

# Mortality in North Korean migrant households: a retrospective study

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## Summary

**Background** A deteriorating economy, coupled with a series of natural disasters in 1995–97, led to a severe food crisis in North Korea. Although the country has received substantial international aid since 1996, demographic assessments of crisis impact have been limited. We assessed mortality trends in North Korea since 1995.

**Methods** At 15 randomly selected sites in China, 440 North Korean adult migrants were interviewed during July–September, 1998. Respondents were asked about births, deaths, and migration patterns in their households between mid-1994 and mid-1998, and about household food sources. The respondents also provided basic demographic information about the households of their relatives. We compared mortality rates from migrant households with data from the 1993 census and with data about households of non-migrant relatives.

**Findings** Households that included a recent migrant to China showed increasing mortality: crude death rates rose from 28.9 per 1000 in 1995, to 45.6 per 1000 in 1996, and to 56.0 per 1000 in 1997 ( $p=0.0001$ ), with a 3-year average rate of 42.8 per 1000. The crude 3-year birth rate was 11.0 per 1000. Average household size declined from 4.0 at the beginning of 1995 to 3.4 at the end of 1997 ( $p=0.0002$ ). Among 259 households of non-migrant relatives, the crude death rate was 43.2 per 1000 and the crude birth rate was 8.8 per 1000. In these households, the 3-year trend of increasing mortality was significant ( $p=0.001$ ), as was the decline in average household size from 4.3 at the beginning of 1995 to 3.7 at the end of 1997 ( $p=0.0001$ ).

**Interpretation** Among North Korean households that include a recent migrant to China, mortality has increased and household size has declined since 1995. This trend raises concern about the state of the general population, at least in the province of North Hamkyong, from where most of the migrants originated.

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## Introduction

Large-scale migration from Korea into northeastern China began in the 1880s. Many migrants were farmers fleeing famine conditions in North and South Hamkyong provinces.<sup>1</sup> By 1945, roughly 750 000 Koreans had settled in China and by 1990, Korean-Chinese numbered nearly 2 million, including 839 000 in China's Yanbian Korean Autonomous Prefecture, bordering North Korea.<sup>2</sup> 50 000–150 000 North Koreans are now estimated to temporarily reside in China, mainly in Yanbian.<sup>3</sup>

After the death of North Korea's leader Kim Il Sung in July, 1994, his son Kim Jong Il inherited a country whose economy had been in decline since the 1989 break-up of the Soviet Union. As a result of crop damage from extensive flooding in July and August, 1995, North Korea appealed to the United Nations for relief aid for the first time in its history.<sup>4</sup> In 1995, North Korea issued bilateral appeals for food aid to Japan, Egypt, and South Korea, among other countries, prompted by Chinese cutbacks in food shipments.<sup>5</sup> More floods in 1996 damaged or destroyed an estimated 1.2 million tonnes of crops (12% of total production).<sup>6</sup> In April, 1997, the World Food Programme made a US\$95 million emergency appeal for 200 000 tonnes of food for an estimated 5 million North Koreans facing starvation. North Korean government food rations issued through the public distribution system had declined from a precrisis level of about 700 g per person per day to about 100 g in 1997.<sup>7</sup>

A World Food Programme nutritional assessment in August, 1997, measured a non-random sample of 3695 children younger than 7 years in 42 selected nurseries and kindergartens from 19 counties in five provinces of North Korea. That study found a 16.5% prevalence of wasting and a 38.2% prevalence of stunting.<sup>8</sup> In September and October, 1998, UNICEF, World Food Programme, European Union, and North Korea did a nutritional survey of randomly selected children aged 6 months to 7 years. 14 teams surveyed 1762 children from 3600 households in 30 counties. For access or security reasons, 82 counties in which 29% of North Korea's population lived were excluded. The survey found 15.6% of children to be wasted, 62.3% stunted, and 60.6% moderately or severely underweight.<sup>9</sup> Although the comparison is not strictly precise because of different age-groups studied, in Bangladesh, 18% of children younger than 5 years were wasted and 55% were stunted (1990–97), and in Cambodia, 13% of children younger than 5 years were wasted and 56% were stunted (1990–97).<sup>10</sup>

Although those studies show nutritional effects of the food crisis on young children, there has been little reliable information about the impact on the population in general. Efforts to obtain demographic data, particularly on mortality, have been hindered by the North Korean government.

