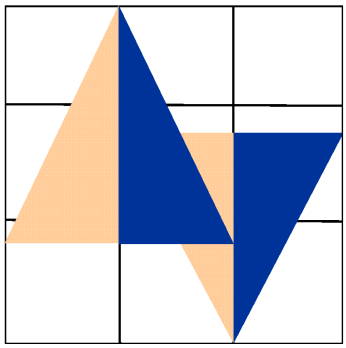

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The mortality of non-Germans in Berlin – A comparison of results estimated from the Official Statistics and the Central Register of Foreigners

Anke Hannemann and Rembrandt D. Scholz

Abstract:

Most national and international studies concerning migrant mortality find advantages for migrants in health and survival in comparison to host populations. Although that phenomenon has been known for several years, no final explanation has been found until today. Health selection effects (like the Healthy Migrant Effect and the Salmon Bias), acculturation, as well as data artifacts are the theories most often mentioned in that context, and they are introduced and discussed in this working paper. Furthermore, we present own mortality estimates for non-Germans in Berlin based on data from the Official Statistics and the Central Register of Foreigners (*Ausländerzentralregister*, abbreviated AZR). To the best of our knowledge, this is the first study using the AZR data for a small scale mortality analysis that is restricted to one federal state of Germany. Therefore, the methodological approaches to data preparation are considered to be important, and are presented in detail.

Life expectancy at birth calculated from the Official Statistics shows on average a difference between non-Germans and Germans of about 22.4 years (men) and 14.4 years (women) over the period 2001-2004. However, the recently revised AZR provides more reliable, and clearly lower, figures for life expectancy at birth for the non-German population (86.7 years for men, 86.3 years for women in the period 2001-2004) than those included in the Official Statistics. The differences in life expectancy between the foreign and host populations in Berlin are thus reduced to 9.6 (men) and 4.6 (women) years, which are still enormous. Unfortunately, the data does not allow us to ascribe this mortality advantage to one of the explanation theories, though we found tendencies pointing towards a Salmon Bias and further data artifacts.

Keywords: life expectancy, mortality, foreigner, Berlin, Central Register of Foreigners

Introduction

Mortality differences between subpopulations have always been a topic of interest for medics, epidemiologists, and demographers, as their analyses identify causes for diseases and high or low risk groups. The fact that most studies, national (Altenhofen and Weber 1993, Korporal and Geiger 1990, Razum and Rohrmann 2002, Lechner and Mielck 1998) and international (Abraído-Lanza et al. 1999, Sharma et al. 1990, Singh and Siahpush 2001, Feinleib et al. 1982), indicate a mortality advantage for migrants compared to non-migrants is especially interesting because it reveals a paradox. From socioeconomic studies, it is widely known that the socioeconomic status of a person and his or her mortality risk are highly negative correlated (Lampert et al. 2007, Helmert 2003, Klein et al. 2001). When we consider that on average migrants have a lower socioeconomic status than non-migrants, it is surprising to see their higher chances of survival. This advantage is explained in different ways. Health selection effects on entry and departure are intensively discussed in this context, as are data artifacts, which influence data quality (Bos et al. 2004, Mc Kay et al. 2003). However, if and to what extent these approaches reflect the underlying reasons for the lower mortality of migrants is still not clarified.

Explanatory Theories

Health selection effects are produced by immigration (Healthy Migrant Effect) or by remigration (Salmon Bias). Both events result in better health among migrants than among the non-migrant populations of the host and the origin countries. The Healthy Migrant Effect characterises the self-selection of healthy immigrants. International migration, it is argued, is physically and mentally a highly stressful experience, which is only carried out by healthy individuals. Sick or disabled persons do not usually migrate. That self-selection process is enforced by migration laws, which have the task of selecting “the ‘best’ immigrants on the basis of education, language ability and job skills - characteristics that facilitate social and economic integration and go hand-in-hand with healthy lifestyles.” (Hyman 2001, p. 11).

