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Source: *Population and Development Review,* Vol. 21, No. 4 (Dec., 1995), pp. 783–812
Published by: Population Council
Stable URL: http://www.jstor.org/stable/2137774
Accessed: 07/01/2010 00:41

Vietnamese Casualties During the American War: A New Estimate

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> ... the [Vietnamese] population has not had to participate in
> external wars from 1885 on, and has not been subjected to the heavy
> death tolls which have devastated the European nations.
> —Gourou 1955 [1936]: 224

FROM OUR CURRENT vantage point, there is little doubt that Vietnam has suffered the tragedies of the twentieth century, especially of war, more than most countries. The normal privations of colonialism were accentuated during World War II, when bad harvests combined with the export of rice to Japan led to a massive famine that is reputed to have taken between 400,000 and 2,000,000 lives in the Red River Delta during the winter of 1944–45 (Long 1973: 130–133; Woodside 1976: 159). From 1946 to 1954, the war for independence from the French took a large but unknown number of military and civilian casualties—perhaps up to a half-million dead and one million wounded (Harrison 1989: 124). Warfare was soon resumed at even more deadly levels with the replacement of the French colonial army by military forces from the United States and other countries. Between 1965 and 1975, the escalation of the war reached its peak with the presence of more than a half-million American soldiers and massive aerial bombing campaigns that traumatized the world (Harrison 1993).

Although there was a careful counting of the casualties sustained by foreign armies, there are no reliable statistics on the Vietnamese war losses during the "American war."[1] Numbers from one to three million Vietnamese war dead are frequently reported (Lewy 1978: 450; Thayer 1985: 103–104 and 128–129; Turley 1986: 195–197; Associated Press 1995). A *New York Times* reporter who covered the war summed up the prevailing view

of most knowledgeable authorities by claiming that close to one million communist combatants lost their lives, in addition to a quarter-million South Vietnamese soldiers and an unknown number of civilian casualties in South and North Vietnam (Browne 1994: 1).

Our aim here is to provide a more credibly data-based estimate of Vietnamese war-related deaths from 1965 to 1975 using the analytical tools of modern demography. Although demographers have developed a reper-toire of techniques to estimate mortality levels using unconventional data (United Nations 1983), for Vietnam the near absence of population statis-tics prior to the first modern censuses conducted in 1979 and 1989 poses severe obstacles. Data from these two censuses have been used to provide estimates of mortality for the last decade or so, but are not sufficient to gauge mortality for the earlier war period. Prior to 1979, there were only administrative head counts and limited (and unpublished) censuses con-ducted in 1960, 1974, and 1976 (Jones 1982; Vietnam, General Statistical Office 1991: xi). Beyond a few estimates of population size and growth, one finds only scattered reports of demographic characteristics of the Viet-namese population.

In an experiment to assess whether valid retrospective data could be gathered on adult mortality, especially of war losses, several questions were included in the Vietnam Life History Survey (VLHS), a small sample sur-vey conducted in 1991 in four locations (urban and rural areas in the North and South). A type of indirect demographic method to estimate adult mor-tality is based upon survey reports of the survival status of parents and siblings (Timaeus 1991). The 1991 VLHS questions, however, went much fur-ther and asked respondents the birthdates of parents and siblings, and, if par-ents and siblings had died, asked about the year of death (or age at death) and whether the deceased had died as a military or civilian casualty of war.

The conventional wisdom is that respondents in developing countries cannot accurately report birth and death dates of parents and siblings. In order to create a convincing case for the validity of the VLHS estimates of Vietnamese war deaths, we must first demonstrate the overall quality of the mortality rates generated by detailed retrospective survey questions. Accordingly, the central portion of this article is a description of the VLHS mortality data and an evaluation of their internal consistency and their validity in the light of other information on Vietnamese mortality. Our dis-cussion of that information is a necessary prelude to the estimation of Viet-namese war deaths based on VLHS data.

Our topic requires that we start with some reference to the broader canvas of Vietnamese social and political history. We begin with a brief historical overview of mortality trends and patterns in Vietnam. Next, we offer a short account of the background of the 1965–75 war and the inad-equate literature on estimates of Vietnamese war casualties. Finally, we

describe and evaluate the mortality data from the Vietnam Life History Survey and the procedures that were used to estimate Vietnamese war-related deaths from 1965 to 1975.

Prior estimates of overall mortality in Vietnam

Relatively little is known about mortality levels in Vietnam during the colonial era, except that they were very high. In his classic work, *The Peasants of the Tonkin Delta* (the Red River Delta in northern Vietnam), originally published in 1936, the French geographer Pierre Gourou reports very high mortality caused by childhood diseases, tetanus, and tuberculosis and observes that anti-tuberculosis drives seemed of little consequence because of chronic malnutrition (1955: 221). For the year 1934, Gourou assembled death rates per thousand population for 46 parishes (one or more villages) in the vicariate of Haiphong from information collected by the Catholic Missions (pp. 225–226). Across the 46 parishes, he reported crude death rates ranging from a low of 8 per thousand to a high of 51 with a mean of 22.7 and a median of 21. These rates, he noted, were often badly understated because infant deaths before baptism were not recorded (p. 225).

Most analysts of Vietnamese demography conclude that mortality fell in the postcolonial era, but there is considerable uncertainty about its levels in the decades after World War II (Ng 1974; Jones 1982; Banister 1985, 1993; United Nations 1995). The fragmentary data available from an incomplete vital registration system, local surveys of unknown quality, and some rudimentary censuses yield a diverse set of mortality indicators for different periods and regions of Vietnam.

Reviewing the secondary literature and various estimates of vital rates for the 1950s and 1960s compiled by the United Nations, the Economic Commission for Asia and the Far East, and the Population Council, Ng (1974: 72–73) concluded that there had been substantial declines in mortality in both the Republic of Vietnam (South Vietnam) and the Democratic Republic of Vietnam (North Vietnam) from prior levels. Ng attributed the reductions in mortality to improved health facilities in both the North and the South (pp. 72 and 74). Based on data from the Vietnamese Ministry of Health, Jones (1982: 209) reported that the crude death rate in the North was around 12 per thousand in the late 1950s and around 6–7 in the late 1960s and early 1970s. Also drawing on data from Vietnamese sources, Banister (1985: 14) concluded that the expectation of life at birth for the country as a whole rose from a level of 32–34 years in 1936 to 50 years in 1970, and 60 years in 1978. Although these estimates should be treated with considerable skepticism (as the original authors acknowledge), there is little doubt that mortality levels in the 1950s and 1960s were considerably lower than those during the colonial era.

The first official national data on Vietnamese mortality were published in the 1979 Population Census (Vietnam, General Statistical Office 1983: 125–126). Additional mortality estimates have recently become available from the 1988 Vietnam Demographic and Health Survey (Vietnam, National Committee for Population and Family Planning 1990; Swenson et al. 1993, 1995; Savitz et al. 1993) and the 1989 Population Census (Vietnam, General Statistical Office 1991). Although these estimates are drawn from independent sources and rely on different estimation techniques, they yield a fairly consistent picture of moderate mortality levels over the last decade, but with little sign of a trend.

Using the number of registered deaths from 1978 and 1979 as numerators and the 1979 census counts for denominators to calculate age-specific death rates, the 1979 census report contained estimates of life expectancy by single years of age and sex. Based on these figures, Banister produced abridged life tables and assessed the quality of the data (1993: 12–19 and 88–89; also see Banister 1985: 13–18). Although Banister concluded that the officially reported 1979 mortality levels were too low, the patterns of mortality were internally consistent and similar to patterns in China (Banister 1993: 14). The life tables published in the 1989 Population Census reports show almost exactly the same levels of overall mortality as those from 1979 (1989 e_0 = 63 for men and 67.5 for women) (Vietnam, General Statistical Office 1991: 116).

The mortality rates reported in the 1989 census are based on responses to a census question on deaths in the household during the last year, with the rates adjusted upward for incompleteness using the Preston–Coale method (Preston et al. 1980). The authors of the 1989 census report evaluated the adjusted mortality rates (based on household deaths) by comparisons with three independent sources: model life table patterns, survival ratios from the 1979 census population to the 1989 census population, and survival rates of children based on census questions on children ever born and children surviving. Overall, the patterns were fairly consistent, lending credibility to the estimated mortality levels (Vietnam, General Statistical Office 1991: Ch. 10).

