

Discussion: On the Study of Population Structure of Democratic People's Republic of Korea

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This excellent paper by Jeon *et al.* (2015) presents a demographic analysis of data from North Korea. Their key concerns are with population age structure as well as patterns of mortality between the censuses of 1993 and 2008. Their assemblage of clues from the two censuses, as well as other statistics and official estimates, help to improve our understanding of North Korea.

The 1993 and 2008 census counts by age and sex provide two “bookend” estimates of population structure. The authors then use the demographic balancing equation - the fundamental accounting system of demographic analysis - which requires that changes between the two bookends be due to births, deaths, and net migration. Of course, annual statistics for these components of demographic change may be unavailable, and the data that is available (including the reported census counts) may not be accurate. Thus, the challenge for demographers is to decide how to fit together (or adjust) the available demographic evidence as required by the balancing equation. When there is a lack of information or uncertainty about data quality, there are multiple ways in which the evidence can be fit together.

An important concern that anchors their analysis is the estimation of “excess deaths” caused by the Great Famine in North Korea during the late 1990s. Shortly after the famine, experts speculated that it caused anywhere from one to three million deaths that otherwise would not have occurred. Goodkind and West (2001) then proposed a narrower range of 600 thousand to 1 million excess deaths based on indirect inferences - the lower estimate based on child malnutrition survey data and the upper estimate based on Chinese mortality during a famine following the Great Leap Forward. Following the 2008 census, which allowed for revised estimates based on intercensal analysis, the proposed range was reduced to about 500–600 thousand (Goodkind *et al.*, 2011). Some experts suggested that this revised range was too low and that the original range extending to one million was more accurate (Noland, 2011). Conversely, others claimed the revised range was too high. For instance, an alternate demographic analysis using a different set of assumptions concluded that the range should be 240–420 thousand (Spoorenberg and Schwegendiek, 2012).

Yet these challenges to the revised estimates by Goodkind, West, and Johnson are themselves highly questionable. There is no reason to believe that North Korean mortality should have followed

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the same pattern as in China following the Great Leap Forward - which was the basis for the estimate of 1 million. Nor is that higher figure confirmed by trends in food imports or the mere possibility of inaccurate statistical reporting (Noland, 2011). One should also question the low range of estimates proposed by Spoorenberg and Schwekendiek. As Jeon, Kim, and Park point out, those low estimates were based on the assumption that mortality in 2000 just after the famine returned immediately to the levels that had been recorded in 1993, just prior to the famine. This seems unlikely. In addition, Spoorenberg and Schwekendiek's estimates require us to believe that life expectancy declined by three years from 2000 to 2008. This is contradicted by the best empirical evidence I know of - successive surveys in North Korea indicate a notable decline in child malnutrition from 2000 to 2009 (FAO/WFP, 2010; Figure 6). This evidence implies steady improvements in child health and, most likely, improved health at all ages.

Of course, given limited data sources, we should all acknowledge uncertainty about demographic conditions in North Korea. Indeed, although Goodkind *et al.* (2011) and Jeon *et al.* (2015) agree about general levels and trends in North Korean mortality, there are some modest differences in their assumptions. For instance, the former group assumed that life expectancy as reported in the 1993 census was about 3 years too high due to underreporting of deaths - the true life expectancy in 1993 was assumed to be identical to that estimated in 2008. Due in part to this lower initial life expectancy, as well as the common census bookends, the pace of life expectancy improvements from 2000-2008 were faster in the former study compared to the latter (see Table 2 in each study).

The two studies also identify different "model life table" patterns of mortality by age and sex. This is likely because of different methods. Goodkind, West, and Johnson calculated intercensal population survival by age and sex between the two censuses, which yields an ideal life table for the entire intercensal period (North for males; Far East for females). In contrast, Jeon, Kim, and Park examined model life tables for deaths reported in the years prior to the 1993 and 2008 censuses separately. Although the South provided by far the best fit to reported death rates in 1993, the South gave a notably worse fit in 2008 than either North, West, or East. It is possible that the model age pattern of mortality changed in North Korea over time, as long as we can rule out that the shift was not caused by reporting problems at particular ages in one (or both) of the censuses.

The two studies quote different estimates of death reporting completeness based on applications of the Hill General Growth Balance Method. Goodkind, West, and Johnson calculated that deaths recorded in the censuses were 82 percent complete (both sexes), while Jeon, Kim, and Park calculated 76 percent completeness for males and 34 percent for females. Clearly, either the underlying data and/or formulas used in applying the Hill method differed between the two teams. This is not unusual. In my experience, although the Hill method is quite elegant, it is sensitive to minor differences in its specifications.

Despite these modest differences, what is remarkable about these two studies is their agreement about the overall trends of mortality and demographic impact of the famine. Both Goodkind *et al.* (2011) and Jeon *et al.* (2015) conclude that famine deaths most likely ranged between about 500

and 600 thousand. It is possible that future evidence may lead investigators to question that range of estimates. Yet, in my view, the fact that these two separate teams came up with very similar estimates establishes a benchmark for future discussions, and against which future evidence must be evaluated.

As to the numbers themselves, no one should be ‘disappointed’ if the estimates by these two teams are lower than they had assumed they should be. The human tragedy of these numbers is unsettling enough as it is. In sheet demographic terms, they correspond to almost 3 percent of North Korea’s population. If a disaster with a similar per capita impact were now to befall South Korea, there would be about 1.5 million excess deaths.

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