An example for an obvious health selection of immigrants can be found in the recruitment agreement between Germany and Italy from 1956. Italians who applied to become guest workers in Germany had to pass a medical examination before they

received their work permit (Amtliche Nachrichten der Bundesanstalt für Arbeitsvermittlung 1956, Abschnitt II, Artikel 7(1)). Subsequent agreements—e.g., with Spain and Greece in 1960, Turkey (1961), Portugal (1964), and Yugoslavia (1968)—did not differ in crucial points (Tietze 2006): a medical examination was again part of the recruitment process. Lechner and Mielck (1998) later observed a decreasing mortality advantage for the guest workers, providing further confirmation of the Healthy Migrant Effect.

Sharma et al. (1990) showed that all immigrants to Canada, except those from Africa, not only have a higher life expectancy at birth than Canadians, but also compared to the population in the country of origin. Similarly, Tsungane et al. (1989) who studied Japanese in Brazil, found out that the mortality rates of this group were lower than those of the Brazilians, and of the Japanese living in Japan.

However, the health selection effect may not in all cases fully explain the advantages enjoyed by migrants. Abraído-Lanza et al. (1999), for example, discovered that US-born Latinos also have lower mortality compared to US-born whites, which cannot be ascribed to health selection.

The second selection effect, the Salmon Bias, illustrates why migrant populations maintain their health advantages over the non-migrants. Assuming that migrants return to their home countries after retirement or when seriously ill, a young and healthy migrant population remains in the immigration country (Turra et al. 2005). Palloni and Arias (2004) observed such a health selection when studying returning Mexicans from the US to Mexico. They assessed their health status as worse than that of Mexicans living in the US. Turra et al. (2005) furthermore showed that recently repatriated foreign-born Hispanics from the US exhibit significantly higher mortality risks than foreign-born Hispanics living in the US. On the other hand, Razum et al. (2005) found that, in recent decades, health status has lost its importance as a factor influencing the decision for return migration. They conducted group discussions with Turkish migrants who had returned to their home country from Germany, and came to the conclusion that return migration at older ages is becoming less common.

Apart from health selection effects, there is another explanation which attributes the lower mortality of foreigners to health behaviour: The Acculturation Hypothesis (Scribner 1996). In contrast to selection effects, its main focus lies on culturally shaped characteristics which vary between natives and migrants. Those

characteristics—like tobacco, alcohol and drug use, physical activity, diet and social integration (Singh and Siahpush 2001)—are, according to Scribner (1996), more important to the risk of developing chronic diseases than genetic, biological, or socioeconomic factors operating on the individual level.
Abraído-Lanza et al. (1999) confirmed in their study that Hispanics in the US often have healthier life styles than the non-Hispanic population, as the former consume less alcohol, and Hispanic women smoke less than non-Hispanic women. Family support and a traditional diet also play protective roles.

A numerator-denominator mismatch in the mortality rates, based on an overestimation of the migrant population, is the central argument within another explanatory approach. Here, the high migrant mortality advantage is called into question, and is said to be overstated (Ringbäck Weitoft et al. 1999): The overestimation of the population numbers mainly derives from an under-registration of emigration, and is higher for migrants than for non-migrants. Consequences for mortality analyses were studied by Ringbäck Weitoft et al. (1999) on the Swedish population register data. They came to the conclusion “that Swedish mortality statistics are misleading for immigrants” (Ringbäck Weitoft et al. 1999, p. 736). Kibele et al. (2008) also express concerns about the low mortality of migrants at retirement ages in Germany. Their calculations, basing on German Pension Scheme data, show that retired foreign men aged 65+ in fact have a slightly higher mortality than German men.
Information about all foreigners living in Germany is collected in the Official Statistics. Their data is based on the most recent census and estimation of continuous population change due to cases of death, birth, and migration. However, with growing distance to the last census, the data loses quality and the population becomes overestimated (Jdanov et al. 2005). Life expectancy calculated from that data indicates an increasing advantage for non-Germans over Germans as time passes since the last census, conducted in 1987 (Luy 2007).
One more German data source also contains information about the total number of non-Germans permanently residing in Germany, the Central Register of Foreigners (AZR). This register provided the data for the following analysis. There is, to the best of our knowledge, only one mortality analysis using that data (Kohls, 2008b). Its empirical results confirm a mortality advantage for the total non-German population in

Germany in 2006. As described in the following, this paper will focus on a selected group of the non-Germans in Germany, on those living in Berlin.