Even if we accept the average of the 1979 and 1989 census mortality rates (the rates are quite similar) as representative of the 1980s, the lack of a trend over the decade is counterintuitive. There have been two attempts to measure trends in infant mortality; neither shows a significant trend. Using an adaptation of Brass methods (Trussell 1975) with data on children ever born and children surviving, the authors of the 1989 census reported estimates of infant and early childhood mortality (Vietnam, General Statistical Office 1991: 103). The estimates of infant mortality showed a slight decrease from around 47 per thousand births for the period around 1980 to an average of 43 in the mid to late 1980s. This small change is,

however, within the ranges of error inherent in the underlying data and in the methods of estimation.

In another study based upon the measurement of infant mortality using birth history data from the 1988 Vietnam Demographic and Health Survey, Savitz et al. (1993) estimated infant mortality for three periods: prewar (before 1965), wartime (1965–75), and postwar (1976 and later). The estimated infant mortality rates were 57.3, 37.4, and 35.8 per thousand births. Although the authors failed to find the expected impact of the war, these estimates are broadly consistent with the estimates from the 1989 census (Allman et al. 1991: Table 3).

A somewhat different account of the recent trend in Vietnamese mortality is presented by the Population Division of the United Nations. According to UN estimates, the expectation of life at birth in Vietnam rose from 47.9 years in 1965–70 to 55.8 years in 1975–80, and 62.6 years in 1985–90 (United Nations 1995: 872). The major reason for the difference in the mortality trend in the UN estimates and Vietnamese sources is the estimate of life expectancy for the late 1970s. The UN discounted the reported values of life expectancy from the 1979 census as too high (based on the assessment by Banister 1993: 14), and relied instead on an interpolation of the 1970 value of life expectancy of 50 years (reported in Banister 1985: 14) and a life table value of 65 years based on data from the 1989 census (personal communication with Bhakta Gubhaju, United Nations Population Division, 7 June 1995).

In spite of the problems of measurement, two tentative findings emerge from prior studies of Vietnamese mortality: (1) mortality declined from very high levels in the colonial era to moderate levels during the 1960s and 1970s, and (2) the downward trend of mortality may have leveled off during the 1980s. Both of these findings require further investigation. There are many reports relating to public health programs in Vietnam during the 1950s and 1960s, particularly in the North (Banister 1985: 13–18), but a satisfactory analysis of how moderate levels of mortality were reached in a very poor country during wartime conditions is yet to be carried out. The leveling off of mortality during the 1980s (if indeed that is the case) may find its explanation in the prevailing levels of mortality. There are limits to the effectiveness of public health programs in a very poor country that lacks modern medical technology and medicines (see Banister 1993: 12–19).

The American war in Vietnamese history

For most Americans, the Vietnam war was a minor overseas military engagement until 1965. Although the number of American military personnel in Vietnam grew from less than a thousand in 1960 to some 23,000 in 1964, and 246 American war deaths were recorded in these years (Lewy

1978: 24), the "real war" began in 1965. The number of American troops in Vietnam rose to 184,000 in 1965 and peaked at 541,000 in 1969 (Gibson 1986: 95). In spite of occasional offensives and renewed aerial bombing campaigns, the American strategy after 1969 resulted in the gradual withdrawal of US combat troops. This was completed with the signing of the Paris Peace Accords in 1973, which brought the exchange of war prisoners. The war, however, continued between North and South Vietnam (with external aid to both sides) until 30 April 1975, when the fall of Saigon marked the final defeat of the South Vietnamese government.

In contrast to the dominant American version of the "Vietnam war," a broader perspective shows that the 1965–75 "American war" was the final stage of the modern Vietnamese national revolution (Woodside 1976; Kolko 1985). The roots of the revolution reach back to the resistance to the French colonization of Indochina from the 1860s to the 1880s. Although the country was "pacified" under French colonial rule for the first four decades of this century, the continuity of the struggle against foreign domination from the 1880s to the end of World War II and in subsequent wars against the French (1946–54) and the United States is evident in all scholarly analyses except for those written through the lens of American cold war policy.

One of the most poignant accounts of the continuity of the Vietnamese revolution is anthropologist Hy Van Luong's reporting of the history of human suffering in a Vietnamese village in the Red River Delta, where he conducted research in 1987 (Luong 1992: 5–7). For almost a hundred years, each generation of villagers suffered from the intervention of foreign armies. In the struggle against French colonialism in 1884–85, 300 villagers were reported to have been massacred. After an abortive anticolonial uprising in 1930, more than half of the houses in the village were burned, a local leader was beheaded, and 19 villagers were exiled, including some to French Guiana in South America. In 1951, during the first Indochina War, the village was bombed four times by the French air force, leaving 30 villagers dead and 78 houses destroyed. In 1965 American planes destroyed the local secondary school and adjacent homes. In addition to the civilians killed by the bombs, the village sent 360 men to fight in the war.

The modern phase of the Vietnamese revolution begins with the "August revolution" of 1945 (Khanh 1982: Ch. 6). In the closing days of World War II after Japan had surrendered, the Viet Minh, led by Ho Chi Minh, declared the country's independence and the birth of the Democratic Republic of Vietnam. France, however, sought to reclaim its colonial possession, and from 1946 to 1954 the first Indochina War was a struggle between the nationalist forces led by the Viet Minh and the French colonialists (SarDesai 1992: 58–63).

In one of the great ironies of modern times, the new leaders of independent Vietnam spoke warmly of their ties with the United States, and

US army officers stood in the reviewing stand as Ho Chi Minh proclaimed the independence of Vietnam on 2 September 1945 (Herring 1986: 3). Indeed, the newly independent Vietnamese government continued to initiate contacts with the United States up to 1947 in hopes of gaining American support to stop the French armed intervention (Bradley 1993). In the late 1940s, however, American foreign policy was increasingly involved in cold war struggles against growing communist forces in Europe and Asia. In Vietnam, the American position shifted from initial sympathy toward the nationalist forces to support for France's military effort (Kahin 1986: Chs. 1–2). By 1954, the United States was underwriting over three-quarters of the French war bill in Indochina (Turley 1986: 4).

After the defeat of the French forces by the Viet Minh at Dien Bien Phu in 1954, the United States refused to sign the accords of the Geneva Conference that settled the war. The US-installed government of Ngo Dinh Diem in the South also refused to hold national elections to unify the country, as stipulated in the Geneva Accords, and began to eliminate all political opposition (Kahin 1986: 96). The Viet Minh veterans in the South fought back against the Diem regime and received the support of men and materiel from the government in the North. Over the next decade, the communist revolutionary forces in the South, aided by the North (the Democratic Republic of Vietnam), struggled for military and political dominance against the US-supported government of the South (the Republic of Vietnam). At the stage where the communists were poised for almost certain victory in 1964, the United States embarked on a major military escalation of the combat that brought 500,000 American soldiers and tens of thousands of additional soldiers from South Korea, Thailand, Australia, and New Zealand to support the South Vietnamese regime.

Prior estimates of Vietnamese war casualties

The human costs in Vietnamese lives of the American war from 1965 to 1975 have never been fully documented. In the major entry on the Vietnam War in the 15th edition of the *Encyclopaedia Britannica*, the author notes that the cost of the war totaled about $200 billion, but no word on casualties is offered beyond the observation that, "In Vietnam, many thousands were killed, wounded, or rendered homeless" (*Encyclopaedia Britannica* 1988: Vol. 12: 363). The only component that was measured with some accuracy was the deaths of soldiers of the Republic of Vietnam, and even here accounts differ. Thayer reports that 171,331 South Vietnamese troops were killed in combat from 1965 to 1972 (1985: 106), while Lewy cites a total of 220,357 South Vietnamese military deaths from 1965 to 1974 (1978: 451). The difference in these numbers may reflect the differing time periods and perhaps also the inclusion of noncombat deaths in Lewy's figure.

