided government funding to pay either for health insurance for the poor or to provide direct reimbursement to health facilities to cover costs of providing free health care to the poor. In 2005, the amended Law on the Protection, Care and Education of Children laid out Government responsibilities to ensure the policy of free health care for children under age 6. Government budget funding was guaranteed for this purpose, including transfers from the Central budget to the

provincial budgets of disadvantaged provinces. Guidelines explained how provinces should organize the issuing of free health care cards to children under 6 years of age allowing them to seek medical care at government health facilities at no charge.

A 2007 impact evaluation study⁵¹ of Decision 139 found that free health care cards for the poor had led to increased access to health care services among the target groups (including the poor, ethnic minorities in disadvantaged provinces and residents of disadvantaged communes belonging to Program 135). Impact on out-of-pocket spending was less impressive.

A 2007 study by the Ministry of Health on the policy of health care for children under 6 in general found that the policy had led to important increases in the utilization of health care services by children covered under the policy, especially at the commune and district levels and that the policy had actually increased the funds available at the commune level for child health care.52 However, the study found a few problems with the policy. Firstly, estimates of the number of eligible children are 3 million short of GSO estimates of the population under age 6. Coverage of children under age 6 with a card is thus estimated at 66% of the actual number of children under age 6, although it is unclear which children are being missed. Secondly, policies dealing with children lacking the free health care card vary across provinces, in some cases requiring parents even of poor children to pay a deposit which will be reimbursed as soon as proper paperwork has been processed. Thirdly, some provinces impose ceilings on the cost per visit or on some high tech services while others cover all costs of health care for children under age 6, which again can create financial barriers for poor children with severe illnesses. Fourth, transportation and accommodation costs for family members of child patients are not usually covered by the policy and can be a strong deterrent for poor families to seek appropriate care for very sick children.

⁵¹ Sarah Bales, James Knowles, Henrik Axelson, Pham Duc Minh, Duong Huy Luong, Tran Thi Mai Oanh, 2007, The Early Impact of Decision 139 in Vietnam: An Application of Propensity Score Matching. Hanoi, October.

⁵² Ministry of Health, 2007, Review on the implementation of free healthcare services for children under six in public healthcare facilities with regards to child mortality and morbidity patterns and available treatment, Hanoi, May.

CONCLUSIONS

This situational analysis has prepared estimates of the degree of inequality in both maternal and child mortality and other high-level maternal and child health outcomes causally related to maternal and child mortality, including child morbidity, children's nutritional status and fertility. Estimates have also been prepared for several key intermediate health outcomes causally related to maternal and child mortality, including family planning, antenatal care, obstetric delivery care, immunization and curative care. Both early estimates for 1992/93 and recent estimates for 2006 of inequality have been prepared, and the estimated changes over time in the degree of inequality have been quantified. Province-level estimates of inequality for 2005 have also been prepared for most of these outcomes using data from the MOH Health Information System (HIS) and other sources. In addition, regression analysis has been used to identify the underlying factors, such as age, sex, education, income, urbanization and ethnicity that are most closely associated with these outcomes, and the observed inequality (as reflected in the CI) has been decomposed in order to quantify the contributions made by the various underlying factors to the observed inequality.

The main conclusions drawn from the situational analysis are as follows:

Firstly, the degree of inequality in key maternal and child health outcomes varies widely in Vietnam, both in 1992/93 and in 2006. Some indicators show very little inequality, including indicators of women's nutritional status in 1992/93, indicators of current contraceptive use in 2006 (any method or a modern method), most indicators of breastfeeding in 2006 (the exception is breastfeeding of children aged 20-23 months, in which

there is substantial inequality favoring the poor), and whether children under 5 have received vitamin A supplements in 2006. Others show a moderate degree of inequality disfavoring the poor, including child mortality in both 1992/93 and 2006, maternal mortality (but based on limited data collected in 2006), children's nutritional status in both 1992/93 and 2006, cumulative fertility (i.e., CEB) in both 1992/93 and 2006, curative care consultations for women ages 15-49 in 1992/93 and for children under 5 reported to have been ill or injured during the past 4 weeks in 1992/93, and the proportion of children under 5 who have been completely vaccinated with 4 basic vaccines (i.e., DPT, measles, polio and BCG) in both 1992/93 and 2006.

However, a few maternal and child health indicators exhibit a high degree of inequality disfavoring the poor and approaching (or even exceeding) the degree of inequality in the living standards measures (LSM) themselves. This category includes several indicators of antenatal, obstetric delivery care and postnatal care (including the number of antenatal visits in 1992/93, the proportion of pregnant women receiving complete antenatal care in 2006, the proportion of obstetric deliveries assisted by a medical doctor in 1992/93, the proportion of obstetric deliveries occurring in a hospital in 1992/93 and 2006, and the proportion of women ages 15-49 who received a vitamin A supplement within two months of giving births in 2006), several more strictly defined immunization indicators in 2006 (for example, the proportion of children who were completely vaccinated during their first year), and whether or not a child under 5 that was reported to have had pneumonia symptoms during the past two weeks obtained care at a health facility in 2006.

Secondly, where comparable data are available for the same indicators in 1992/93 and 2006, there has been

significant improvement in reducing the degree of inequality in some indicators, including current use of a modern contraceptive (from moderate inequality favoring the rich in 1992/93 to a small degree of inequality favoring the poor in 2006), any antenatal care by a trained provider, obstetric deliveries in any type of health facility or in a hospital, and in the proportion of children under 5 who have been completely vaccinated with 4 basic vaccines. However, there has been little or no change in the degree of inequality observed in several other key indicators, including child mortality, cumulative fertility, or the proportion of professionally assisted obstetric deliveries, despite impressive improvements in the average values of these indicators during the same period. Discouragingly, the degree of inequality in the nutritional status of children under 5 has increased between 1992/93 and 2006. At the same time, there are data gaps that prevent any assessment of changes over time in the degree of inequality in maternal mortality or in the number of antenatal care visits. In addition, likely under-enumeration of both maternal and child morbidity in the 1992/93 VLSS makes it infeasible to assess changes over time in the degree of inequality in maternal and child morbidity.

