

Incorruptible Information on North Korea? An Overview and Review of Anthropometric Assessments

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국문요약

북한은 믿을 만한 통계가 거의 없다는 점에서 여전히 은둔의 왕국이다. 인체 측정학의 자료는 출판되어 왔고, 신체와 관련된 측정은 그 자체로 조작할 수 없는 것이다. '부패되지 않은 청렴 결백한 정보'에 의해 제공된 기술적 잠재성과 관련하여, 이 글은 질적 토론과 양적 지수 모두 사용함으로써 조직적인 재검토를 가능하게 할 뿐만 아니라 북한의 인체 측정학 판단의 포괄적인 개관을 처음으로 제공한다는 데 있어서 큰 의의가 있다. 23개나 되는 많은 조사가 이루어졌으며, 이는 다른 통계적 미개척의 영역이라는 점에서 아주 인상적이다. 질적 용어에 있어서 여기서 사용한 지표는, 조사는 국제 기구들에 의해 수행된 그런 것들이 난민 조사와 북한 간행물들보다 우세하다는 것에서부터 세 가지 범주로 되어 있다는 것을 보여준다. 난민 조사는 아주 편향되게 자기 선택적인 경향이 강하며 정부 조사는 완전히 복제할 수 없게 되어 있고 그리고 국제연합 조사는 선택 지역에 있어서 미리 선택함으로써 편향될 소지가 있는 것과 같이, 북한에 대한 완전히 통계적으로 대표하고 독립된 것으로 수행된 조사는 없다.

주제어: 북한, 생활 수준, 인체 측정학, 영양, 기근, 건강

I. Introduction

Reliable information on North Korea is hard to come by. Beyond anecdotal evidence, few sources offer meaningful glimpses behind the last remaining wall (Smith, 2004). When it comes to quantitative information, the Democratic People's Republic of Korea (DPRK) has been a 'statistical blackout' for decades (Eberstadt, 2001a). The government stopped releasing regular statistics in 1965: data is, if at all, released on an ad-hoc basis (Eberstadt and Banister, 1992). Furthermore, for obvious reasons, independent data collection from inside is restricted and usually prohibited.

Consequently, information on North Korea comes mostly from external analysts who must frequently base their estimations on generous model assumptions. Moreover, it is known that the statistics released by communist governments are subject to manipulation. This is where anthropometry enters the picture. In contrast to conventional demographic or macroeconomic approaches, anthropometry produces 'incorruptible' data. Firstly, raw data does not have to be calculated but is measured physically. No extensive transformations and theoretical assumptions are required, which leaves less room for manipulation or systematic statistical errors. Secondly, the implementation is not complicated since measuring heights can be done anytime, anywhere, and at low costs. At minimum, all that is needed is one researcher and a tape measure; at most, two researchers and a stadiometer are sufficient. Finally, by measuring emigrants from the studied country, reliable data can be obtained even if the government has a genuine interest in censoring this information. However, anthropometry in North Korea is a

delicate issue:

I just can't respect anybody that would really let his people starve, and shrink in size as a result of malnutrition. It's a sad, sad situation for the North Korean people.¹⁾

(George W. Bush)

Profound debates can arise from such data. Since malnutrition and socioeconomic factors lead to shrinkage, data on average human height and weight reflect the overall performance of the regime. This undoubtedly adds a political dimension, let alone a humanitarian dilemma, to the anthropometric approach (Schloms, 2004). And even during the 2008 US-presidential debate, height differences between the two Koreas became an issue for the campaign (Schwekendiek and Pak, 2009).²⁾

In this light, virtually every centimeter and gram that is measured becomes political. Thus, experts on the North Korean system often refer to nutrition surveys (Cumings, 2004 ; Eberstadt, 2001b ; Haggard and Noland, 2007 ; Noland, 2000 ; Noland et al., 2000 ; Schwekendiek, 2009a), which are primarily based on anthropometric data. As it is, one may therefore discuss anthropometry in North Korea per se.

In sum, by acknowledging the huge statistical, political and scientific potential offered by anthropometric data on North Koreans, this paper gives an overview of surveys that include such data, discusses their characteristics

¹⁾ George W. Bush to reporters on October 22, 2003: *Roundtable Interview of the President by the Press Pool*.

²⁾ See: <http://blogs.wsj.com/numbersguy/the-korean-height-gap-431> and <http://www.politifact.com/truth-o-meter/statements/751>.

from conception to finding, and last but not least reviews their conceptual validity.

II. North Korea's perception of anthropometry

Nowadays, international visitors to North Korea report on stunted children – small-sized children who look many years younger than they actually are because of retarded growth as an outcome of the North Korean famine (Mohr, 2000 ; Stehling, 2001). Historically, the first anthropometric concerns were already voiced in 1979 when the North Korean leader Kim Il Sung admitted child stunting during a meeting (Lee, 1999). As a result, a campaign suggesting the cultivation of runner-bean plants to increase protein supply and thus children's heights was launched. In the mid-1980s, two hours of extra curricula were assigned to all primary and junior high schools in order to increase children's heights as part of the "Movement to Become Taller" (Chong, 1998).

In brief, it becomes obvious that North Korea has been paying specific attention to anthropometry. There is also commonly known evidence such as minimum height requirements and extra weight-gaining programs for North Korean soldiers serving in the Demilitarized Zone (DMZ) for the purpose of ideological demonstration; or of propagandist slogans in the streets telling people to increase their height.

Notwithstanding the North Korean regime's awareness of the political power of anthropometric indicators, it was only in 1987 that the first civilian anthropometric survey was carried out to assess the nutritional situation on

a large scale (UNICEF, 1999). The most recent survey dates from 2004, and a 5th Multiple Indicator Cluster Survey (MICS) - which regularly includes an anthropometric module - was announced (DPRK and UNICEF, 2004) but had in fact never been carried out.³⁾

III. Technical terms and terminology

When presenting a structured overview and review, it is useful to establish some basic terms which are frequently used in our text and tables. Sometimes, a term used in one context will be similar to a different term used in another context. For instance, an inside survey will usually be a household survey as well. Since our aim is to point out nuances in the quality of the data, specifying structural biases becomes imperative. It is thus of primary importance to differentiate the locations and localities of the measured individuals, as will be shown below.

Height vs. weight vs. MUAC

The selection of the most adequate anthropometric variable is important. For example, height is not very sensitive to temporal external shocks, whereas weight and mid-upper arm circumference (MUAC) react immediately and can be volatile throughout life. Height and weight are the standard anthropometric variables collected throughout surveys because, apart from

³⁾ Note that in 2002, the UN conducted a survey that was entirely based on MICS modules. This survey was not officially labeled “MICS” but “Household Survey”. We hereafter refer to the 2002 survey of the U.N. as the 3rd MICS.

MUAC which is the variable easiest to obtain, they allow the construction of powerful indices in combination with the basic variables sex and age (WHO, 1986). There are further anthropometric variables such as skinfold fatness, skull circumference etc., but they are not discussed here because they are usually a proxy for one of the standard anthropometric variables and most importantly, because they have never been collected for North Koreans.⁴⁾

Measurements vs. indices vs. cut-offs vs. indicators

In anthropometric terminology, height, weight and MUAC are raw measurements. In our context, they have the particular advantage of being precise and less manipulable variables. Measurements are used to construct indices. The most common ones are z-scores of weight per age (WAZ), height per age (HAZ) and weight per height (WHZ), which in turn can be used *inter alia* as an indicator of malnutrition or the biological living standard.⁵⁾ Now, since our research formulation is to review the conceptual validity of anthropometric surveys on North Korea, we are not really interested in the (rather academic) interpretation of indicators and the usefulness of the indices. However, since most surveys only report the malnutrition indicator based on the standard cut-offs of anthropometric indices, we work with these results instead of preferable raw measurements (tables 1 and 5).