The counting of casualties suffered by the communist military forces and their supporters was an important political objective of American military strategy in Vietnam. In the words of General William Westmoreland, commander of the American armed forces in Vietnam, the conflict was a "war of attrition" (Gibson 1986: 155). The plan was to kill as many enemy soldiers (and their civilian supporters) as possible, with the hope that those remaining would give up the struggle (Spector 1993: 154). Elaborate efforts were made by the American military managers to collect "body counts" of enemy dead, but almost no one believed them (Lewy 1978: 78–82). In addition to the technical problems of finding bodies and distinguishing between military and civilian casualties, a statistical side product was that the effort introduced powerful incentives for the American and South Vietnamese military to report exaggerated enemy body counts (Gibson 1986: 110–112). Because it was almost impossible to check on the veracity of such reports, inflation of numbers was routine.

The official US Department of Defense figure was 950,765 communist forces killed in Vietnam from 1965 to 1974 (Lewy 1978: 450). In his comprehensive evaluation of war casualties, Lewy (p. 450) notes that Defense Department officials believed that these body count figures need to be deflated by 30 percent; making this adjustment would reduce the estimate of communist forces killed to 666,000. In addition, Lewy assumes that one-third of the reported "enemy" killed may have been civilians, concluding that the actual number of deaths of communist military forces was probably closer to 444,000 (pp. 450–452).

Equally uncertain is the number of civilian wartime casualties—killed and wounded—in Vietnam during the American war. Estimates of the loss of Vietnamese civilian lives were conducted only under pressure by Congressional committees, most notably led by Senator Edward Kennedy (Lewy 1978: Appendix I; Thayer 1985: Ch. 12). High civilian casualties were an inevitable feature of the nature of the war and the sheer volume of firepower used by the American military. Harrison (1993: 131) claims that over 15 million tons of explosives were expended over Indochina, almost half from the air. A lower estimate of 4 million tons of bombs dropped by US aerial forces is presented by Wiesner (1988: 304). In either case, the volume of American bombing in Vietnam exceeded the 2.7 million tons of bombs dropped by the Allied Forces in all theaters during World War II (Harrison 1993: 133; also see Littauer and Uphoff 1971). Based on alternative extrapolations from the number of hospital admissions of war casualties, the estimates range from 195,000 to 430,000 civilian war deaths and about a million wounded in South Vietnam from 1965 to 1974 (Thayer 1985: Ch. 12; Lewy 1978: Appendix I). In his comprehensive assessment of war victims in Vietnam, Wiesner (1988: 347) presents Lewy's estimate of 247,000 civilian war deaths in South Vietnam from 1965 to 1974 and

observes that these "estimates are as accurate as can be derived from the incomplete raw data."

One estimate of the number of civilians killed by American bombings in North Vietnam is 65,000 (Lewy 1978: 451), but this figure seems even more specious than most of the other numbers in the literature. This figure is an extrapolation of the 52,000 North Vietnamese civilian deaths as a result of American air strikes from 1965 to 1969 estimated by the staff of the US National Security Council in 1969 (Wiesner 1988: 310).

Clearly, the available literature provides a very weak basis for an assessment of Vietnamese casualties during the American war. The lowest estimate is 1,234,000 Vietnamese military and civilian war deaths from 1965 to 1974 (Lewy 1978: 450–453). Lewy's total consists of: 220,000 South Vietnamese soldiers, 660,000 communist soldiers (as noted above, he suggests that up to one-third of these deaths may have been civilians), 250,000 South Vietnamese civilian deaths from military operations, 39,000 civilians assassinated by communist forces, and 65,000 North Vietnamese civilians killed by American bombing. Lewy's figure is only half the estimate of 2,358,000 Vietnamese war deaths (1.2 million civilian and 1.158 million military) from 1960 to 1975 cited by Robert McNamara in a survey of deaths caused by wars and conflicts around the world since the end of World War II (McNamara 1991: 111). In turn, McNamara's estimates are considerably less than the number of Vietnamese war deaths cited in a recent report from the Vietnamese government. In April 1995, the Ministry of Labor, War Invalids, and Social Affairs released an estimate of 1.1 million communist military deaths and almost 2 million civilian deaths due to war-related causes from 1954 to 1975 (Associated Press 1995). Unfortunately, lacking access to the source data and independent records, a critical evaluation of these estimates of Vietnamese war deaths is not feasible.

The war's imprint in the 1979 and 1989 censuses

It may be expected that the legacy of wartime mortality would be evident in the age-sex structure of the populations enumerated in the 1979 and 1989 censuses. The population structures revealed in census data do, of course, bear the imprint of past mortality, but that impact is confounded with the effects of other demographic processes and with reporting errors in census enumerations. These factors make it difficult to ascertain the magnitude of wartime mortality. Table 1 shows the population numbers and sex ratios (males per 100 females) by five-year age groups from the 1979 and 1989 censuses.

Normal mortality, because of the generally higher mortality of males, would lead to a gradual decrease in sex ratios from over 100 at the youngest ages to much lower levels at older ages. According to the 1979 census,

TABLE 1   Population (in thousands) by age and sex: Vietnam, 1979 and 1989

| | 1979 census | | 1989 census | | Sex ratio (percent) | | Cohort survival rate: 1979 to 1989 | | |
| | | | | | | | Age in | | |
Age group	Males	Females	Males	Females	1979	1989	1979	Males	Females
0–4	3,946	3,766	4,646	4,364	104.8	106.5	0–4	0.98	0.97
5–9	3,929	3,762	4,404	4,177	104.4	105.4	5–9	0.86	0.92
10–14	3,632	3,407	3,876	3,651	106.6	106.2	10–14	0.79	0.92
15–19	2,954	3,061	3,377	3,444	96.5	98.1	15–19	0.91	0.97
20–24	2,281	2,601	2,880	3,120	87.7	92.3	20–24	0.99	0.95
25–29	1,742	1,976	2,696	2,971	88.2	90.7	25–29	0.89	0.90
30–34	1,177	1,315	2,264	2,469	89.5	91.7	30–34	0.88	0.91
35–39	967	1,104	1,551	1,774	87.6	87.4	35–39	0.91	0.98
40–44	919	1,085	1,039	1,196	84.7	86.9	40–44	0.94	0.99
45–49	995	1,114	882	1,083	89.3	81.4	45–49	0.93	0.94
50–54	825	902	865	1,077	91.5	80.3	50–54	0.87	0.95
55–59	681	873	922	1,045	78.0	88.2	55–59	0.79	0.80
60–64	541	663	714	861	81.6	82.9	60–64	0.60	0.73
65–69	419	560	537	701	74.8	76.6	65–69	0.50	0.63
70–74	284	434	326	481	65.4	67.8	70–74	0.33	0.45
75–79	183	313	211	354	58.5	59.6	75+	0.17	0.20
80–84	64	136	95	195	47.1	48.7			
85 +	40	91	48	110	44.0	43.6			
Total	25,579	27,163	31,333	33,073	94.2	94.7			

SOURCE: Vietnam, General Statistical Office 1991: 11.

a sharp male deficit, beginning at ages 20–24, continues roughly at the same level through ages 50–54, and then drops off even further. Undoubtedly, the impact of military casualties is reflected in these figures, but the lack of a difference between the cohort who were teenagers in the last stages of the war in the early 1970s (ages 20–24 in 1979) and prior cohorts who endured the war for a longer time is unexpected. Matching age cohorts from the 1979 and 1989 censuses (see righthand columns in Table 1) reveals considerable flux in cohort survival rates that is not always consistent with the expectation of gradual increases in mortality at each older age.

A number of factors may account for the lack of consistent patterns of sex ratios within and across censuses. One probable factor is the exodus of refugees from Vietnam after 1975. From a variety of sources, Banister estimates that 1.4–1.5 million Vietnamese may have emigrated (or died while trying to flee) from Vietnam between 1975 and 1990 (Banister 1985: 13; 1993: 32–33). Although there is a fairly balanced sex ratio among the 543,000 foreign-born Vietnamese enumerated in the United States in 1990 (US Bureau of the Census 1993: 34), the sex composition of those who

fled to other countries (including over 200,000 to China), those lost at sea, and those still in refugee camps is unknown. Other factors that affect the census figures shown in Table 1 include underenumeration (often selective of young men), sex differentials in age misstatement (in part because women above age 45 are exempt from public service; see Vietnam, General Statistical Office 1991: 18), the absence of the large number of Vietnamese men on military duty in Cambodia, and the absence of those studying and working in Eastern Bloc countries (Banister 1993: Appendix B). Isolating the impact of wartime deaths through an analysis of the age-sex composition of the populations in the 1979 and 1989 censuses does not seem possible.