Data and Method

According to the Official Statistics, a foreigner or non-German[1] is a person who does not possess German nationality (Statistisches Bundesamt 2007). Consequently, there are not only migrants in that group, but also their children and grandchildren, some of whom may have spent their whole lives in Germany. To differentiate between migrants and non-migrants would therefore be more accurate, especially for analysing health selection effects, but unfortunately that is not possible with the data available from either the AZR or the Official Statistics.

For the analysis, the period life table was applied for measuring mortality. It provides a summary of mortality conditions prevailing in a given calendar year, and for a given population. Life expectancy at age x, derived from the life table, is equal to the number of years a mean person attaining age x can expect to live (Chiang 1984). Based on data from the Official Statistics and the AZR, life tables separated by sex and five-year age groups were calculated.

As a provider of information, the AZR cooperates with more than 6,000 partner authorities, such as administration offices. It contains approximately 23.7 million personalised data sets of foreigners who permanently live or have lived in Germany (Bundesverwaltungsamt 2008). In each of the data sets, information such as full name, date of birth, date of entry into Germany, and the current residence status is recorded. In contrast, the Official Statistics are based, as already mentioned, on census data and continuous updating by deaths, births, and migration. All foreigners who register their residence, regardless of the length of stay, are included in the Official Statistics (Opfermann et al. 2006). Hence, the Official Statistics should state a higher number of non-Germans. The fact that fewer people are registered in the AZR is also a result of the register revision of the years 2000-2004. In that process, all data records in the AZR were updated using current information provided by the local authorities (*Ausländerbehörden*). Information from the latter was considered to be

[1] The terms ‘non-German’ and ‘foreigner’ are used interchangeably.

more up-to-date, and was used to replace obsolete information. When in the AZR two data sets were found for one person, or when a person was found to be registered as currently living in the country, even though he or she was no longer in Germany[2], the residence status of that person was changed to 'a move abroad' on January 1, 2004 (Opfermann et al. 2006). These are, however, the only data records which can be identified as affected by the revision, as none of the other changes were marked. An additional analysis of the influence of the revision will therefore be based solely on the moves abroad on January 1, 2004.

In the Official Statistics, the changes of the AZR revision were not implemented (Statistisches Bundesamt 2007). Therefore, we can assume that the AZR data is more accurate than the Official Statistics data.

Regarding mortality analysis, another disadvantage of the Official Statistics relative to the AZR stems from the missing personal references. In the Official Statistics, events are counted but not linked to individuals. Therefore, the number of moves to and from Germany is not equal to the actual numbers of migrants. The AZR data, on the other hand, does allow us with certain limitations to reconstruct parts of the migration history of the individuals. The more precise migration information speaks in favour of the AZR data. However, before the life tables can be calculated, the implied constraints of the AZR data have to be addressed. While the Official Statistics data do not need to be prepared for analysis[3], the AZR files must first be rearranged.

The AZR files

The two AZR files given to the Max Planck Institute for Demographic Research for statistical analysis cover the years 2000-2004 and the city of Berlin. They contain 700,000 data sets each[4], representing the number of foreigners registered in Berlin on the two reference dates: December 31, 2004 and June 30, 2005. The AZR data are anonymous and do not allow us to identify individuals. The following characteristics are given: nationality, sex, date of birth, date of the first entry, residence status, and the date of the last residence status change. The residence status variable is crucial for the analysis. It gives information about the presence in

[2] About 534,000 cases according to Opfermann et al. (2006).