⁴⁾ An additional anthropometric variable that has been collected is subcutaneous fat thickness, but it is only available for 55 North Korean children (Pak, 2003)

⁵⁾ The term “biological standard of living” was suggested by Komlos (1985).

Inside vs. outside surveys

In spatial terms, there are two types of surveys: those conducted in the DPRK and those for which data were collected abroad, notably 'migrant surveys'.⁶⁾ One concern of this study will be to determine to what extent migrants or refugees are representative of the DPRK since, by definition, no refugee leaves the country voluntarily, which implies underlying (self-) selectivity. The measured migrants resided either in China or South Korea. The latter constitutes a special case of outside surveys because the majority of migrants transfer from China to South Korea. As a consequence, a double-selection bias might ensue and this additional migration pattern might induce further statistical distortions in the sample.

Household vs. institution vs. migrant survey

Another spatial differentiation should be made with respect to the sampling unit. Anthropometric measurements of inside surveys are based on private households or public institutions, whereas outside samples are drawn right on the spot from North Koreans who are non-permanent residents. From among these three types of surveys, household surveys are to be preferred because from a statistical point of view, all members of society will have the same chance of being selected.⁷⁾ However, this becomes a problem when relying on institution surveys, as not all North Koreans will attend the

⁶⁾ Terms such as asylum seekers, refugees or defectors are also used. In using the neutral label "migrants", we follow Smith (2002a).

⁷⁾ We oppose (2004) who prefers institution-based surveys because he is presumably concerned more with the destination and monitoring of food aid, and less with sampling issues.

selected facilities (i.e. children in nurseries, kindergartens and schools). Even though attendance is theoretically compulsory in the DPRK and communist enrollment rates are usually high, privileged and particularly vulnerable individuals may routinely not be among the attendants. Migrant surveys are the least preferable on account of the aforementioned self-selection bias *before* migration, but also due to additional distortions caused *after* migration. In short, migrant surveys are based on a questionable statistical universe; nevertheless, these surveys are indispensable, as will be seen.

North Korean vs. private vs. international organizations

All in all, anthropometric data come from three sources: North Korean organizations, private organizations or researchers, and international organizations. This does not mean that the participation of one organization precludes that of another, since a lot of surveys were carried out jointly. Either way, we refer to the responsible organization under whose aegis the survey was initiated and mainly conducted.

IV. Minor anthropometric studies

In general, measuring people is forbidden in North Korea. Even more prohibited is it to conduct a comprehensive anthropometric nutrition survey, unless special permission is granted in indirect exchange for international aid. Nevertheless, there are some unofficial 'field reports' based on small sample sizes and mostly from one sample location, as well as 'eyewitness reports' based on visual inspection – most of these handed in by international

medical personnel who collected data during their field trips to North Korean institutions. Apart from this, information on living standards is offered by surveys conducted by two religiously affiliated organizations, the “Korean Buddhist Sharing Movement” (KBSM) and the Christian “Commission to Help North Korean Migrants” (CNKR) Chang (1999).⁸⁾ However, these resort to demography but not anthropometry. Given our research formulation, we will focus on surveys that include anthropometric data, but we will briefly make use of these surveys when discussing the sample selection bias of refugees. Moreover, only methodologically sound surveys that recorded data in an extensive and systematic manner will be considered, i.e. all minor reports were discarded from the start. For the sake of completeness, table 1 summarizes left-out field reports which lacked statistical explanatory power.

V. Major anthropometric surveys

Table 5 summarizes the major anthropometric surveys on North Korea in chronological order. The first 10 columns refer to the descriptive part of this study by presenting a systematic overview of anthropometric surveys on North Korea, whereas the last 6 columns relate to our aim of a statistical review, where we made use of an index. We will start with the descriptive part.

⁸⁾ The KBSM was renamed to “Good Friends” in 1999. Reports were continuously published in 6 volumes, here, we only refer to the final report (Korean Buddhist Sharing Movement, 1998).

1. Surveys by North Korean organizations

Surveys by the government were conducted in 1987, 1996 and 2000. They are not quoted internationally due to a lack of replicability and, in the case of the 1996 survey, for reason of unspecified information on data collection and analysis. Even though these surveys are not frequently referred to, there are three reasons why they should not be ignored.

Firstly, there was a certain degree of international participation in some of these surveys. The 1987 survey of the Kangwon province was conducted by an Australian professor of nutritional science even though the North Korean Institute of Child Nutrition (ICN) released this publication (Smith, 2004). The MICS from 2000, conducted by the North Korean Central Bureau of Statistics (CBS), was neither monitored nor analysed internationally, but the organization, logistic support and training of the teams was carried out with the help of UN staff prior to the survey (CBS, 2000).

Secondly, in spite of their complete irreproducibility, the reported survey findings are at least not completely implausible. For example, the findings of the irreproducible MICS of 2000 can be roughly compared to those of the independent and (conceptually) similar MICSs of 1998, 2002 and 2004. As can be seen in figure 1, the z-scores from 2000 seem to be consistent regarding the time trend as well as the historical reasoning that the last year of the severe crisis was around 1998 (Smith, 2002b). Drawing a straight line across the years 1998 - 2002 reveals that the rates 2000 rates are below the corresponding linear interpolation (figure 1), suggesting that the government falsified the figures by underreporting all three malnutrition rates. However, the relation could indeed be an exponential one, as suggested by looking

at the dotted lines. Thus, this survey is both unreliable and consistent.⁹⁾ In a similar vein, the 1996 survey by the Ministry of Public Health (MOPH) remains critical. On the one hand, a malnutrition rate of 15.6% at the peak of the food crisis seems to be too low if related to the HAZ or WAZ; on the other hand, if related to the WHZ, it is plausible (figure 1). Unfortunately, no further information was available (Centers for Disease Control and Prevention, 1997). Hence, this irreplicable survey must be regarded as only somewhat consistent.

Thirdly, governmental surveys offer unique information which no independent survey can provide. The 1987 survey of the Kangwon province allows an exceptional glance at the living standard before the collapse of the Eastern Block and the nutritional situation prior to the North Korean food crisis (Smith, 2004). Furthermore, the MOPH survey of 1996 is the only anthropometric survey which is based on a full statistical population, i.e. all North Korean children under 5 years. It is thus one of the few complete surveys of a country that has been characterized, with due reason, as 'a statistical blackout' (Eberstadt, 2001a). On top of that, the MICS of 2000 is an exclusive survey representative of North Koreans from all 12 provinces and theoretically all counties, including even those counties where no foreigner has ever trodden because they were declared inaccessible by the government.

⁹⁾ An exponential trend would also make sense from a social-biological point of view: if the peak was in the late mid-1990s, international food aid as well as adapted local coping mechanisms would have had a large and immediate effect on height - esp. in the case of children - before settling down to a lower but persistent level.

2. Surveys by private organizations

All surveys conducted by private organizations are based on anthropometric data on North Korean migrants and are therefore, as distinct from surveys by the government and international organizations, outside surveys. There are three surveys by the Johns Hopkins School of Public Health (JHSPH)¹⁰ from 1998-2000, where the MUAC of North Korean migrants to China, or more precisely, to the Yanbian autonomous region in the Jilin province located at the north-eastern border of the DRPK, was measured (Robinson et al., 1999 ; Robinson et al., 2001a ; Robinson et al., 2001b). Note that the aforementioned KBSM and CNKR migrant surveys are left out in our anthropometric summary. They were conducted in a similar time period, are large in sample size but less scientifically sound and, as discussed, not based on anthropometry but demography. However, we will have a look at those surveys when discussing the selection bias caused by a migrant sample drawn for cross-checking information on the profile of migrants (table 2). Above all, it is necessary to point out that not even the number of migrants (let alone the underlying dynamics of migration) can be reconstructed (Smith, 2002a). Thus, only rough estimates exist, and there is not even consensus about the range of migration.