The 1991 Vietnam Life History Survey

The primary data source for our study is the 1991 Vietnam Life History Survey, a sample survey of 403 Vietnamese households briefly characterized above. Although the survey, conducted from January to March 1991, was limited to four selected areas, that selection was designed to incorporate regional diversity and a mix of urban and rural areas. Four primary sampling areas were chosen: a medium-size city in the North (Hai Duong), a village (Tien Tien) about 6 kilometers from Hai Duong, a city in the heart of the Mekong River Delta in the South (Can Tho), and a nearby village (Long Hoa).

In each of the four areas, approximately 100 households were selected to be interviewed (99, 101, 100, and 103). Given that the overall sample size was set by budget constraints, the sample size in each area was chosen to offer the possibility of between-area comparisons. In the two villages, every "Nth" household was selected from a list of all households in the village, where "N" was the total number of households in the village divided by 100. In the city in the South, the same general sampling strategy was used in two areas of the city: a mixed commercial/residential area and a working-class residential area. The urban sample in the North was selected in a comparable fashion from the household list of one of the city's subdistricts.

For the purposes of the survey, a household was defined as one or more persons who live together in a house or housing unit and who usually share some common expenses and often have meals together. Although most households contain only family members (a family was defined as persons related by descent or marriage), some households include unrelated persons, and a few are entirely composed of unrelated persons. Individuals who were temporary visitors (there were very few in the sample) or were boarders or employees were included as household members in the VLHS. The household questionnaire collected standard demographic information on all persons in the household as well as basic information

on housing characteristics and on the ownership of consumer goods. In addition, an individual-level questionnaire was administered to the 921 persons between the ages of 15 and 65 in the selected households (240, 220, 220, and 241 persons in the four sampling areas).

The interviews for the 1991 VLHS were conducted by 14 Vietnamese researchers who had prior interviewing and field research experience. The first author conducted interviewer training (which included practice interviews in Ho Chi Minh City) before the field work began and then accompanied the interviewing team to three of the four field sites in January and February 1991. Interviewing at the fourth site was conducted in March 1991 by the third author and another Vietnamese colleague who had been an interviewer and supervisor in the earlier phase of the field work. Although preliminary evaluation and coding of the questionnaires were begun in the field, the final coding of the data was conducted by Vietnamese-speaking research assistants at the University of Washington. All cases of missing data and inconsistent responses were carefully evaluated and double-checked with the original questionnaires. Overall, the 1991 VLHS data appear to be internally consistent (Center for Studies in Demography and Ecology 1993).[2]

Mortality data in the 1991 survey

Questions asked on surveys or censuses about the survivorship of kin have become the most important basis for estimating mortality levels in countries lacking good vital registration systems (United Nations 1983; Timaeus 1991). The estimation methods used with such data are necessarily indirect, since kin survival status information is elicited but the dates of events are not. Analysts must then use models of event placement to infer mortality levels at particular times. In contrast to these indirect approaches, information in the VLHS was also elicited on the dates of death and birth (i.e., the commencement of exposure to the risk of death), so that the data collected permit the use of direct methods of estimating mortality.

In the individual questionnaire, each respondent was asked the year of birth of his or her mother and father and whether they were still alive at the time of interview. If either parent had died, additional questions were asked about the age and the year of death. Another question was asked about the cause of death, with the possible responses being: (1) military casualty (while serving in any army or militia), (2) civilian casualty of war, (3) died while trying to flee the country, (4) accident, (5) sickness, (6) other, (7) old age ("natural death"), and (8) don't know. The value of this question for our present purpose is limited to distinguishing war-related casualties from all other causes of death.[3]

The same questions were also asked concerning all of the respondent's brothers and sisters (including step-siblings). In a household where two or

more siblings were interviewed, only one was included in the subset of the data used for our analysis of mortality patterns, to avoid duplicate reporting of information related to the same parents or siblings. A basic description of the data set is presented in Table 2. The top panel shows the data on parents; the middle panel contains the data on siblings, and the third panel is the combined data file of parents and siblings.

The stub of Table 2 lists the year of birth (and age as of January 1991) of the parents and siblings.[4] The columns give the numbers of parents (and siblings): still alive, dead at the time of interview, dead with age at death known, dead with age at death unknown, total, and the percent of the total that survived to the date of the VLHS interview. The grand total in the top panel consists of 1,608 parents; information concerning them was obtained from 804 of the 921 VLHS respondents. The balance of respondents (921 − 804 = 117) are siblings of other respondents and thus share the same parents.

Of the total sample of 1,608 parents, 999 were still alive at the time of the survey, 492 had died and the respondent was able to report the age at death, and 117 had died at an age unknown to the respondent. For a substantial number of parents the year of birth was unknown (n = 237) and/or the age at death was missing (n = 117). There is considerable overlap between data missing for age at death and missing data for year of birth: of the 117 cases with an unknown age at death, 115 also had an unknown year of birth. Of the grand total of 1,608 parents, there are 1,369 cases (898 living and 471 dead) without missing data. The survivorship (to the date of the survey) of the subsample of parents with a known year of birth is close to that of the total sample (65.5 percent and 62.1 percent). The pattern of survivorship by year of birth (shown in the last column) follows the expected pattern of higher likelihood of survival among younger parents.

The middle panel shows a much larger sample of siblings: 3,954 reported by the 804 VLHS respondents (our working data file includes only one respondent per sibship). This number excludes 14 cases where the respondent did not know whether a sibling was alive or dead.[5] The data on siblings include 3,103 living brothers and sisters with a known year of birth and 345 dead siblings with a known year of birth and known age at death. The bottom panel is simply the combined file of both parents and siblings. As might be expected, the combined file provides a much broader record of mortality across a wider age spectrum than would a sample of only parents or only siblings.

Altogether, the combined data file (parents and siblings) contains a sample of 4,001 living kin with a known year of birth and 816 deceased kin with a known year of birth and known age at death. This sample of 4,817 kin without missing data was the source for our initial analysis of Vietnamese mortality patterns ("unadjusted rates"). In addition, we con-

TABLE 2   Mortality status of the parents and siblings of respondents in the Vietnam Life History Survey

Year of birth	Age in 1991	Still alive	Dead	Age at death Known	Age at death Unknown	Total (alive and dead)	Percent surviving
Parents							
Before 1900	90 and older	6	95	95	0	101	5.9
1901–10	80–89	43	129	129	0	172	25.0
1911–20	70–79	130	127	127	0	257	50.6
1921–30	60–69	282	82	80	2	364	77.5
1931–40	50–59	287	34	34	0	321	89.4
1941–50	40–49	116	5	5	0	121	95.9
1951–60	30–39	34	1	1	0	35	97.1
1961–90	0–29	0	0	0	0	0	
Total known		898	473	471	2	1,371	65.5
Unknown		101	136	21	115	237	42.6
Total		999	609	492	117	1,608	62.1
Siblings							
Before 1900	90 and older	0	0	0	0	0	
1901–10	80–89	0	0	0	0	0	
1911–20	70–79	12	12	12	0	24	50.0
1921–30	60–69	111	63	59	4	174	63.8
1931–40	50–59	244	49	46	3	293	83.3
1941–50	40–49	412	83	78	5	495	83.2
1951–60	30–39	934	77	76	1	1,011	92.4
1961–90	0–29	1,390	77	74	3	1,467	94.8
Total known		3,103	361	345	16	3,466	89.5
Unknown		301	189	141	48	490	61.4
Total		3,404	550	486	64	3,954	86.1
Parents and siblings							
Before 1900	90 and older	6	95	95	0	101	5.9
1901–10	80–89	43	129	129	0	172	25.0
1911–20	70–79	142	139	139	0	281	50.5
1921–30	60–69	393	145	139	6	538	73.0
1931–40	50–59	531	83	80	3	614	86.5
1941–50	40–49	528	88	83	5	616	85.7
1951–60	30–39	968	78	77	1	1,046	92.5
1961–90	0–29	1,390	77	74	3	1,467	94.8
Total known		4,001	834	816	18	4,837	82.7
Unknown		402	325	162	163	727	55.3
Total		4,403	1,159	978	181	5,562	79.2