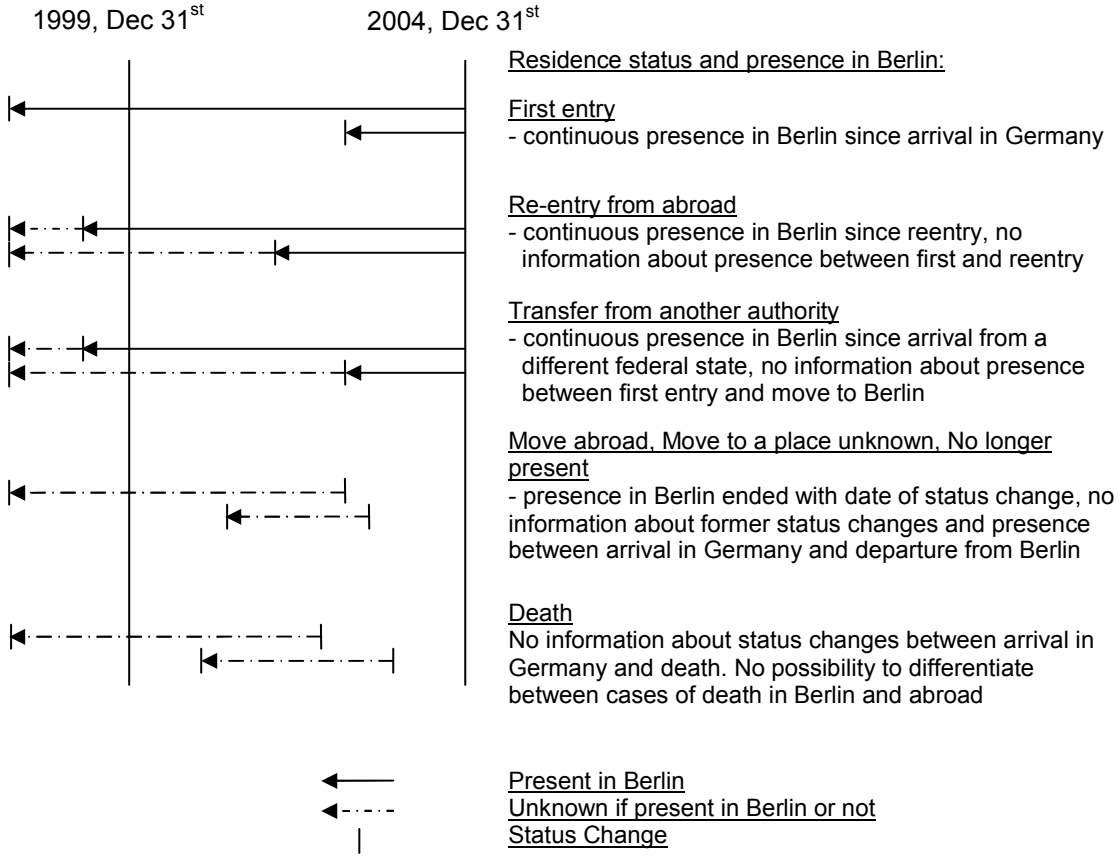
[3] Given is the sex and age structure of the Germans and non-Germans of the years-end population 1999-2004 and the structure of the cases of death of the years 2000-2004 subdivided in the same categories.

[4] Extract December 31, 2004: Total number of foreigners registered – 717,368, Total number of cases of death – 4,585

Extract June 30th, 2005: Total number of foreigners registered – 717,474, Total number of cases of death – 4,660; Source: own calculations.

Berlin on the reference date, and possesses the values ‘first entry’, ‘transfer from another authority’ (i.e., arrival from a different federal state), ‘reentry from abroad’, ‘move abroad’, ‘move to an unknown place’, ‘no longer present’ and ‘death’. Based on that variable, the analysis has to be made backward in time starting from the reference date. The analysis is, however, constrained by the overwriting of the residence status with every status change. Using residence status as a basis, the number and age structure of the non-German population was determined. In the following, that process is illustrated for the AZR extract of December 31, 2004. The extract from June 30, 2005 was processed analogously.