Thirdly, the results of regression analysis indicate that the main underlying factors associated with maternal and child health outcomes are household living standards themselves, education, nutritional status, ethnicity and location. One important and re-assuring finding is that a child's sex is significantly related to only one of the many outcomes analyzed, i.e., diarrhea morbidity among children under 5 during the past 4 weeks in 1992/93 (and only at the 0.10 level of significance). Although schooling is an important underlying factor for most maternal and child health outcomes, the analysis found only a few cases where the woman's/mother's own level of schooling is significantly related to maternal and child health outcomes when a measure of the schooling of all adult household members is also included in the model (i.e., either the highest level of schooling completed by any adult household member, or in some cases, the mean level of schooling completed by all adult household members, including the woman). This finding, while surprising, is nevertheless robust.

The regression analysis also finds that most of the high-level maternal and child health outcomes are significantly related to measures of nutritional status in the 1992/93 VLSS. For example, child mortality is significantly related to mother's height (negatively), while morbidity among women ages 15-49 is significantly related to her BMI (negatively). Perhaps most interestingly, indicators of children's nutritional status (for example, height-for-age and weight-for-age z-scores) are significantly related to the mother's nutritional status (positively, to both her height and BMI) and to the father's nutritional status (positively to his height, but negatively to his BMI), suggesting that during the period 1987/88-1992/93 father's may have competed for scarce food supplies within the household with their children under 5. These findings support growing recognition of the importance of maternal and child nutrition as a factor affecting child mortality.

The regression analysis also finds that all of the maternal and child health outcomes analyzed are significantly related to the commune of residence, even with relevant household and individual socioeconomic characteristics held constant. Supplementary commune-level analysis suggests that location is likely to reflect both supply-side factors, such as physical proximity to health services and demand-side factors, such as community average levels of income and schooling (that may also proxy for the quality and cost of locally available health services).

Fourthly, the decomposition of the observed inequalities, which reflects not only the relationships estimated in the regression analysis but also the degree of inequality in the underlying factors themselves, finds that the main factors contributing to the observed inequality in maternal and child health outcomes are the living standards measures themselves and both observed and unobserved factors related to location. Other underlying factors that contribute importantly to inequality in some indicators include schooling and ethnicity.

Lastly, there are some important data gaps that will need to be addressed in order to provide an effective basis for monitoring inequalities in maternal and child health outcomes in Viet Nam. One important gap is in child mortality. Currently, the only ongoing household survey collecting data on complete birth histories is the DHS (the latest estimates are based on the 2002 DHS and refer to children born during the period 1992-2002). The aggregate child mortality data collected in the MICS supports indirect estimates at an aggregate level (for example, at the national level or by urban-rural area), but they do not support reliable estimates of the degree of inequality in recent child mortality. Another important data gap relates to women's/mother nutritional status. The last household survey that collected such information was the 2001/02 Viet Nam National Health Survey. Thirdly, data on sibling mortality related to pregnancy and childbirth are an important tool for monitoring maternal mortality. Although data on sibling mortality are collected in the MICS, collecting such data in a larger survey would be helpful (for example, in the annual population change surveys). In addition to these three main examples, there are data gaps for some individual indicators, such as the number of antenatal care visits or obstetric deliveries assisted by a medical doctor, that should also be addressed (MICS). Lastly, the analysis of province-level data points to the limitations of routine health information system data for the assessment of health equity (due mainly to incomplete coverage in remote, rural areas and to the omission of information on private health services).

The findings of the situational analysis confirm that there is still an important and persistent degree of inequality in several high-level maternal and child health outcomes and that these inequalities are matched (or even exceeded in some cases) by the degree of inequality in several causally related intermediate outcomes (for example, immunization). The factors contributing to the observed inequality include both demand-side factors (i.e., the household's "permanent income," adult schooling, and ethnicity) and supply-side factors (i.e., the accessibility and quality of locally available health services). A reasonable conclusion, therefore, is that an effective strategy to address the remaining inequalities in maternal and child mortality should include both demand-side and supply-side interventions targeted to the poor, many of whom are ethnic minorities residing in remote localities.

In addition to existing demand-side interventions (i.e., free health care for children under six, for the poor and for ethnic minorities residing in mountainous areas), one possibility would be to provide conditional cash transfers to the poor and ethnic minorities residing in remote areas to motivate them to obtain cost-effective preventive health care for themselves and their children and to reimburse their transportation and related expenses when they are referred to hospitals for either outpatient or inpatient curative care.

On the supply side, an equally important and complementary set of interventions might include additional investments in commune and district-level facilities in poor districts, combined with adequate financial support for recurrent costs at these levels (possibly requiring a more pro-poor allocation of State Budget resources, along with earmarking or appropriate incentives to ensure that the additional resources are allocated by provinces to these areas) and innovative human resources interventions in the same localities to ensure that there are adequate numbers of appropriately trained health personnel working at the village, commune and district levels and that they are retained and motivated through an effective system of performance-based incentives. The progress in converting moderate inequality favoring the rich to a small degree of inequality favoring the poor in modern contraceptive use between 1992/93 and 2006 demonstrates how much can be achieved in Viet Nam when effective demandside interventions are combined with effective supplyside interventions.

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