SOURCE: 1991 Vietnam Life History Survey

ducted a comparable analysis based on "adjusted rates" that include the (allocated) deaths and the person-years lived of deceased kin with missing data on year of birth and/or age at death. Although our overall conclusions do not differ according to the use of unadjusted or adjusted rates, the adjusted mortality rates were somewhat closer to independent estimates of mortality. For this reason we present only the adjusted mortality rates in this article.[6]

Mortality rates are measured as a function of the person-years of exposure to the risk of death. For the retrospective analysis of period mortality trends, we estimate the number of persons alive at each age for each calendar year from the sample of VLHS data on parents and siblings. When siblings are alive at the time of interview, they are "survived backward" one year of age for each calendar year until their birth (e.g., age 50 in 1990, age 49 in 1989 . . . , age 0 in 1940). Siblings who died are projected backward from their year of death to their year of birth. The backward projection of parents is handled in a similar fashion, except that the reverse survival stops at the age of the parent at the birth of the respondent. Parents of VLHS respondents provide no information about mortality before the respondent was born, since they must have survived to the date of the respondent's birth or conception. The sample of 4,817 relatives for the unadjusted rates (based on parents and siblings with known year of birth and age at death) yields a total of 151,089 person-years of exposure. The adjusted rates are computed on the basis of 161,777 person-years of exposure based on 4,817 kin with known dates and 343 deceased kin with allocated dates.

In addition to the procedures for dealing with incomplete information, our results are affected by other factors. Given that survey respondents are survivors, we have to assume that the probability of one's death (at a specific age) in prior years is not correlated with the number of surviving children or siblings at a later date (and at risk of being interviewed in the VLHS). However, the death of one family member is likely to be positively associated with the deaths of other members. For example, the deaths caused by a bombing campaign that killed all members of a family would be unreported in the VLHS data.[7] For this reason, our estimates of mortality are likely to be biased downward. Emigration from Vietnam would also have removed some families from the risk of being interviewed in 1991. Selective emigration of members of higher socioeconomic groups would be expected to bias upward the estimated mortality of those who remain. Families with fewer children are also less likely to have survivors at later dates, although we think the bias introduced by this fact will be modest.

The final assumption is that the mortality experiences of the parents and siblings of VLHS respondents can be generalized to the larger population of Vietnam. While we are aware of no obvious biases that would ren-

der our study areas unrepresentative of the national experience, there is no statistical justification for this assumption. Data from a nationally representative sample are simply not available. Mortality levels and patterns are fairly comparable across the four sampling areas.[8] However, the figures offered here should be regarded as provisional estimates; to provide more reliable estimates of Vietnamese war casualties, a national probability survey, analyzed by using the methods described here, should be conducted while memories are still relatively fresh.

A more detailed picture of the mortality of parents and siblings in the VLHS sample is shown in Table 3 with deaths by year and age at death, and by "cause of death." Years are categorized to represent the major historical periods of war and peace in Vietnam: 1954 and before, 1955–64, 1965–75, and 1976–90. The first period includes the colonial era and the French war. The second era (1955–64) was one of recovery and relative peace, although there was significant military conflict in the South. The third period (1965–75) represents the peak years of the American war, and the period from 1976 onward represents the postwar unification. The cause-of-death classification separates military casualties and civilian war casualties from all other causes—labeled as "normal" (nonwar) deaths.[9]

The bottom panel for parents and siblings combined shows a total of 1,159 deaths in the sample. The upper panels show that the deaths of parents are clustered in the middle age range, with an increasing number at older ages for the most recent period. This pattern is consistent with the age composition of the sample of parents and rising death rates with age. In contrast, the age composition of siblings is such that deaths are concentrated in childhood and middle ages.

There are 112 military casualties and 43 civilian war deaths in the VLHS data file. Excluding cases with missing data on year or age at death, there are 84 military casualties: 14 parents and 70 siblings. All died in the prime adult age range of 15–54. The largest cluster of military deaths, 57, occurred during 1965–75. As noted earlier, a low level of military conflict during 1955–64 was followed by a sharp escalation in the mid-1960s. Although the war ended in 1975, some military deaths continued in the late 1970s with the hostilities between the Khmer Rouge and the Vietnamese along the Cambodian–Vietnamese border and the Vietnamese invasion and occupation of Cambodia (Chanda 1986). In 1979, the Chinese army attacked a northern province in Vietnam, and heavy casualties were reported on both sides (Chanda 1986).

The 35 civilian casualties of war with a known age and year of death have somewhat different distributions than the military casualties, including seven children (less than age 15) and four older persons (older than 55). This pattern seems plausible, as does the concentration in the pre-1955 (15 deaths) and the 1965–75 periods (14 deaths). Because of the small number of war-related deaths in the VLHS sample, we have combined the

TABLE 3   Reporting of war and nonwar deaths by age at death and year of death

Year of death	All deaths					"Normal" (nonwar) deaths					Military casualties					Civilian casualties of war				
	0-14	15-54	55+	Age un-known	Total	0-14	15-54	55+	Age un-known	Total	0-14	15-54	55+	Age un-known	Total	0-14	15-54	55+	Age un-known	Total
Parents																				
1954 and before	0	62	17	24	103	0	52	16	19	87	0	2	0	0	2	0	8	1	5	14
1955-64	0	26	16	22	64	0	23	16	20	59	0	3	0	2	5	0	0	0	0	0
1965-75	0	37	60	27	124	0	26	58	23	107	0	9	0	4	13	0	2	2	0	4
1976-90	0	37	216	12	265	0	37	216	11	264	0	0	0	1	1	0	0	0	0	0
Total known	0	162	309	85	556	0	138	306	73	517	0	14	0	7	21	0	10	3	5	18
Unknown	0	9	12	32	53	0	8	12	31	51	0	1	0	0	1	0	0	0	1	1
Total	0	171	321	117	609	0	146	318	104	568	0	15	0	7	22	0	10	3	6	19
Siblings																				
1954 and before	46	30	0	0	76	45	18	0	0	63	0	7	0	0	7	1	5	0	0	6
1955-64	35	14	0	0	49	35	9	0	0	44	0	4	0	0	4	0	1	0	0	1
1965-75	41	73	0	0	114	35	21	0	0	56	0	48	0	0	48	6	4	0	0	10
1976-90	19	66	21	0	106	19	53	20	0	92	0	11	0	0	11	0	2	1	0	3
Total known	141	183	21	0	345	134	101	20	0	255	0	70	0	0	70	7	12	1	0	20
Unknown	110	28	3	64	205	109	13	3	56	181	1	13	0	6	20	0	2	0	2	4
Total	251	211	24	64	550	243	114	23	56	436	1	83	0	6	90	7	14	1	2	24
Parents and siblings																				
1954 and before	46	92	17	24	179	45	70	16	19	150	0	9	0	0	9	1	13	1	5	20
1955-64	35	40	16	22	113	35	32	16	20	103	0	7	0	2	9	0	1	0	0	1
1965-75	41	110	60	27	238	35	47	58	23	163	0	57	0	4	61	6	6	2	0	14
1976-90	19	103	237	12	371	19	90	236	11	356	0	11	0	1	12	0	2	1	0	3
Total known	141	345	330	85	901	134	239	326	73	772	0	84	0	7	91	7	22	4	5	38
Unknown	110	37	15	96	258	109	21	15	87	232	1	14	0	6	21	0	2	0	3	5
Total	251	382	345	181	1,159	243	260	341	160	1,004	1	98	0	13	112	7	24	4	8	43

SOURCE: 1991 Vietnam Life History Survey

military and civilian war deaths in the subsequent analysis. We compare nonwar (or "normal") mortality levels (from all causes except military or civilian war deaths) with total mortality (which includes war deaths).

Mortality estimates from the 1991 survey

In this section, we translate the survey responses into conventional period life table measures and compare the results to other information available on the level of mortality in Vietnam, in order to assess the plausibility of the VLHS mortality data. We rely heavily on model life tables, which present the typical age pattern of mortality for countries at a particular level of mortality. Thus, the model life table "levels," reflecting mortality over the entire age range, provide the basic metric that permits comparison of death rates recorded at different ages.