Figure 1: The residence status and the presence in Berlin 2000-2004 in the AZR abstract 2004, Dec 31



Source: AZR abstract 2004, Dec 31; own illustration.

Based on the information available, the population present at the beginning of each year from 2000 - 2004 is determined with the following assumptions:

- *First entry:* Foreigners are included in the population at risk starting with the date of the first entry.

- *Reentry from abroad:* Persons are included in the population at risk starting with the reentry date. An underestimation of risk time is produced because time spent in Berlin between first entry and reentry is not taken into account.
- *Transfer from another authority*: Foreigners are included in the population at risk starting with the date of arrival from another federal state. The time spent in Germany between the first entry and the arrival in Berlin is not considered in the analysis. In any case, the data of foreigners who left Berlin for another federal state during the observation period cannot be considered. When leaving Berlin, their data is assigned to the new federal state, and their presence in Berlin cannot be reconstructed. This results in an underestimation of risk years.
- *Move abroad, move to an unknown place, no longer present:* Foreigners are assumed to be present from first entry until the last residence change. In these cases, an overestimation of risk time results, since potential stays abroad cannot be considered.
- *Death:* Foreigners are assumed to be present from first entry until death. This results in an overestimation of risk time analogous to the moves abroad. Furthermore, to some small extent, cases of death which occur abroad are included in the AZR. Those are not to be differentiated from the cases of death occurring in Berlin. That makes it impossible to differentiate between foreigners who were present in Berlin before their deaths, and those who lived abroad. This further increases the overestimation of risk years.

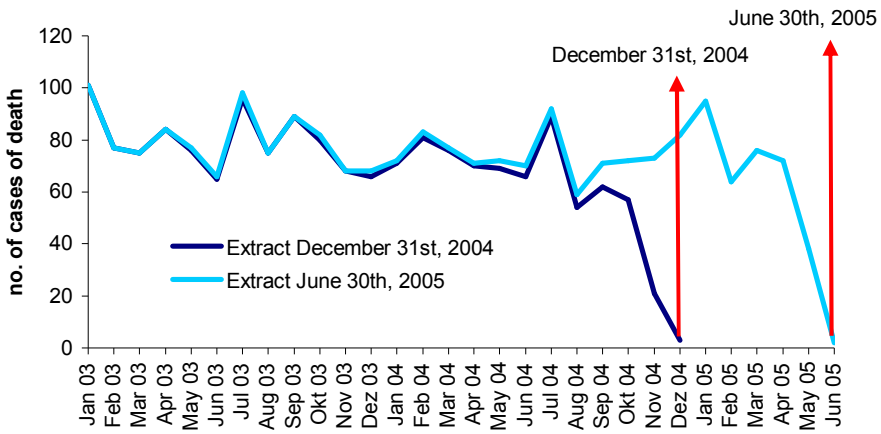
Considering the problems which result from the overwriting of the residence status, we refrained from estimating the duration of stay of the foreigners. However, as this is a requirement for analysing the influence of a Healthy Migrant Effect, direct evidence for that effect cannot be provided in the following.

Another general limitation to the analysis of the AZR files is determined by the time span after which the data of a person is deleted. According to the executive order (AZRG-DV) of the law regarding the centralised registration of foreigners (AZRG), individual data must be removed from the register 10 years after a move abroad, and five years after the death of a foreigner (AZRG-DV, §18, (1)). Thus, the extract of

December 31, 2004 contains cases of death from the year 2000 onwards The mortality analysis cannot be extended to years before that.