Let us point out the main advantage of migrant surveys. Beyond anthropometry which is a physical method and therefore ‘incorruptible’, less tangible socioeconomic information about individuals such as social

¹⁰ The JHSPH was invited by the humanitarian NGO “Mercy Corps International” which is a relief agency active in North Korea (Robinson et al., 2001a).

stratification or food security are of research interest. In the course of the abovementioned outside surveys, free interviews could be conducted, i.e. critical questions were not censored and critical answers not precluded by the presence of North Korean officials.

However, there are three arguments against migrant surveys. The first is that the process of weighing the benefits of leaving home *before* migration results in a self-selection bias. People who were worse-off will undoubtedly be more motivated to emigrate, *vis-à-vis* members of the elites and farmers who may have had access to food through informal or direct channels. Hence, there will be a clear downward bias from the true anthropometric mean, since the samples will be based on rather vulnerable families. As a counteracting effect, however, vulnerable North Koreans might not have the energy and resources to make the trip to the border. Additionally, households may send out only their healthiest members to obtain food in China (Robinson et al., 2001b). In the case of the JHSPH survey, the most evident bias is that approximately 90% of the migrants were originally from the two Hamgyong provinces in the Northeast, a major mining and industrial region which is geographically close to Yanbian where ethnic Koreans live. Furthermore, these provinces collapsed economically in the post-Cold War era and are supposed to have been subjected to a triage strategy by the government (Natsios, 2001). Thus, we expect a downward bias with regard to national representativeness.¹¹⁾ In summary, there are too many undetermined

¹¹⁾ At least concerning children's data. On the contrary, concerning height data on adults, there might be an upward bias because these regions were prosperous in the Cold War era when mining and industrial production were North Korea's key industry.

self-selection biases in both directions, which calls for sound statistical research that is yet to be done (Smith, 2002a).

Secondly, *after* migration, all short-term anthropometric measurements are biased. Whereas the idea of anthropometry is to reflect conditions in North Korea, measuring MUAC approximates the current net-nutritional status in China (or during the strenuous trip). Less sensitive height measurements would therefore be preferable but were not collected for the JHSPH surveys.

Thirdly, the selection of respondents *after* migration is biased because both the interviewers and the respondents act illegally in China. In consequence, only a restricted random sampling could be conducted at migrant sites by the JHSPH surveys, i.e. out of 200 local aid networks only 57 answered and 18 were selected (Robinson et al., 2001a). Besides, some migrants in China will have a smaller chance of being selected than others. For instance, North Koreans who can rely on relatives in China (“Chogyos”) will be underrepresented at these sites, because presumably, only the most desperate will stay there.¹²⁾ On top of this, the majority of the women who came through bride trade will be locked away, typically on rural and isolated farms, and women who are forced into prostitution will be hindered from reaching the sites. Therefore, depending on the survey design, there are substantial differences among the migrant surveys carried out in China at a similar period; the CHHR survey, for example, reports that 3/4 of individuals were males whereas both the KBSM and JHSPH surveys report only 1/2 (table 2).¹³⁾

¹²⁾ I.e. ethnic Koreans living in China (Chong, 1995). There are more than 2 million Chogyos, and some 800,000 live in Yanbian alone (Smith, 2002a).

¹³⁾ Chang (1999) notes that women are underrepresented at the sites because many

In conclusion, it becomes obvious that the JHSPH surveys are of limited use for anthropometric research. However, they offer first-hand supplementary information on North Korea. Without the interviews of migrants, there would be virtually no uncensored data on the circumstances North Koreans have been exposed to.

Apart from the migrant surveys carried out in China, S.Y. Pak from Seoul National University (SNU) uses anthropometric data on North Korean adults and children who entered South Korea between 1999 and 2003. The South Korean government systematically interviews and measures any North Korean immigrant on arrival; since 1999, a substantial number of North Koreans seeking asylum have been recorded.¹⁴⁾ Note that other researchers, in particular South Korean scholars, have reported anthropometric data of these refugees, too. However, they have merely used sub-sample sizes of the North Korean refugee population, e.g. by conducting surveys among North Koreans residing in Hanawon (facilities set up by the South Korean government for North Korean defectors). As the data reported by Pak (2004a) covers the whole refugee population, we here discarded all sub-assessments that are generally characterized by smaller sample sizes. Note that we have also limited ourselves here to anthropometric literature published in English.

of them are sold to locals prior to arrival. However, the JHSPR surveys which were also conducted based on sites (unlike the KBSM interviews which were conducted on the street and closer to the border) do not show such a ratio. This also hints at severe and undetected biases in the sampling design of these migrant surveys.

¹⁴⁾ According to the South Korean Unification Ministry, 148 North Koreans entered South Korea in 1999, 312 in 2000, 583 in 2001, and 1139 in 2002; cf. *The Korea Times*, Oct. 10, 2004.

Most of the pros and cons (apart from the sampling complications attributed to the illegal status of migrants) underlying the JHSPS surveys apply here as well. Professor Pak's surveys are marked by a further characteristic: on top of the selection bias resulting from migration to China, there might be a second - hypothetically dominant - selection bias due to migration to South Korea. Bridging the distance from home to the Chinese border requires few resources, as it can be done on foot - the average travel distance to the North Korean border was 143 km in 1999 (Robinson et al., 2001a). Once at the border, guards can be bribed easily if necessary.¹⁵⁾ Moreover, re-migration is likewise common, so that the migrants' decision to move is not a permanent one. In contrast, the second selection bias, arising from bridging the distance between the Chinese border and Seoul which is at least 500 km longer, might be dominant because it requires a lot of resources, and it also implies a permanent decision. The only way to reach South Korea is by ship or plane, so traffickers have to be paid; and since re-migration is not easy, migrants must have strong incentives and sufficient resources, which suggests that elite members are better equipped to migrate. All in all, it can be expected that the second bias will have a larger effect on sample selectivity.

From an empirical point of view, descriptive statistics do not hint clearly at the existence of such a double selection bias. For instance, when comparing North Koreans measured in China to those measured in South Korea, we find that the latter are frequently in their 20s - suggesting age selectivity -

¹⁵⁾ Note that North Koreans escaping to South Korea have to choose the longer and indirect way via the porous northern Chinese border because the direct way via the southern border, the DMZ, is guarded by thousands of posts (Oberdorfer, 1999).

but unambiguously elite members, as argued above (table 2).¹⁶⁾ Unfortunately, no further statistical testing has been done on the impact of the second selection bias. So, for the time being, we speculate that there might be some second selection bias but we do not know if it has any significant effect on the anthropometric mean at all. Moreover, we are unable to prove the final direction.

The first selection bias comes again into play here: consistently across all migrant surveys, some 80% of the North Korean migrants entering South Korea are from the two Hamgyong provinces where less than 25% of the North Korean population live (table 2). Therefore, it is quite clear that an extreme regional selection bias is given in the South Korean samples as well.

Most importantly, however, the surveys from South Korea are excellent in that extensive interviewing and measuring took place both independently and continuously, unlike in the JHSPH surveys which were conducted under extreme circumstances. Therefore, the most detailed and systematic socio-demographic information on North Korea comes from this survey; additionally, it is the only systematic survey worldwide which covers the heights of adult North Koreans. For further reading on weights of North Korean adults, see Schwekendiek (2009a).

¹⁶⁾ We expected to find more soldiers or students in the sample because they belong to the privileged class. Since some 80% come from the Hamgyong provinces, it is likely that what matters is simply geographic proximity to the border.