We computed life tables for the four periods in Vietnamese history noted above: before 1955, 1955–64, 1965–75, and 1976–90. For each period, deaths by single years of age are related to the person-years lived in the age interval. Person-years combine those lived by kin who survived the period and those lived by kin who died during the period. The initiation of exposure begins at the birth of the respondent when parental survival is considered, or at the birth of the sibling when sibling survival is considered. In both cases, exposure ends at death or 1991, whichever comes first. To reduce the standard errors of survival rates, we have combined the data derived from questions about both siblings and parents and examine survival rates in broad age categories.[10] Survival rates, $_nP_x$, represent the probability of survival from exact age x to exact age $x + n$.

Table 4 presents 15-year survival probabilities (based on the "adjusted" mortality rates) for the total sample, combining males and females and the four geographical samples of the VLHS. We begin at age 15 because war deaths are concentrated among adults and because greater exposure to the risk of death is observed among adults than among children in our sample. Values of survival probabilities are translated into the "level" of mortality in the "West" model life table system of Coale and Demeny (1983). This system embodies a modal age pattern of mortality widely observed in European, and some Asian, populations with good data. Each increase in level is associated with a gain in life expectancy at birth of approximately 2.4 years. The survival probabilities in Table 4 span the range from level 12, associated with a life expectancy at birth of 46 years, to level 22, associated with a life expectancy at birth of 70.5 years.[11] The upper panel in Table 4 includes deaths from all causes, while the lower panel includes only nonwar deaths (i.e., excluding deaths reported as military or civilian war casualties).

One important result shown in Table 4 is that the "levels" of mortality implied by the data at different ages in a particular period are quite

TABLE 4   Estimated probabilities of dying within specified age intervals, based on kin survival and implied mortality levels in the West model life table system

Probability of survival ($_nP_x$) between ages	Before 1955		1955–64		1965–75		1976–90	
	($_nP_x$)	Implied West level	($_nP_x$)	Implied West level	($_nP_x$)	Implied West level	($_nP_x$)	Implied West level
All deaths								
15 and 30	.909	12.2	.958	18.1	.908	12.1	.971	20.0
30 and 45	.879	13.6	.941	19.1	.919	17.1	.965	21.6
45 and 60	.775	13.7	.849	19.1	.877	21.1	.890	21.9
60 and 75	*	*	*	*	.605	21.3	.627	22.2
15 and 45	.799	13.0	.901	18.7	.835	15.0	.938	21.0
15 and 60	.619	13.3	.765	18.9	.732	17.6	.834	21.4
Excluding war deaths								
15 and 30	.945	16.5	.974	20.4	.981	21.5	.981	21.5
30 and 45	.903	15.7	.950	20.0	.957	20.8	.968	21.9
45 and 60	.791	14.8	.856	19.6	.895	22.1	.892	21.9
60 and 75	*	*	*	*	.610	21.5	.627	22.2
15 and 45	.854	15.9	.925	20.2	.938	21.0	.950	21.8
15 and 60	.675	15.4	.792	19.9	.840	21.6	.847	21.8

*Fewer than 500 person-years of exposure were recorded in this category.
NOTE: Adjusted data include deaths and person-years lived of persons who died at an unknown age or date.
SOURCE: Based on 1991 Vietnam Life History Survey.

similar to one another. Levels show a tendency to improve over time, but within a particular period the levels of mortality tend to cohere, except for mortality including war deaths during 1965–75. It is obvious that war deaths during this period were heavily concentrated among younger adults; when these deaths are excluded, the levels of mortality associated with the different ages also show a high degree of coherence, similar to that observed in other periods. The similarity of implied model life table levels for a particular period is an indication that the age pattern of mortality implied by the data set (exclusive of war deaths during 1965–75) is typical of human populations and thus helps to validate the quality of the data.

Are the mortality levels shown in Table 4 plausible? Unfortunately, there is no clear standard against which they can be compared. Potential benchmarks for the most recent period are the life tables prepared from the 1979 and 1989 population censuses (Banister 1993: 88–89; Vietnam, General Statistical Office 1991: 116). Each uses census populations as the denominators for calculating death rates. The 1979 life table uses deaths recorded in the vital registration system, which is acknowledged to be incomplete (Banister 1993: 14–15). Thus, survival probabilities in the 1979 life table are almost certainly overestimated. The 1989 life table uses deaths derived from a census question on household deaths in the past year. The number of reported deaths is then increased by a factor of 2 since the com-

pleteness of retrospective reports on deaths was estimated at 45 percent for females and 55 percent for males. However, the Preston–Coale method used to estimate the completeness-of-death reporting assumes that vital rates prior to the census have been constant. When mortality has been declining, as was possible for Vietnam, the method underestimates the completeness-of-death reporting (Preston 1984). Thus, it is likely that the 1989 life table underestimates survival probabilities.

Survival probabilities from these two life tables are presented in Table 5, along with their implied mortality level in the Coale–Demeny West model life tables. For comparison, survival probabilities derived from VLHS kin survival questions for the period 1976–90 are also presented. It is clear from Table 5 that the VLHS probabilities from the kin survival questions closely match the probabilities from the 1979 and 1989 life tables, which are quite similar to one another (perhaps because of an underestimation of mortality rates in 1979 and an overestimation of rates in 1989). If these errors in the 1979 and 1989 life tables offset one another (although there is no reason to expect that they do), then the average level of mortality derived from the two would best represent the mortality levels in Vietnam during the 1980s. The rates derived from VLHS kin survival questions are generally less than one level different from one or both of the census mortality estimates. Given the potential measurement problems from all sources, our conclusion is simply that the levels of mortality implied by the VLHS questions on kin survival are quite consistent with the life tables available from other sources.

Our estimates of mortality levels based on the VLHS data can also be compared with mortality levels implied by estimates of child survival. These latter estimates are based on retrospective reports of mothers about the survival of their children and have a good record in demographic estimation (United Nations 1983). Two sources of data on child survival in Viet-

TABLE 5   Comparison of survival probabilities in Vietnamese life tables

Probability of survival ($_nP_x$) between ages	1979[a]		1989[b]		1976–90 VLHS[c]	
	($_nP_x$)	Implied West level	($_nP_x$)	Implied West level	($_nP_x$)	Implied West level
15 and 30	.976	20.8	.971	20.0	.971	20.0
30 and 45	.956	20.6	.952	20.2	.965	21.6
45 and 60	.882	21.3	.866	20.3	.890	21.9
60 and 75	.597	20.9	.597	20.9	.627	22.2
15 and 45	.933	20.6	.925	20.2	.938	21.0
15 and 60	.822	21.2	.801	20.2	.834	21.4

[a]Life table released in conjunction with 1979 census (Vietnam, General Statistical Office 1983) and retabulated in Banister 1993: 88–89.
[b]Vietnam, General Statistical Office 1991: 116.
[c]From Table 4; all causes of deaths included.

nam are available. The 1989 census asked all ever-married women about the number of children they had borne and the number who were still living. Results from the census questions have been converted into estimates of the probability of death before age five, with identification of the date to which the estimate applies, in the demographic report from the 1989 census (Vietnam, General Statistical Office 1991: 103). The average value of the probability of dying before age five based on reports of women aged 20–24 to 45–49 is .0648; the mean date to which the estimate pertains is February 1982—which happens to be the midpoint of the most recent period of the VLHS mortality estimates. This probability of dying corresponds to level 19.8 in the West model life tables. This value is only about one level below the one corresponding to the probability of surviving from age 15 to age 45 according to the VLHS data (see Table 4). Thus, there is a close correspondence (in the West model life tables) between the VLHS estimates of adult mortality and the census-based estimates of child mortality.