Our aim was to obtain information from a sample of adult North Korean migrants in China about household births, deaths, family size, migration patterns, and sources of food between mid-1994 and the date of their departure for China. Because of the possibility that recent migration to China might be correlated with higher mortality in the migrant's household, we also sought demographic information about relatives who were not members of the respondent's household and who had not visited China since mid-1994.

## Methods

### Study area

In March, 1998, we sent out a questionnaire to about 200 community-based organisations in Yanbian Korean Autonomous Prefecture, asking about their assistance to North Koreans. Of the 102 organisations that responded, 57 reported that they assisted North Korean migrants. From the 57 active sites we drew a stratified sample of 18 sites, selecting three sites at random from each of the five border counties in Yanbian Prefecture (Yanji, Hunchun, Yungjung, Tumen, and Hwaryong), and one site from each of the three interior counties (Ando, Dunwha, and Wangchung; figure 1). Two sites were later excluded because of non-participation and data from one site were excluded because of apparent selection bias, leaving 15 sites.

North Korean migrants in China are a diverse, highly mobile, and largely hidden population, so it was not possible to establish a sampling frame or estimate the probabilities of selection. Monthly arrivals at each site in the previous 12 months ranged from one to 400, with the sites receiving an average of about 25. In the absence of a true random sample, we estimated that 400–600 migrants interviewed at a stratified sample of sites throughout Yanbian would provide a representative cross-section of this population.

### Study design

One Korean-Chinese interviewer from each site was given 2–3 days of individual training on the survey design and interviewing techniques. Three area supervisors monitored the interviews and reviewed completed questionnaires. Each interviewer did at least ten practice interviews using a pretest questionnaire. On the basis of feedback from the interviewers, the questionnaire was revised and training was provided for the new forms. We began surveying in early July and ended in September, 1998.

We defined a household as people who normally live together and share the same cooking facility. North Korean respondents younger than 18 years were excluded, and no more than one member of a family travelling together was interviewed. All respondents were assured that the interview was voluntary and confidential. No incentives were given to migrants, although interviewers received a monthly payment and a small contribution of medical supplies was made to each site. In the less active sites (less than ten arrivals per month), all North Korean migrants were interviewed. In more active sites, at least one arrival per day was surveyed, generally the first arrival at the site in the morning or afternoon.

Respondents were asked to provide a list of their household members as of July, 1994, as well as information on births, deaths, and migration patterns in their household in North



Figure 1: Map of study area

Korea between 1994 and 1998, and information about their own migration experience. Respondents were also asked how much food they received each year through government distributions, to name the main source of the household's food each year, and to rank food sources by order of importance.

We had postulated that, given the risks and the costs involved, North Korean migration to China was undertaken in distress and that migrant households would show higher mortality than non-migrant households. Since we had no direct access to non-migrant households in North Korea, we obtained information indirectly by asking each respondent to provide basic demographic information on a household of relatives with whom they were most familiar. If no member of this proxy household had visited China since 1994, the relative's household was defined as non-migrant. This classification did not exclude movement within North Korea.

Data were entered and analysed with SPSS version 8.0 and EpiInfo (CDC). The study was approved by institutional review boards in Baltimore and Yanbian.

## Results

Between July and September, 1998, 440 North Koreans were interviewed. We estimate that the non-response rate was no more than 5% at any site and that the sample represented 30–100% of the 3-month migrant caseload in the 15 sites. Of those interviewed, 343 (78%) respondents lived in North Hamkyong province and 51 (12%) were from South Hamkyong. The residence of 284 (65%) was described as urban or periurban, whereas 143 (30%) came from rural areas (including fishing and mining communities). Mean age of respondents was 32.5 years, 282 (64%) were men, and 158 (36%) were

Year	Mid-year household population	Number of births	Crude birth rate (per 1000)	Number of deaths	Crude death rate (per 1000)	Net migration	Net migration rate (per 1000)
1995	1732	23	13.3	50	28.9	27	15.6
1996	1665	21	12.6	76	45.6	25	15.0
1997	1570	11	7.0	88	56.0	32	20.4
Total	..	55	11.0*	214	42.8*	84	16.8*

\*3-year average rate.