3. Surveys by international organizations

Anthropometric surveys by international organizations, notably UN agencies and one EU agency, were conducted in 1997, 1998, 2002 and 2004. Being inside surveys which, in relative terms, were conducted independently, these surveys are methodologically superior to surveys by the government and private organizations – which is why they are frequently quoted, but also debated.

In 1997, the World Food Program (WFP) systematically measured children in 5 provinces.¹⁷⁾ This survey is cited less often than the 1998 and 2002 MICSS: even WFP executive director C. Bertini admitted that “we cannot vouch for its scientific accuracy”.¹⁸⁾ Methodologically, it is characterized by three drawbacks:

Firstly, it is an institution survey, whereas the others are household surveys. As a consequence, an attendance bias ensues: the average attendance rate of these institutions was 68% (Katona-Apte and Mokdad, 1998), and it may be argued that the missing proportion consists of worse-off individuals, either because children were hospitalised (due to malnutrition) or looking for food,¹⁹⁾ but also because poor-looking children might have been instructed by the government to stay away. What follows from these explanations is that children were presumably absent due to self-selection rather than

¹⁷⁾ Including data obtained during the pre-test phase.

¹⁸⁾ Quoted in: *Emergency Nutrition Network* (1998).

¹⁹⁾ Also because of impoverished parents unable to pay fees. Note that kindergarten is free of charge in the DPRK, but a contribution in terms of ration tickets, or a school fee, is common (Chong, 1995).

governmental selection. Generally, it is important to note that the reported average attendance rate seems to be accurate and not artificially trimmed. Evidence comes from several sources, including the principal of a North Korean primary school who reported an attendance rate of 75% before international aid was distributed (Committee on International Relations, 2002) and a defected director of a North Korean kindergarten who reported that “60% of students attend school [...]” and were “admitted to be absent from school” to search for food (Chong, 1995). When interpolating these rates, an average attendance rate of 68% seems to make perfect sense. Now, looking at the 1998, 2002 and 2004 surveys, it may be speculated that the government influenced the anthropometric findings by pre-selecting specific regions instead of individuals, i.e. by declaring some counties inaccessible while allowing full sample selection in the accessible ones. In this case, the pre-selection of facilities would supposedly correspond with the way in which the government wanted to control the anthropometric findings; this is a critical point, and leads on to the next.

Secondly, data collection was restricted to 40 government-selected facilities. This implies a serious selection bias, since no sampling randomness is given at all. We do not know if the government picked only ‘good’ facilities in ‘good’ counties²⁰⁾ - certainly, there must have been reasons for not allowing a randomised sample, but at the same time, one should remember that a

²⁰⁾ Most of the institutions are located in coastal counties. Although it can be argued with due reason that these regions are better off than the mountainous regions, they might have suffered more from weather anomalies between 1995 and 1997, especially from the infiltration of sea water into the fields which caused the complete loss of the harvest, see (FAO and WFP, 1997).

purely whitewashed sample would not be in the interest of the DPRK, either. On the one hand, the delivery of international food aid would have been endangered if extremely low rates of malnutrition had been recorded; on the other hand, the prevalence of extreme malnutrition would have spurred political criticism. Therefore, it is more likely that 40 average institutes were selected, which would not impair the representativeness of the recorded data too strongly. At least, when looking at the reported WHZ and HAZ distribution (Katona-Apte and Mokdad, 1998), we do not see a skewed distribution, which would result if only better-off children were systematically selected from these institutions. Additionally, when comparing these survey findings to the random MICS of the EU/UNICEF/WFP/DPRK survey which was conducted only a year later (EU et al., 1998), we find indeed that the WHZ are consistent, while the HAZ are too low (Schwekendiek, 2008b). Unfortunately, there are too many technical differences between these two surveys even when ignoring a likely time trend. In other words, just cross-checking the reported results of the WFP 1997 survey does not seem to be recommendable, and the question remains to what extent the government influenced the anthropometrical research by pre-selection. Anyhow, the given attendance-bias cannot be ignored, hence there can be no doubt that the survey at hand is a non-random survey.

Thirdly, even when assuming that the obtained samples reflected the true malnutrition rate, they would still be representative of 5 out of 12 provinces only. Thus, the WFP is not a national survey, unlike the MICSs which cover most provinces.

What is important to note is that the 1997 survey was the first systematic and interregional anthropometric study which was carried out under the

aegis of international staff on North Korean ground. It is one of the prime sources for anthropometry, even more so because it was conducted at the peak of the food crisis and covered almost 4000 individuals. Malnutrition findings have been re-confirmed in further research (Schwekendiek, 2008b).

In 1998, 2002 and 2004, MICs were conducted by international agencies. Due to their similar conception and statistical design, we elaborate only on the 2002 survey, but these comments apply to the other MICs as well.²¹⁾ First of all, it is necessary to point out that there was international participation in all surveys: DPRK agencies (co-)issued some of the reports, which gave rise to some misunderstandings and reproaches regarding unreliable data collection and evaluation. However, as a matter of fact, all data collection teams were monitored by at least one international staff member; and the reported results can be reproduced externally (Schwekendiek, 2008a; Shrimpton and Kachondham, 2003).

The main criticism was raised because of implementation issues. Noland (2003) notes that malnutrition could be wrongly reported because the UN might have used Korean age and not Western age, which differ by up to two years. However, from looking at the operational guidelines of 1998 and 2002, it can be said that age was supposed to be calculated on the basis of the exact date of measurement and the exact date of birth.²²⁾ In other

²¹⁾ The major differences are the agreed sample size and the fact that in the 2002 survey, the two provinces Chagang and Kangwon were excluded by the UN (not by DPRK authorities) because of the large number of inaccessible counties (figure 10; UNICEF, 2002).

²²⁾ See EU et al. (1998); (2003). Note that this misunderstanding occurs when Koreans are asked how old they are, but not if being asked in which year they were born. There is further evidence: first, the EPI software used requires these two exact

words, such a distortion could not have occurred at all.²³⁾ Another reproach concerning the implementation was that “there was no possibility to check if the selected households were the ones actually visited” (Schloms, 2004). In fact, however, sample selection and household identification were explicitly under international responsibility. In 2002, even the driver was employed by the UN (Shrimpton and Kachondham, 2002). Therefore, it is not likely that active manipulation by the government occurred during the implementation phase, though there might have been some passive influence during interviews. As distinct from the outside surveys, North Korean officials attended the interviews. Consequently, critical information on the situation of the household might have been distorted. For instance, just 1% of the respondents admitted relying on the markets as a common food source (there are legal farmers’ markets, but one could also associate ‘black’ markets or ‘capitalist’ markets with the term). For this reason, one should be attentive with some pieces of information offered by the MICs, but the ‘incorruptible’ anthropometric module remains robust nevertheless. For a further discussion on the self-censorship bias of the respondents, see Schwekendiek (2009c).

Most importantly, apart from practical implementation issues, all MICs might be fundamentally biased due to their sampling design. In 2002, prior to implementation, 43 out of 206 counties were declared inaccessible on the

dates to calculate z-scores. Second, if Korean age were applied, no child below 1 year (i.e. 12 months) would exist, but both surveys report children under 12 months. Third, the standard anthropometric UN module for MICs always asks for the exact date of birth.

²³⁾ Noland argues that high decline rates of malnutrition rates are implausible for the period 1998 to 2002 and might be attributed to a statistical bias. However, this might be due to an exponential improvement after a severe external shock (figure 1).

grounds of 'security concerns,' so that individuals living in those counties were systematically excluded from the sampling list. For understandable reasons, no criteria for inaccessibility were given. The critical point is thus whether counties were excluded for security reasons or because of nutritional concerns, which would result in an upward bias of the reported anthropometric findings.