The other source of data on early-life mortality is from the 1988 Vietnam Demographic and Health Survey, a national probability sample of households. This survey asked women about the dates of birth and death of all their children. Because the DHS gathered information on the precise dates of events (the 1989 census questions measured only current survival status), it is possible to estimate trends in infant mortality from the responses. These estimates, as prepared by Savitz et al. (1993), are shown in the top row of Table 6. Two adult mortality estimates (for total and nonwar deaths) derived from VLHS kin survival reports are also presented, using the most comprehensive indicator, the probability of survival from age 15 to age 60. When translated into model life table levels, the VLHS estimates of adult mortality line up very closely with the series of infant mortality rates, with the exception of the 1965–75 war period. The difference of 3.2 levels between that implied by the 1965–75 infant mortality rate and the

TABLE 6 Comparison of estimates of infant and adult mortality in Vietnam

Estimate	1955–64		1965–75		1976–90
	Proba-bility	Implied West level	Proba-bility	Implied West level	Proba-bility
Probability of dying before age one[a]	.0573[c]	19.0	.0374	20.8	.0358[d]
Probability of surviving from age 15 to age 60[b]					
All causes of death	.765	18.9	.732	17.6	.834
Nonwar deaths	.792	19.9	.840	21.6	.847

[a]From Savitz et al. 1993.
[b]From Table 4.
[c]Before 1965.
[d]1976–88.

level implied by the "all deaths" probability of survival is by far the largest discrepancy in Table 6. This discrepancy suggests that the 1965–75 period may have had little effect on infant mortality—also a conclusion of the study by Savitz et al. (1993). This is simply another way of saying that the war appears to have left a much bigger mark on adults than on children. When war deaths are removed, the discrepancy between the mortality levels implied by adult and infant mortality disappears.

As is the case with the infant mortality series, our estimated adult mortality series without war deaths show moderate improvement over time. The absence of a faster improvement for the most recent period may reflect unknown biases in the underlying data. However, it is clear that the kin survival questions are capable of uncovering high-mortality conditions in the more distant past, as is indicated by the results for the pre-1955 period shown in Table 4. Implied life expectancies for this period are 10–14 years lower than for 1955–64. So the slow improvements after 1955–64 are not readily accounted for by any obvious flaws in the data base. The change in the mortality level for all causes of death between 1955–64 and 1976–90 in Table 4 is 2.5 levels, or about six years of life expectancy at birth (from row 2 of Table 6). This seems to be a more plausible change than the gain of 13.4 years that the United Nations (1995: 872) estimates for the period from 1960–64 to 1980–84.

We conclude that the VLHS data on survivorship of siblings and parents provide credible estimates of the level of adult mortality in Vietnam. They are internally consistent, in the sense that independent estimates of age-specific mortality correspond to similar levels in a model life table system; and they are consistent with several independent sources of data on the mortality of adults and of children.

The war's impact: Death rates and numbers

Having shown that VLHS kin mortality estimates are internally consistent and in line with independent measures of national-level mortality in Vietnam for the recent past, we now assess the impact of the American war on Vietnamese mortality from 1965 to 1975. Specifically, we estimate two measures for those years: the risk of war mortality (death rates) and the numbers of Vietnamese who died as either military or civilian casualties. The estimates of war-related mortality rates are based on the adjusted data that generated the life table survival ratios (Table 4).[12] To estimate the number of war dead implied by our estimates of mortality rates, we draw on estimates of the size of the Vietnamese population, by age and sex, published by the United Nations.

Based on VLHS data, Table 7 shows age-specific death rates for all deaths (including war deaths) and nonwar deaths of Vietnamese adults for the period 1965 to 1975. Mortality rates are presented for three 15-year

age groups (15–29, 30–44, and 45–59), and a residual group of age 60 and older. The rates in Table 7 are central death rates: deaths occurring in a time interval are divided by the total number of person-years lived in the same interval. Death rates are computed separately for men (based on the fathers and brothers of VLHS respondents) and women (based on the mothers and sisters of VLHS respondents). Based on model life table patterns, the level of nonwar mortality during this era corresponds to West model mortality levels from 20.8 to 22.1, implying an estimated life expectancy of about 68–70 years.

The impact of the American war on Vietnamese mortality rates is shown by the ratios of total mortality rates to nonwar mortality rates in column 3 of Table 7.[13] The risk of dying in war is primarily a phenomenon affecting young men. During 1965–75 the risk of dying for young men age 15–29 was more than 7 times higher than the "normal level" of nonwar mortality; for men age 30–44 the comparable figure was about 2.5 times greater. During these years, mortality among all Vietnamese men above age 15 was twice as great as would have been expected in the absence of war.

For young women during the American war, mortality rates were 35 to 39 percent higher than would have been expected in the absence of war. Data on war mortality for earlier periods are not shown in Table 7, but the level of such mortality was modest when compared to the level of mortality experienced during the American war.

TABLE 7   Estimates of Vietnamese war-related deaths, ages 15 and older, by age and sex, 1965–75

Age and sex	Death rates per 1000[a]			Population 1970[b] (4)	Annual war deaths (5) = ((1–2)/1000)x(4)	Estimated deaths 1965–75 (6)=(5)x11
	All deaths (1)	Nonwar deaths (2)	Ratio (3) = (2)/(1)			
Men						
15–29	10.9	1.5	7.11	4,681,000	43,861	482,471
30–44	7.2	2.9	2.46	3,124,000	13,315	146,469
45–59	7.6	6.5	1.17	2,234,000	2,410	26,510
60 +	31.7	31.7	1.00	1,232,000	0	0
Total	10.9	5.5	1.99	11,271,000	59,586	655,44
Women						
15–29	1.1	0.8	1.39	5,045,000	1,624	17,868
30–44	4.3	3.2	1.35	3,721,000	4,156	45,718
45–59	8.8	6.8	1.29	2,376,000	4,755	52,301
60 +	36.1	34.6	1.04	1,600,000	2,471	27,183
Total	6.4	5.4	1.19	12,742,000	13,006	143,070

[a] From the adjusted VLHS data on siblings and parents.
[b] From United Nations 1994: 834.

Estimating the absolute number of war-related deaths, corresponding to the VLHS mortality rates, requires an estimate of the national population. Although there are no published census data of either the North Vietnamese or the South Vietnamese population for years prior to 1979, the United Nations periodically publishes historical population estimates and future population projections for every country of the world (United Nations 1994, 1995). The UN series begins with 1950 population estimates by age (in five-year age groups) and sex and continues for five-year intervals up to 1990, followed by projected figures for future years. Although the UN estimates are based on models and assumptions that do not necessarily fit well the case of Vietnam, the UN figures for Vietnam are as good as can be found anywhere.

Column 4 in Table 7 shows the UN estimate of the Vietnamese population age 15 and above by sex and broad age categories in 1970, approximately the midpoint of the 1965–75 war period. Of the estimated 42.7 million total population of Vietnam in 1970, about 24 million were age 15 and above. We have multiplied the war mortality rates (column 1 minus column 2 divided by 1000) by the population estimates in column 4 to yield the estimated average annual number of war deaths (military and civilian) by age and sex in column 5. The annual number of deaths is then multiplied by 11, the number of years to which the death rates pertain, to obtain the total number of Vietnamese war casualties during the American war from 1965 to 1975. The results are shown in column 6 of Table 7.

On the basis of these calculations, we estimate there were 655,000 adult male and 143,000 adult female war casualties, or a total of 798,000 adult (persons above age 15) Vietnamese war deaths. Based upon our estimate of 84,000 war deaths among children (calculations not shown here), the estimated number of all Vietnamese war deaths rises to 882,000.[14]

The standard deviation of the estimated (adjusted) death rate from war-related causes at ages 15 and above is .0003438. Applying this figure to the estimated number of person-years at risk, the standard deviation of the estimated number of war-related deaths (age 15 and above) is 91,000. This figure represents 11.4 percent of the estimated total of war-related adult deaths, so random error creates relatively little uncertainty about the national number of war-related deaths. Nonrandom error is probably a more important source of uncertainty. In particular, the VLHS sampling scheme gives equal weight to rural and urban areas and to the northern and southern regions. Although mortality differences among these areas are not statistically significant in the VLHS, rural areas in our sample do exhibit higher mortality than urban areas, and the country is closer to 80 percent than 50 percent rural (United Nations 1989: 199; Vietnam, General Statistical Office 1983: 75).

Using VLHS death rates specific to rural and urban areas, and assuming that the population was 80 percent rural and 20 percent urban, pro-

duces an estimate about 19 percent higher—or 1,050,000 war-related deaths from 1965 to 1975—than the number based on the equal weighting of the four sampling areas. The fact that this estimate is as defensible as our earlier estimate expands the range of uncertainty. To the range of 882,000 to 1,050,000 that is produced by the two weighting schemes, we add the standard deviation of 91,000, giving a midpoint of 966,000 and a range of 791,000 to 1,141,000, or ±175,000 around the midpoint estimate.