Table 1: Birth rates, death rates, and net migration rates

women. 203 (46%) were married, 185 (42%) were single, 35 (8%) were divorced or separated, and 16 (4%) were widowed. Of respondents, 315 (70%) had completed middle school, 66 (15%) high school, and 25 (6%) college. The most common occupation was factory worker (172 [29%]), followed by farmers and miners (38 [9%] each). 50 said they were unemployed, and 47 stated they were retired.

The average distance travelled from home to destination in China was 257 km, much of which was covered on foot. Most respondents (72%) had left their homes within 30 days of being interviewed. 288 (66%) had been in China for fewer than 10 days, and 345 (78%) travelled alone. Migrations into China can be characterised typically as short-term movements by a single member of a household whose other members remained in North Korea.

For 294 (67%) respondents, the main reason for migrating to China was to get food, and 67 (15%) said their intention was to earn money. When asked about their future intentions, 183 (42%) said they would return to North Korea, and 28 (6%) said they did not know. Although nearly half indicated no plans to return home, key informants in the Yanbian aid networks believed that about two thirds of North Korean migrants eventually do return home, not necessarily by choice but because life in China becomes too difficult or because they are deported.

The 440 respondents reported a total of 1782 people in households in July, 1994. From the beginning of 1995, to the end of 1997, respondents reported 55 births, 214 deaths, 91 in-migrations, and 196 out-migrations. During this time the total number of household members declined from 1782 to 1482, or from an average of 4.0 per household to 3.4 ( $p=0.0002$ ).

During 1995–97, crude birth rates averaged 11.0 per 1000, or about half the 21.8 UN estimated for 1990–95 (table 1).<sup>11</sup> Mean crude death rates in the migrant households were 42.8 per 1000 in 1995–97, nearly eight times more than the 5.5 per 1000 derived from the 1993 census. Age-specific death rates, calculated as 3-year averages (figure 2), were highest among migrants older than 65 years (131.8 per 1000) and among those aged 60–64 years (129.3 per 1000). Children aged up to 4 years had a death rate of 88.9 per 1000. Among the 55 children born in 1995–97, deaths at younger than 1 year were none of 23 births in 1995, five of 21 in 1996, and four of 11 in 1997, which shows a rise in infant mortality during this period ( $p=0.004$ ). The UN estimate for infant mortality in North Korea for 1990–95 was 24.4 per 1000 live births. Overall, male members of migrant households had higher mortality rates (49.8 per 1000) than did females (35.4 per 1000) during the 3-year period ( $p=0.01$ ).

By analysis of the rate of household decline, which averaged 5% per year in 1995–97, we found that 65% of the decline was attributable to deaths in excess of births. Household out-migration exceeded in-migration during

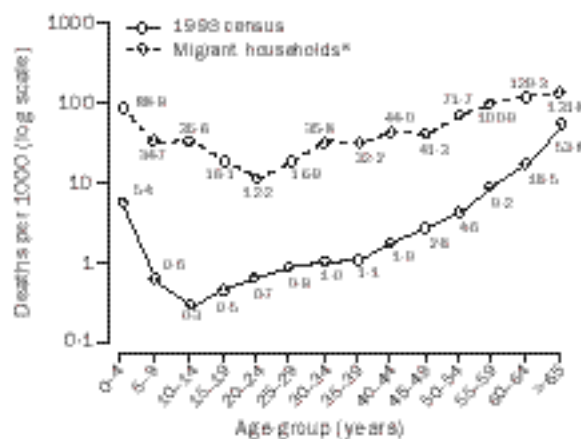


Figure 2: North Korean age-specific death rates  
\*3-year average (1995–97).

that period, contributing to 35% of the annual rate of decline. Of the 91 in-migrants who entered respondent households in 1995–97 and stayed for 1 month or more, the mean age was 35.1 years and 45 (49%) were female. The mean age of 196 out-migrants was 29.1 years, and 94 (48%) were female.