Undoubtedly, security interests play a role in 'infamous' counties such as Nyongbian (where the currently debated nuclear reactor is located) or Yodok (where political prisoners are kept in a huge internment colony along with their families). However, it is not known whether this was the case for all other inaccessible counties. We therefore ran a maximum-likelihood estimation for the 2002 survey in order to check the official 'security concerns'-explanation by controlling for selected political hot spots.²⁴⁾

Hot spots are politically sensitive locations. We specified military facilities (conventional and non-conventional weapon sites and strategic headquarters) and political prisons (kwan-lirso) as hot spots. Kwan-lirso are massive penal-labor colonies (Hawk, 2003) whose camp size is reported to range from 50 to over 200km² (Chong, 1995). Most of the available information is based on defectors' testimonies and satellite photographs - thus, double-checking becomes a virtually impossible endeavour. Beyond military and humanitarian hot spots, there are some extra sites which were left out because accurate information on them is lacking.²⁵⁾ Moreover, we entered the variable elevation

²⁴⁾ We also ran a contingency analysis which confirmed the major finding that political areas did not matter systematically [inaccessible counties and politically sensitive counties: (Pearson's) Chi-Square Test $p=0.63$, (Fisher's) Exact Test: $p=0.71$].

²⁵⁾ Nanchu and Hang (Nanchu and Hang, 2003) describe secret cattle farms situated

because when looking at clusters of inaccessible counties, we suspected that more elevated regions were less accessible (figures 2 and 3).

As table 3 shows, elevation is the only significant independent variable in the equation: counties over 1000 meters above sea-level have a significantly higher chance of being excluded. What is pivotal is that none of the political variables matter. With respect to anthropometry, we can thus draw either of two conclusions.

Firstly, the information on hot spots might be inaccurate. For instance, S. Swedlund, head of the Red Cross in North Korea and an experienced admiral, explained while looking at a map of inaccessible counties that there are indeed military installations there, referring to them as “what is broadly known”.²⁶⁾ In the same vein, it is possible that secret political prisons might be located in those areas. Thus, adding unavailable material could indeed change the overall picture, which would support the ‘government’s security interests’ explanation.

Secondly, the information on hot spots is accurate and the government did not exclude counties on the grounds of security concerns but in order to influence the malnutrition rates. Since the elevation variable is highly significant, it may be suggested that the nutritional situation in mountainous counties is below average. However, elevation does not necessarily have to be a significant determinant of nutrition. For instance, according to the

somewhere in the province of South Hwanghae. Breen (2004) notes that the DPRK uses some 4200 to 7000 hectares of arable land for the cultivation of illegal drugs.

²⁶⁾ Elisabeth Rosenthal, “In North Korea Hunger, Legacy is Stunted children” in: *The New York Times*, December 10, 1998.

unreliable but representative MICS of 2000 conducted by the government and covering all counties, “mountainous counties” are worse-off than other counties in terms of WHZ, HAZ and WHZ, although - in diametrical opposition to this - “plain counties” perform as bad as mountainous counties and are thus presumably not significantly different (CBS, 2000).²⁷⁾

In other words, elevation could be a proxy for travel time, vegetation, population density and other variables which may or may not correlate with nutritional outcomes.²⁸⁾ We have to wait until the remaining counties are declared accessible to unambiguously clarify this matter, for the main problem is that by definition, absolutely no systematic information is available on inaccessible counties. Beyond nutritional data, there are also no agricultural data available, and even the UN received no demographic data on those counties. As WFP regional director J. Powell put it when asked if there is at least anecdotal evidence on what is going on there (Committee on International Relations, 2002):

I am not able to enlighten the Committee simply because we do not know. We are absolutely refused access. We cannot pass through those areas in transit to somewhere else. So we simply don't go there at all.

To conclude, it is necessary to point out that the MICSs are exceptional inasmuch as they are the only international surveys based on a random

²⁷⁾ Unfortunately, no information on malnutrition rates at the county level is given. Thus, selected inaccessible counties cannot be re-identified.

²⁸⁾ For instance, if the DPRK aimed first and foremost at getting rid of foreigners as soon as possible, travel time will be the main criterion.

sample of North Koreans - though they neglect some 20% of the mountain-dwelling population - and inasmuch as a large sample size covering most provinces was accomplished each time. For further reading on inaccessibility issues of counties and regional living conditions, see Schwekendiek (2009b ; 2009c)

VI. Review of major surveys by index

In general, democracy can be seen as a *conditio sine qua non* for the independence of research. E.g. anthropometric surveys conducted by the Republic of Korea are used in anthropologic research (Pak, 2004a). If a reference survey existed for the northern counterpart as well, it would not be so important to elaborate on conceptual peculiarities. However, since this is not so, we are interested in the relative ranking of each survey on North Korea - given the restrictions imposed by the totalitarian political system. We therefore construct an index to rate the validity of each anthropometric study on North Korea.

1. Construction of the index

Our index is based on four components: reliable (*rel*) surveys with a random (*ran*), national (*nat*) and large (*lge*) sample are preferred. The index score x is the sum of the weighted scores of the four components of survey i . When assigning weights (w) to single scores, the following abstract order

is applied:

$$(3.1) \quad w(\text{rel}) > w(\text{ran}) > w(\text{nat}) > w(\text{lge})$$

Given $\sum w=1$, the following weight distribution is used for the index:

$$(3.2) \quad 0.55 > 0.25 > 0.15 > 0.05$$

This yields:

$$(3.3) \quad x_i = 0.55 \text{ rel}_i + 0.25 \text{ ran}_i + 0.15 \text{ nat}_i + 0.05 \text{ lge}_i$$

The encoding of the four component ratings is based on table 4. The figure presented in the second to last column of table 5 is the percentage of the maximum score received by survey i . In the end, the “final rating” presented in the last column of table 5 is derived by first categorizing the results shown in the second to last column into low (0-33.3%), medium (33.4-66.6%) and high (66.7-100%) performance, then by assigning the corresponding number of stars.

This is the logic underlying the chosen order and distribution of weights. Because reliability is by far the most important criterion given that we are dealing with an omnipotent apparatus, at least half of the total weight had to be assigned to this component. The actual weight assigned to reliability was 55% because we added an incremental unit of 5% in order to give preference to a perfectly-reliable-but-unrepresentative survey over a perfectly-representative-but-unreliable one. Apart from this, one might argue that

unreliability itself should be treated as a critical threshold and lead to the immediate rejection of a survey, but we argued that there are good reasons why these surveys should not be ignored. Randomness was assigned the second largest weight. Increasing this weight to a level of about 30-40% would not leave enough weight for the remaining two components. National representativeness was assigned rather low weight. Acknowledging that the majority of the surveys can only offer a regional glimpse, we reduced the weight of (nat) to a level of 15%. In doing so, surveys covering only a few provinces are less underrated, giving credit to the circumstance that they might at least be representative of the specified region. Finally, a large sample size was only assigned a weight of 5% because we had already carried out a pre-selection by considering only major anthropometric surveys which had a substantial sample size. Nevertheless, huge differences persist (Min-Max = 221-ca.2 million). Assigning a 5%-weight seems reasonable because in this way, quantitative information is not lost but retains only a marginal influence since only the major surveys were targeted.

2. Discussion of the index

First of all, let us point out that the constructed index refers exclusively to conceptual validity in terms of statistical reliability and representativeness. Particularly, it does not rate non-conceptual issues of rather subjective quality, e.g. whether adults or vulnerable children should be the primary target group, what time period is most critical, or which anthropometric measure is superior. Such questions cannot be addressed without embarking on a profound humanitarian, historical and academic discussion, which is

not useful for our purpose.