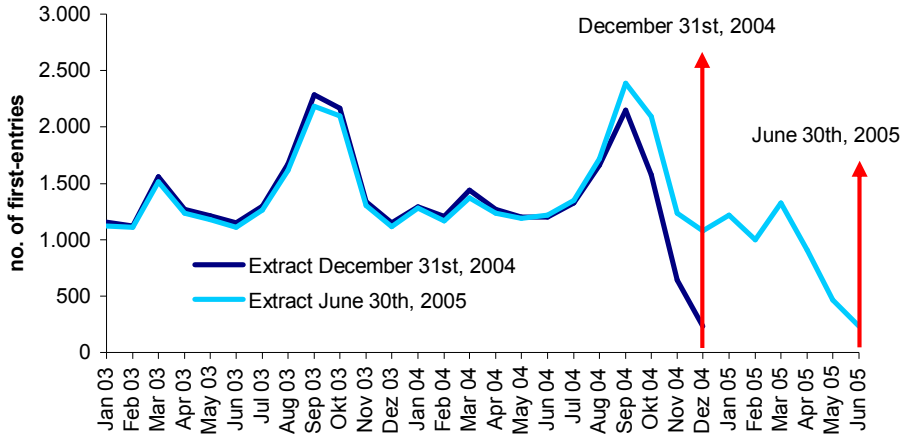
A further limitation of the observation period is due to the time lag in the register. The implementation of status changes does not proceed simultaneously with the occurrence of the events. That means the population actually present on December 31, 2004 in Berlin is not accurately reflected in the extract generated on this day, as not all status changes are registered immediately. This so-called time lag can be observed by comparing the numbers of first entries and cases of death in the two AZR files (Figures 2.1 and 2.2). These events are the only ones suitable for quantifying the time lag, as they remain unchanged by following residence status changes. First entries are recorded in a separate variable, and cases of death are irreversible, and therefore cannot be overwritten by subsequent status changes.

Figure 2.1: The time lag in the AZR extracts 2004 and 2005 visualised by the number of cases of death by month



Source: own illustration.

Figure 2.2: The time lag in the AZR extracts 2004 and 2005 visualised by the number of first entries by month



Source: own illustration.

In Figures 2.1 and 2.2, the rapid drop in the number of first entries and cases of death close to the reference date of the extracts can be seen. For the year 2004, the biggest part of the backlog shows up in the months September to December, ultimately amounting to almost 2,200 cases of first entry and 155 cases of death. The time lag in the 2005 extract is not relevant for the analysis, as the year 2005 is not included in the observation period.

Generally, for obtaining exact population numbers from the register, this comparison suggests using extracts with a reference date three months after the end of the observation period. To quantify the influence of the time lag on mortality calculations, a life table for the year 2004 is calculated, once with the AZR extract of December 31, 2004, and once with the extract of June 30, 2005. The resulting differences in life expectancy can be largely attributed to the time lag[5].

Another factor which has to be considered when comparing the AZR data to the data of the Official Statistics is the impact of naturalisations. As prescribed in the law (AZRG, §36 (2)), data of naturalised individuals is removed from the AZR. That means none of the foreigners who obtained German nationality in the period 2000 until 2004 is included in the extract of December 31, 2004. Neglecting their risk time would induce an artificial difference in the Official Statistics, as here the naturalised foreigners still add risk time in the year of their naturalisation. The number, age, and

[5] Differences in the population numbers of January 1, 2004 and December 31, 2004 between the AZR extracts December 31, 2004 and June 30, 2005 are mainly caused by the time-lag. To some small degree, the assumptions used to determine the presence in Berlin also cause the differences.

sex structure of naturalisations in Berlin were therefore obtained from the Official Statistics, and were included in the analysis[6].

To determine the population number with the AZR extracts on a given date, it is essential that the date of first entry and the date of the last residence change are given; additionally, the birthday is needed to determine the age structure. Unfortunately, these data variables contain missing or implausible values, making modifications necessary[7]. In the data sets, a missing day was set to the 15th, a missing month to June, and, when both types of information were missing, the date was set to the June 30.