There are several additional reasons why the estimate just described may still be too low or too high. Families in which all members died from the war are inevitably missed using our kinship survivor method. Moreover, the VLHS sampling areas may not have included portions of the country with the highest levels of war mortality. On the other hand, the lack of the "person-years of exposure" of living kin with unknown dates in the denominators and the selective emigration of higher-status people mean that adjusted mortality rates may be too high. Although there is no statistical basis for assessing these potential biases, it seems unlikely that their impact, if it could be taken into account, would dramatically alter the results we have presented. Our reasoning is based on the modest variations in the estimated numbers of deaths caused by alternative weighting of four VLHS sampling areas.

Our estimate of approximately one million Vietnamese war deaths is somewhat lower than the 1.2 million estimated by Lewy (1978: 450) and considerably lower than the 3.1 million war deaths recently claimed by the Vietnamese government (Associated Press 1995). Documentation on the basis of this last estimate has not been released, to our knowledge. Part of the reason for the higher figure by the Vietnamese government could be that it covers the years 1954 to 1975, while our estimate is for 1965 to 1975.

Earlier we noted possible downward biases in our estimate based on the VLHS sample. On the other hand, there may be potential biases in the opposite direction in the Vietnamese government data (indirect reporting by survivors may include multiple reports of the same deaths). Strictly speaking, we do not have firm evidence to evaluate the relative degree of bias in the alternative estimates of Vietnamese war deaths. Our analysis suggests that significant differences in assumptions and procedures would expand the range of uncertainty around the VLHS estimates of war-related mortality by at most 20 percent. But if more detailed new data became available, this inference might have to be reconsidered.

Conclusions

In this article, we provided new quantitative estimates of Vietnamese mortality in recent decades and, specifically, new estimates of Vietnamese lives lost during the war years between 1965 and 1975—the peak years of American involvement in Vietnam. We did so by applying a novel methodology

in analyzing unconventional data obtained from a sample survey. We have demonstrated the power of this approach to shed light on demographic phenomena that remain inadequately explored. Applied to data obtained from a more ambitious sample survey than the one we had at our disposal, our methodology could provide more robust estimates of Vietnamese mortality and, especially, of Vietnamese war deaths, provided that such a survey is conducted in the not too distant future.

Our analysis also demonstrates the broader potential of this methodology. Its application could make an important contribution to a description of mortality levels and trends in other countries where vital records and censuses are lacking or deficient. The essential prerequisite is that respondents be able to recall the birth and death dates of parents and siblings. The Vietnamese population, along with other Asian cultures, reckons dates with multiple calendars, including a recurring cycle of animal years. Different birth years, or combinations of years, are thought to be auspicious for the selection of dates for marriage and other important life events. Additionally, dates of death may be memorable because many Vietnamese families hold ceremonies to mark the anniversaries of the deaths of their parents and other ancestors (Luong 1989).

These cultural traditions may create a predisposition for "calendar literacy" among the Vietnamese population that enables survey respondents to answer questions on the birth and death dates of parents and siblings with a high degree of accuracy. To determine whether this capacity exists in other countries and in other cultural settings to a sufficient degree to make the methodology applicable will require more data-collection experiments similar to the VLHS.

What is the meaning of the primary substantive finding of this study—namely, the loss of a million Vietnamese lives from 1965 to 1975 during the "American war"? There is no single answer to this question. Facts can be interpreted in quite different, often opposite, ways by various observers. Some readers may be suspicious because the mortality estimates reported here are lower than some other estimates; other readers may be skeptical because our mortality estimates are higher than they had expected. The mortality levels reported here, however, do not result from ideological or political considerations, but from the demographic data and methods described above. The VLHS data do not distinguish in which army or on which side Vietnamese war deaths occurred. The survey questions simply asked whether the respondent's parents or siblings died as a military or civilian casualty of war. Assignment to the American war period was done on the basis of the year of death, not on the basis of any assessment from the survey respondents.

Another aspect is the social significance attached to the loss in human numbers caused by the war and, by extension, the quantification of the suffering and social dislocation endured by Vietnam. The frequent refer-

ence to the deaths of 56,000 American soldiers in Vietnam (Lewy 1978: 451) by political leaders and the mass media is a telling sign of the profound effect that the Vietnam war has had on American foreign policy and domestic politics for the last three decades. The loss of one million Vietnamese in the war, proportionately 100 times greater than that suffered by the United States, continues to be the dominant historical memory for most Vietnamese above the age of 40 (Tai 1994). To appreciate the depth of this loss among the Vietnamese population is of critical importance for understanding the country and its political outlook.

Finally, it is useful to review the logic of the "war of attrition." As high as Vietnamese death rates were, they were not high enough to sustain the assumptions behind a war of attrition. This strategy, as pursued by General Westmoreland and the American military, was flawed by a lack of elementary demographic logic. Even between 1965 and 1975, the mortality rates for young men in the most vulnerable age group, those 15 to 29, were only slightly above one percent per year. With a rate of natural increase that was at least 2 percent per year in the 1960s and 1970s, there were actually more potential military recruits every year (in both the North and the South) than in each previous year.[15] The inflated enemy body counts certainly encouraged the simple-minded extrapolations that American military planners relied on, but the demographic reality ensured that a war of attrition was based on a false premise.

Notes

1 The standard Western reference to the "Vietnam War" reflects an America-centered perception. The other term used for the 1965–75 war is the "Second Indochina War," the "First Indochina War" being the Vietnamese war of independence from 1946 to 1954 against the French. (The short war against China in 1979 is sometimes called the "Third Indochina War.") In North Vietnam and among those opposed to the American-supported government in the South, the widely used term for this period of warfare was, if literally translated, "the resistance to American aggression." The term "American war" is used here to reflect the Vietnamese perception that the 1965–75 war was a result of American intervention.

2 The VLHS codebook and data files are available upon request from the first author.

3 A reviewer of this article suggested that there might be a regional differential in the willingness to attribute kin deaths to war casualties, with Southerners underreporting

and Northerners overreporting war deaths. Although we cannot rule out the possibility of such a bias, we do not directly address regional variations in this analysis.

4 Age as reported in the 1991 VLHS is considered to be age at last birthday in 1990. Most respondents were interviewed in late January or early February 1991. In other words, respondents' ages, reported as of the survey date, are assumed to be those on 1 January 1991.

5 There were also 46 cases where respondents reported siblings of an unknown sex, most of whom had died in infancy. These cases are included in the total (both sex) population, but are excluded in tables where the population is broken down by sex.

6 The original unadjusted mortality rates and the full details of the methods of adjustment for missing data are available upon request from the first author.

7 An official of the North Vietnamese government reported that US "carpet bombing" in the North often killed all members of many families (Wiesner 1988: 310).

8 There are modest differences in nonwar and war-related mortality across the four sampling areas, with the northern village having the highest level of war deaths. These differences are, however, not statistically significant.

9 Deaths from an unknown cause are included in the normal (non–war-related) category.

10 The life tables were computed by single years of age.

11 The life table for the total population is based on the average of male and female survival probabilities.

12 Estimates of war-related deaths based on the unadjusted rates are slightly lower than those presented here.

13 A potential confounding factor in the comparison of war and nonwar mortality is that all those who died of war-related causes are removed from the risk of dying for other reasons. This is partially offset by the opposite pattern (deaths from nonwar causes are removed from the risk of war mortality), but since warfare was the major cause of death of young men, nonwar mortality is probably somewhat understated for these years.

14 The estimate of war-related deaths of persons below age 15 is based on the same procedures and data sources as our estimates of adult mortality: VLHS death rates and UN population estimates. We believe the reports of child deaths (both war and nonwar) in the VLHS are more subject to errors of recall than are adult deaths. Our computation of the number of child deaths is simply to provide our best estimate of all war-related deaths, not to express great confidence in these methods for the estimation of child mortality.

15 According to UN estimates, the population of Vietnam in 1965 and in 1975 was 38.3 million and 48.0 million, respectively. Thus the average annual rate of population growth during this decade was 2.25 percent. More relevant in the present context are estimates of the young adult male population. According to the UN, in 1965 the number of Vietnamese males age 15–29 was 4.087 million; in 1975, the corresponding number was 5.936 million. Thus, between 1965 and 1975, the size of the young adult male population was increasing at the average annual rate of 3.7 percent (United Nations 1994: 834).

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