For 1994, respondents reported that their households received an average of 150 g government rations per person daily—about 40% of their official allocation. By the end of 1997, respondents reported that the government ration for their household averaged 30 g per person daily—about 8% of the amount to which they were entitled. Respondents ranked their household food sources by order of importance for each year (table 2). Before the onset of the food crisis in 1994, most households reported that government rations supplied their main source of food. By 1997, only 24 households were relying on government rations as their main source, whereas 40% reported that their food came mainly from foraging for wild foods such as roots, grass, and tree-bark.

269 respondents provided information about households of relatives. Ten of these included a household member who had visited China since mid-1994. The remaining 259 proxy households were defined as non-migrant to show that no household members had migrated to China during the recall period. Of non-migrant households, 20 were headed by the mother or father of the respondent, 124 by aunts or uncles, and 108 by brothers or sisters. Non-migrant households had a crude death rate (averaged for 1995–97) of 43.4 per 1000 and a crude birth rate of 8.8 per 1000. Household size declined from 4.3 members at the start of 1995 to 3.7 at the end of 1997 ( $p=0.0001$ ).

In an attempt to control for household age structure and provincial variability, we studied a subsample of 63 migrant and non-migrant households that were all from the same province (North Hamkyong), in which heads of households were siblings. Mortality among the migrant

Year	Government ration*	Buy	Barter	Forage	Grow	Other	Total
1994	260 (60.6%)	70 (16.3%)	16 (3.7%)	51 (11.9%)	18 (4.2%)	14 (3.3%)	429
1995	122 (28.4%)	99 (23.1%)	60 (14.0%)	98 (22.8%)	29 (6.8%)	21 (4.9%)	429
1996	42 (9.8%)	117 (27.4%)	67 (15.7%)	148 (34.7%)	31 (7.2%)	22 (5.2%)	427
1997	24 (5.7%)†	108 (25.8%)†	54 (12.9%)†	168 (40.2%)†	36 (8.6%) ‡	28 (6.7%)‡	418

\*Includes public distribution system as well as government allocations to farmers and the military. † $p<0.001$ ,  $\chi^2$  test for trend. ‡ $p<0.05$ ,  $\chi^2$  test for trend.

Table 2: Primary source of food by year

households averaged 48.9 per 1000 in 1995–97 compared with 39.7 per 1000 among non-migrant sibling households, whereas birth rates among migrant households averaged 9.3 per 1000 compared with 15.9 per 1000 for non-migrant households. In the two groups, average household size declined from 4.3 to 3.7 members.

## Discussion

Our sample of migrants in China was not a true probability sample and the sample of non-migrant households was derived from interviews with migrant respondents and was therefore non-independent. We did not compare means or proportions for significance. Moreover, most of the migrants came from the single province of North Hamkyong. On the basis of our data from these families, migrant and non-migrant households did not differ for increased mortality and declining household size. In the full sample of 259 non-migrant households or the subsample of 63 sibling households, mortality was in excess of the 1993 census baseline of 5.5 per 1000. We do not argue that our findings are generalisable to all migrant households or to their non-migrant families, let alone to an entire province or country. Nevertheless, these trends of rising mortality and declining household size from 1995 to 1997 are significant in migrant and non-migrant households and suggest that, at least in North Hamkyong, conditions have worsened since 1995.

The decline reported in household food security can be attributed partly to the near total collapse of the government's public distribution system. The system apportioned a daily ration of highly subsidised grain (rice or other grains) to 63–78% of North Koreans according to a ten-tiered system based on age and occupational status. Typically, a working adult was entitled to 700 g per day, children 500 g, and elderly people 600 g.<sup>12</sup>

Decline in household size is not necessarily an indicator of distress. From 1980 to 1987, North Korean households declined from 5.1 to 4.8 people, a function of declining fertility and a shift from joint to nuclear families.<sup>13</sup> By the end of 1993, the North Korean census put the average household size at 4.2 (4.1 for North Hamkyong).<sup>14</sup> Nevertheless, the precipitous rate of decline in our sample households and the large contribution from rising mortality suggest that this decline is evidence more of a response to crisis than to opportunity.