As to the components of the index, we are aware that they may be incomplete from a theoretical perspective. For example, it might be worthwhile to rate the fact that some surveys were carried out over several years, some within months, and most within days. However, we had to ignore potential time effects because only aggregated information was published. Hence, we pretended to be dealing with cross-sectional studies, which may not actually have been the case. Overall, however, this will not have a large impact on the final rating because only migrant surveys were carried out for longer periods. Considering time effects would in fact imply an extra ‘punishment’ for these migrant surveys, which performed not too well, anyway.²⁹⁾

Apart from this, it could be suggested that the last two components should be pooled into the single component of sample size per province. Unfortunately, this cannot be done because sub-sample size by political region is not reported by all studies. Moreover, some surveys suffer from an unbalanced regional design.³⁰⁾

²⁹⁾ Note that institution surveys would perform better in this case because they were carried out without a break. Consequently, they would outperform all migrant surveys, although both are equal in quality by now.

³⁰⁾ As to migrant surveys, we pretended that only the two Hamgyong provinces were covered because some 80% and sometimes even 90% of the sample population originated from there. Such an unbalanced sample design occurs mostly in migrant surveys, see the previous footnote for the resulting effects.

VII. Final rating of major surveys

Component ratings are given in table 5, columns 10-14, but let us focus on the last two columns where those ratings are merged. What does the final rating tell us?

First of all, it is remarkable that the international MICs from 1998, 2002 and 2004 are outstanding: they score over 80%, followed by the 1997 international WFP survey which scores 68%. In short, the four surveys by international organizations hold the top positions and are likewise the only ones rated with three stars. Since they are also the surveys most frequently quoted in research, our index seems to reflect reality quite well. Also, note that these are inside surveys, which shows that inside surveys clearly excel surveys conducted abroad in conceptual terms. Regardless of this, even the best survey from the year 2002 is 12% percentage points away from being completely acceptable. Thus, our index corroborates the fact that there is definitely no perfect survey for North Korea which fulfils all conceptual requirements.

Second, all institution and migrant surveys suffer from a clear pre- and self-selection bias, thus exhibiting percentages in the 50s-60s only. This reveals the overall mediocre performance and limited theoretical scope of such surveys. As to migrant surveys, we mentioned above that sound statistical research on single and double selection bias is compulsory before these surveys can be rated higher. Note that even under conditions of complete randomness, these surveys will always lack 15 percentage points

in their final score because they are only representative of 2 out of 12 provinces.

Some final remarks concern the rating of the surveys conducted by North Korean organizations: all fall below 50%. Thus, they score lowest, the obvious reason being that we assigned a high weight to reliability based on the paradox that an omnipotent apparatus is able to manipulate 'incorruptible information.' However, it can be seen that two of these surveys achieve almost perfect scores in the remaining categories. Thus, the release of documentation and raw data would boost the ranking of North Korean surveys because an independent reproduction of the findings would lead to an enormous increase in credibility.

VIII. Conclusion

Totalitarian North Korea is still a hermit kingdom whence few reliable statistics emerge. However, anthropometric information has been published and, above all, is less prone to manipulation by the government than other data. Thus, even if Pyongyang has been thoroughly aware of the economic-political message broadcasted by anthropometry for a long time, physical measurements cannot be distorted without leaving telltale signs.

Given the huge political and scientific potential of anthropometry, we have offered the first complete overview of anthropometric studies on North Korea here. What is more, we have reviewed them systematically in order to be able to rate the true quality of the data. Many anthropometric studies

exist - 23 altogether. Because 11 can merely be described as minor field reports, we focused on 12 major surveys. Still, these surveys suffer from conceptual peculiarities which deserved to be pointed out explicitly by means of a systematic qualitative discussion and a quantitative index. Both revealed large differences in data quality. By and large, the surveys fall into three different categories: surveys by North Korean, by private organizations and researchers, and by international organizations. Each kind of survey has advantages and disadvantages, but none meets all requirements. Thus, there is no fully representative and independent survey on North Korean anthropometry to date, although there are clearly outstanding benchmark surveys by international organizations which deserve our scientific attention. Besides, we would also welcome further statistical research on the impact of self-selectivity in migrant surveys.

Our concluding observations concern further research. The cross-checking of survey results is difficult because there is no common denominator (especially with respect to different variables, cut-offs, locations, sampling design, and target groups). Only the MICs seem roughly to be comparable to each other. Otherwise, one should focus on cross-sectional evidence.

Conceptual and historical importance do - alas - not necessarily coincide - this is the main drawback when one is limited to cross-sectional data. Even though the 2002 surveys performed best in our analysis, any survey conducted before that time might be more interesting since the timing would be closer to the food crisis. In this light, especially the 1987 survey on the Kangwon province, which received the lowest score on our index but was conducted in the Cold War era, might be a most valuable resource

for historical research. To conclude, let us say that this paper was primarily concerned with statistical peculiarities - in the context of a quite peculiar country.

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【Tables】

〈Table 1〉 Summary of minor anthropometric studies

Date	Agency	N	Group (age in years)	Location (County)	Anthropometry	Malnutrition (cut-offs)
1991	DPRK	n/a	children (0-5)	N. Pyongian (Hyangsan)	height, weight	n/a
Oct-1995	WHO	134	children (n/a)	N. Hwangae (Unpa), Chagang (Huichon), N. Pyongian (Bakchon)	MUAC	5% (MUAC: < 125mm)
Mar-1997	European Commission's Humanitarian Aid Office	n/a	n/a	n/a	MUAC	22% (MUAC: n/a)
Mar-1997	European Commission's Humanitarian Aid Office	n/a	children (n/a)	N. Pyongian (Bakchon)	n/a	n/a
Apr 97	CDC	9	children in an orphanage (n/a)	N. Pyongian (n/a)	height, weight, visual inspection	44% (WHZ < -2)
Apr 97	UNICEF	18	children in a kindergarten (2-5)	Chagang (n/a)	n/a, visual inspection	22,2% (n/a)
Jun 97	DPRK (Ministry of Public Health)	n/a	children (<5)	n/a	n/a	37% (n/a)
May-1997	International Federation of Red Cross and Red Crescent Societies	230	children (<6)	n/a	visual inspection	16% (n/a)
Jul 97	World Vision	52	children in orphanages, nurseries and kindergartens (n/a)	n/a, 19 counties in 4 provinces	n/a	n/a (<2)
Jul-1997 to Aug-1998 ; Jan-2000	North Korean Famine Study Group (Published by Sunyoung Pak)	55	children migrated to China (3-18)	likely N. and S. Hamgyong (n/a)	height, weight, MUAC, subcutaneous fat thickness	71% (HAZ < -2), 27% (WAZ < -2)
Sep-2005 to Oct-2005	Action Contre La Faim	582	children in nurseries (n/a)	N. Hamgyong (n/a)	height, weight	4,5% (W/H < 80%)

(Centers for Disease Control and Prevention, 1997 ; Norton and Wallace, 1997 ; Pak, 2003; Pietri, 2003)

〈Table 2〉 Demographic profile of North Korea

Agency	Year	Age	N (valid)	Origin in %		Sex in %				Job Status in %				Completed Education in %			Age in %				
				N. and S. Hangyong	Male	Manual Worker ^a	Office Worker	Military	Student	Jobless	Primary	Second ^b ary	College ^b	10s	20s	30s	40s	50s	60s+		
Migrant samples																					
Sunyoung Pak	99-03	20+	2384	78	44	55	10	3	2	6	2	69	26	35	40	15	6	5			
JHSPH	99	18+	381	84	53																
Sunyoung Pak, incl. children ^c	99-03	10+	2623		45									11	31	36	13	5	4		
KBSM, 6th phase	97-98	10+	9249	80	52	59	14	0	1	15				3	15	34	28	16	5		
CNKR	99	10+	1383	77	75	45		3	26		29	41	28	27	19	33	15	4	2		
Estimations on population																					
Fed. Statist. Office, Germany	90	all	21,771,000		49									21	23	15	9	6	6		
Eberstadt and Banister	87	all	19,346,000		46	82	17						14 ^d								

Notes: Figures may not total 100% due to rounding and categories left out as a matter of different classifications; empty cells: no data.

a. Manual workers incl. farmers; Data for 1987 from Table 28 in Eberstadt and Banister (1992).

b. College, incl. technical and specialized schools.

c. Adapted from Pak (2004b).

d. Percentage of adult population (16+); Eberstadt and Banister (1992), table 26.