We acknowledge the potential for recall bias in our study, possible selection bias by interviewers, and possible response bias by the migrants who were interviewed. A significant trend of rising mortality may be due partly to recall bias when recording deaths between 1995 and 1997. Although deaths in 1995 may be more likely to be under-reported than those in 1997, we do not feel the effect would be large enough to make the trend a statistical artefact.

Death rates (3-year average, 1995–97) for migrant and non-migrant households were at least seven times higher than the 1993 census baseline of 5.5 per 1000 and were raised in all age-groups. Among migrant households, although age-specific death rates of the very young and very old show the highest absolute increases from the baseline level of the 1993 North Korean census, the increases of death rates among children aged 5–14 years are the highest in relative terms. Studies on the

demography of famine in South Asia have also found excess mortality to be particularly severe among older children.<sup>15</sup> Wasting has been associated with a higher mortality risk in later childhood than in earlier childhood.<sup>16</sup> Birth rates for migrant and non-migrant households declined over the 3 years, although the trend was not significant. Because of the duration of gestation, the impact of the food crisis on fertility may lag behind mortality figures.

The risks and uncertainties that migrants are willing to face in their unauthorised trips to China, the fact that 60% migrate for food, and that 40% of households relied primarily on foraging as a primary source of food, support the possibility that household distress is linked in some way to food shortages in North Korea. Data about their non-migrant relatives reflect similarly high rates of mortality and decline in household size, although we have no information about the food situation in these non-migrant households.

Without the ability to directly interview non-migrant households, we used proxy measures. Although this comparison yielded similarly high mortality, as well as similar trends of rising mortality and declining household size, the migrant and non-migrant samples are not independent and may be correlated in at least two important ways. First, familiarity with another household may be correlated with distress in that household. Respondents may have been more likely to know about and report on a household in distress than one that was coping. Second, mortality, whether it is an indicator of distress or not, may be correlated within families and across households.

Although the structure of our study does not allow us to estimate recent mortality with any calculable degree of confidence, the trends of increasing mortality and declining household size in migrant and non-migrant households lead to concern, particularly for the situation in North Hamkyong. This province in the far northeastern sector of North Korea has been one of the most inaccessible to international monitors and is believed by some aid officials to be one of the hardest hit by famine.<sup>17</sup>

In 1993, the population of North Hamkyong was 2 060 725, including 2 013 934 people living in 491 962 households and 46 791 people living in 991 collective units.<sup>14</sup> For example, assuming that the North Hamkyong population grew at the officially recorded rate of 1.4% in 1994 and then experienced a birth rate of 16 per 1000 and a death rate of 40 per 1000 from 1995 to 1997, deaths during the 3-year period would have numbered about 245 000 and would have exceeded births by 2.5 to one. With 1993 census birth rates of 21.8 per 1000 and death rates of 5.5 per 1000, and assuming no substantial migration in or out of the province, births during the same period would have totalled 140 000 and deaths only 35 000.

In reclusive nations like North Korea, which commonly frustrate attempts to gather meaningful demographic information, indirect estimation techniques may be the only ones available. Because such techniques are subject to bias, they cannot substitute for nationally representative, randomised surveys done within a country. A small sample of a selective population of migrants offers no reliable basis for estimating mortality even in one province, let alone an entire country. Data from a related sample of proxied

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non-migrant households, moreover, cannot conclusively prove whether rising mortality is a general phenomenon. Nevertheless, in the absence of more traditional survey opportunities, indirect techniques help to open a small window on the food crisis in North Korea and its possible demographic impacts.

#### Contributors

W Courtland Robinson contributed to the conception, design, implementation, and analysis of the study, and was the principal investigator. Myung Ken Lee coordinated fieldwork in China and contributed to the design and analysis of the study. Kenneth Hill contributed to the conception, design, and analysis of the study, particularly the demographic techniques of indirect estimation. Gilbert Burnham contributed to the conception, design, and analysis of the study and co-wrote the paper.

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