Sources: (Chang, 1999 ; Eberstadt and Banister, 1992 ; Korean Buddhist Sharing Movement, 1998 ; Pak, 2004b ; Robinson et al., 2001a ; Statistisches Bundesamt, 1995)

{Table 3} Logistic regression: county closed in 2002 (yes vs. no)

	Coefficient	Wald Statistic
Constant	-1.49*	30.63
<i>Prisons^a</i>		
Kwan-li-so	0.08	0.00
<i>Weapon Sites^b</i>		
Conventional Weapon Site	0.57	1.15
Nuclear Weapon Site	0.21	0.14
Chemical Weapon Site	-0.99	1.44
Biological Weapon Site	-0.05	0.00
<i>Military Bases^c</i>		
Air	-0.62	0.26
Ground	-6.17	0.18
Navy	-0.39	0.20
<i>Topography</i>		
Elevation > 1000 meters	1.44*	9.54
<i>Nagelkerke Pseudo R²</i>		
N	0.14	168 ^d

Notes: * Significance on the 0.01 level

a. Hawks (2003). Colonies (Kwan-li-so), excl. camps (Kyo-hwarso)

b. Center of Non-Proliferation Studies (Monterey Institute of International Studies). Available on the website of the Nuclear Threat Initiative:

http://www.niti.org/e_research/profiles/NK/index_110.html, incl. dual use sites

c. Savada (1994).

d. This number does not sum up to the total number of counties (206 in 2002) due to the pooling of small urban districts (kuyok), see figure 2.

(Table 4) Code box

Performance:	Low (0 or *)	Medium (0.5 or **)	High (1 or ***)
Reliable Survey	<ul style="list-style-type: none"> - No international data collection and no international data evaluation 	<ul style="list-style-type: none"> - International data collection but no international data evaluation - international data evaluation but no international data collection 	<ul style="list-style-type: none"> - International data collection and international data evaluation
Random Survey	<ul style="list-style-type: none"> - Pre-selection - Self-selection (single or double selection bias) 	<ul style="list-style-type: none"> Random selection within pre-selected regions 	<ul style="list-style-type: none"> - Random selection - Full population (full specified group within population)
National Survey	1-4 provinces	5-8 provinces	9-12 provinces
Large Survey	Sample size rank 9-12	Sample size rank 5-8	Sample size rank 1-4

(Table 5) Summary of major anthropometric surveys

Date	Agency	Classification	Purpose	N	Group (Age in years)	Location	Anthropometry	Malnutrition (Cut-Offs)	Performance Rating				Final Index Score	Final rating
									reliable	random	national	large		
1987	DPRK (Institute of Child Health)	institution survey	assess nutritional status of pre-school children in Kangwon province	3095	children (0-5)	Kangwon	height, weight	1.2-6% (WAZ < -3)	***	***	***	***	33%	***
1996	DPRK (Ministry of Public Health)	household survey	assess nutritional status of all children up to 5 years	2 m	children (0-5)	all	n/a, likely height and weight	15.6% (n/a)	***	***	***	***	45%	***
Aug-97	UN (WFP)	institution survey	assess nutritional status of children	3984	children (0-6)	S. Pyongyang, S. Hamgyong, S. and N. Hwanghae, Kangwon	height, weight	38.2% (HAZ < -2) 16.5% (WHZ < -2)	***	***	***	***	68%	***
Jul to Sep-1998	Johns Hopkins School of Public Health	migrant survey	assess nutritional status and demographic profile of adult migrants	440	adults (18+)	N. Hamgyong (78%), S. Hamgyong (12%)	MUAC	30.85% (MUAC < 230 mm males and < 220 mm females) ^a	***	***	***	***	55%	***
Sep to Oct-1998	EU (ECHO), UN (WFP, UNICEF), DPRK	household survey (1st MICS)	assess nutritional status of children and mothers, gather information on the situation of the household	1762	children (0.5-6)	all but Kaesong	height, weight, birth weight (only children < 5 years)	62% (HAZ < -2), 61% (WAZ < -2), 16% (WHZ < -2)	***	***	***	***	83%	***
1999-2003	Sunyoung Pak	migrant survey	medical checkup of North Korean children entering South Korea	221	children (1-18)	n/a, likely N. and S. Hamgyong	height, weight	29.4% (HAZ < -2), 10.4% (WAZ < -2) ^b	***	***	***	***	55%	***
1999-2003	Sunyoung Pak	migrant survey	medical checkup of North Korean adults entering South Korea	2884	adults (20-69)	N. Hamgyong (65.2%), S. Hamgyong (13%)	height, weight	n/a	***	***	***	***	58%	***

Jul to Sep-1999	Johns Hopkins School of Public Health	migrant survey	assess nutritional status and demographic profile of adult migrants	381	adults (18+)	N. Hamgyong (73%), S. Hamgyong (10%)	MUAC, not reported but collected (Robinson 2001a, 72)	n/a	***	***	***	***	***	55%	***
Jul-1999 to Jun-2000	Johns Hopkins School of Public Health	migrant survey	assess nutritional status and demographic profile of adult migrants	2692	adults (18+)	N. Hamgyong, (>80%, no details)	MUAC	13.5% (MUAC <230 mm males and <220 mm females)	***	***	***	***	***	65%	***
May-2000	DPRK (Central Bureau of Statistics)	household survey (2nd MICS)	assess nutritional status of children and mothers, gather information on the situation of the household	3600	children (0.5-6)	all	height, weight	45% (HAZ <-2), 28% (WAZ <-2), 10% (WHZ <-2)	***	***	***	***	***	43%	***
Oct-2002	UN (WFP, UNICEF), DPRK	household survey (3rd MICS)	assess nutritional status of children and mothers, gather information on the situation of the household	6000	children (0.5-6), mothers	all but Kaesong and Chagang	height, weight, birth weight (only children <5 years), MUAC of mothers	39% (HAZ <-2), 20% (WAZ <-2), 8% (WHZ <-2)	***	***	***	***	***	88%	***
Oct-2004	UN (WFP, UNICEF), DPRK	household survey (4th MICS)	assess nutritional status of children and mothers, gather information on the situation of the household	4800	children (0.5-6), mothers	all but Kaesong, Nampo, Chagang and Ryangrang	height, weight, birth weight (only children <5 years), MUAC of mothers	37% (HAZ <-2), 23% (WAZ <-2), 7% (WHZ <-2)	***	***	***	***	***	83%	***

Notes:

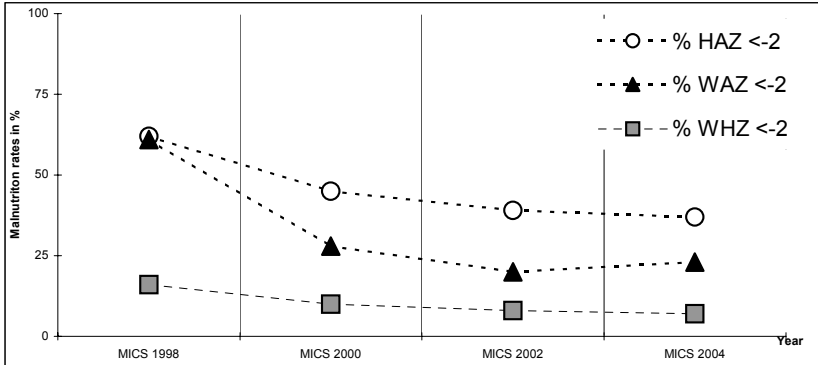
a. MUAC findings of the 1998 survey are reported in Robinson et al. (2001b).

b. Pak, 2004, table 5.

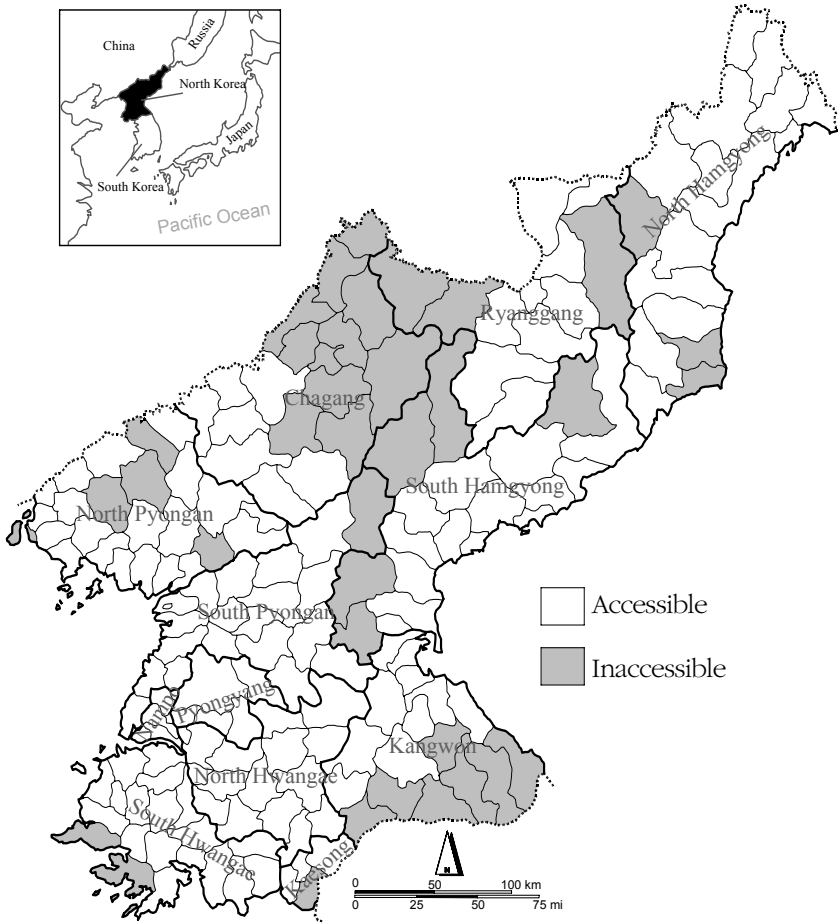
(CBS, 2000, 2004 ; CBS et al., 2002 ; EU et al., 1998 ; KatonarApte and Mokdad, 1998 ; Pak, 2004b ; Robinson et al., 1999 ; Robinson et al., 2001a ; Robinson et al., 2001b ; UNICEF, 1998 ; 1999).

【Figures】

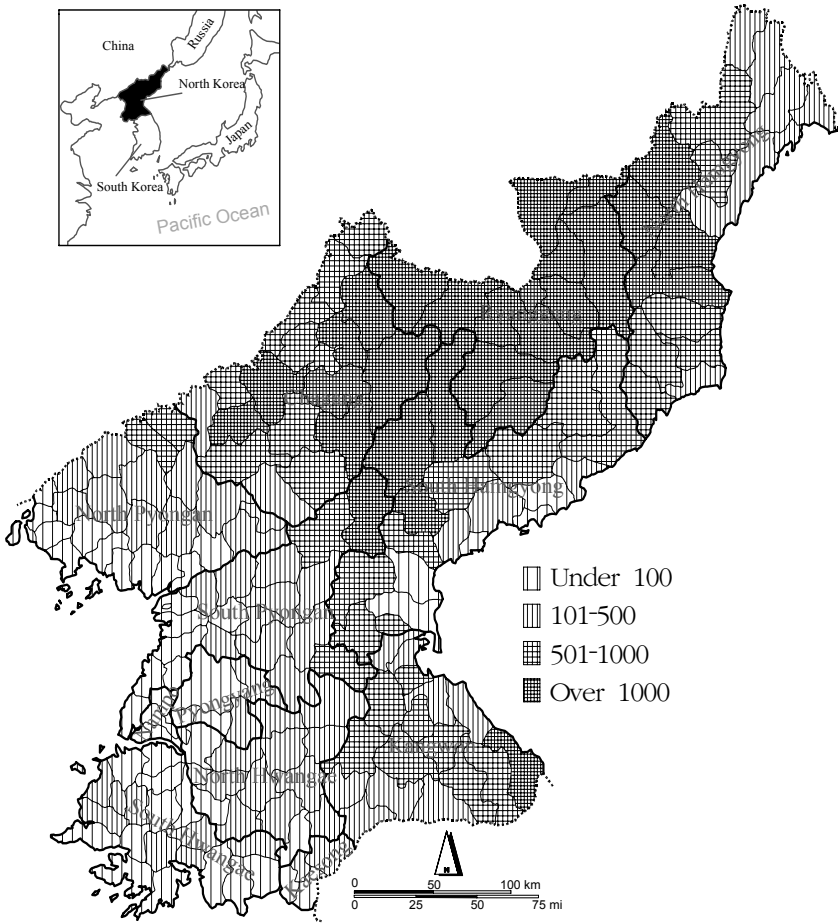
〈Figure 1〉 HAZ, WAZ and WHZ of the MICSS in North Korea



<Figure 2> Map of accessible counties in December 2002



〈Figure 3〉 Map of elevation of counties (in meters)



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Abstract

Incorruptible Information on North Korea? An Overview and Review of Anthropometric Assessments

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North Korea is still a hermit kingdom from where few reliable statistics emerge. Anthropometric information has been published, and physical measurements cannot be manipulated per se. With respect to the technical potential offered by ‘incorruptible information’, this paper gives the first and comprehensive overview of anthropometrical assessments of North Korea, as well as their systematic review by making use of both a qualitative discussion and a quantitative index. As many as 23 anthropometric surveys are available which is quite impressive given an otherwise statistical terra incognita. Our index shows that in qualitative terms surveys fall into three categories from those surveys conducted by international organizations dominate over refugee surveys and North Korean publications. However, no fully statistically representative and independent survey for North Korea has ever been carried out, as refugees surveys are severely self-selection biased, government surveys completely irreplicable, and United Nations surveys possibly skewed by pre-selection of regions.

Keywords: North Korea, standard of living, anthropometry, nutrition, famine, health

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튜빙겐(Tuebingen) 대학에서 경제학 석사와 박사를 전공하였으며, 2008년 이후로 서울대학교에서 여러 다양한 연구소의 연구원으로 활동해오고 있다. 그의 연구 관심은 해외 한국인들의 삶의 질뿐만 아니라 북한과 한국의 생활 수준에 주로 놓여져 있다. 그의 글과 논문은 사회과학과 의학(Social Science and Medicine), 생물 사회학적 과학 저널(Journal of Biosocial Science), 공공 보건에 대한 아시아 태평양 저널(Asia-Pacific Journal of Public Health), 경제학의 역사 리뷰(Economic History Review), 경제학과 인간 생물학(Economics and Human Biology), 인간 생물학의 연대기(Annals of Human Biology), 비교학적 인간 생물학에 대한 저널(Journal of Comparative Human Biology) 혹은 한국 연감(Korea Yearbook)과 같은 국제저널에서 출판된 적이 있다. 그의 논문과 글들은 월 스트리트 저널(Wall Street Journal) 혹은 미국의 목소리(Voice of America)와 같은 유명한 언론에 인용되기도 했다.