Missing year values, which determine the presence of a foreigner on a given date, were found in 908 first entry dates, and in four dates of last residence change. In those cases, based on the residence status, assumptions concerning the presence were made. Foreigners possessing the values 'first entry', 're-entry from abroad', or 'transfer from another authority', were assumed to be present when the year of first entry and the year of the last residence change were missing, or when one value was missing and the other indicated an arrival before the observation date. In addition to those, foreigners who had no first entry year, and who emigrated or died after the observation date, were assumed to be present. Any other combination of missing year values lead to an exclusion from the population at risk on the observation date.

Having determined the population number with the modified AZR data, assumptions concerning missing birth years must be made, as the age cannot otherwise be calculated. As it is assumed that foreigners with missing birth years (2,951 cases) do not differ from those whose birth year information has been provided, their age structure was adopted. The same procedure was applied in cases where the sex was not specified (2,045 cases)[8].

The foreigners who were identified as not present during the AZR revision were subtracted from the population at risk. They were either registered more than once or

[6] Number of naturalisations in Berlin:
2000 – 6,730 2001 – 6,270 2002 – 6,700 2003 – 6,626 2004 – 6,507 (Source: Official Statistics)
It was assumed that every non-German naturalised, added in the year of naturalisation half of the year as risk time for the non-Germans.

[7] There are no missing values in the variables nationality and current residence status.

[8] That the completing assumptions for the date and sex variable did not have a significant influence on the mortality calculations was proved by a separate calculation.

had left Berlin, while in the AZR they were still listed as present. Their residence status was changed to 'a move abroad' on January 1, 2004. As it is assumed, that in the years 2000-2004, none of these foreigners was actually present, all of them were excluded from the population at risk, and therefore from the mortality analysis. As a consequence of this, a major difference in the population numbers between the Official Statistics and the AZR emerges (Table 1).

The differences between the two AZR extracts in the years 2004 and 2005 result predominantly from the time lag in the extract of December 31, 2004 and to some unknown extent from the assumptions basing on the backward determination of the presence on January 1, 2004. The time lag can also be seen in the number of cases of death (Table 2). The difference of 176 cases between the extracts 2005 and 2004 results from incomplete registration in the year 2004. The difference in the years 2000-2003 is probably caused by a similar effect.

Table 1: The non-German population in Berlin on January 1, 2004 and 2005 in the Official Statistics, and the backwards estimated population number in the AZR from the extracts 2004 and 2005

Year	Official Statistics		AZR extract December 31, 2004		AZR extract June 30, 2005	
	Male	Female	Male	Female	Male	Female
2004	236,107	211,218	205,325	189,941	202,62	187,57
2005	239,39	215,155	213,497*	198,134*	212,082	197,346

Sources: Official Statistics and own calculations from the AZR extracts December 31, 2004 and June 30, 2005
*The population on January 1, 2005 equals the population on December 31 of the previous year.

Table 2: Cases of death of the non-German population in Berlin from 2000-2004 in the Official Statistics and the AZR extracts 2004 and 2005

Year	Official Statistics	AZR extract December 31, 2004	AZR extract June 30, 2005
2000	804	887	-
2001	765	892	908
2002	814	863	879
2003	866	947	960
2004	808	718	894

Source: Official Statistics and own calculations from the AZR extracts December 31, 2004 and June 30, 2005
*Data from AZR extract June 30, 2005; all other AZR data from extract December 31, 2004.

The difference from the Official Statistics, which is positive for both sexes and every year, is probably caused by the different handling of cases of death from abroad in the two data sources. While cases of death of foreigners registered in Germany which occur abroad are not included in the Official Statistics, they are included in the AZR (Kohls, 2008a). However, it can be assumed that these events are only partially registered (Razum et al. 1998).

Considering the time lag and the small number of cases of death in the single years, the observation period was set to 2000-2003 for the extract of December 31, 2004 and 2001-2004 for the extract of June 30, 2005. The life tables based on the average population (Table 3) and the cases of death from the AZR were calculated for these two time periods. For comparison, the life tables based on the Official Statistics for Germans and non-Germans were calculated for the same time periods[9].

Table 3: The average population estimated from the AZR extracts and the Official Statistics for the observation periods 2000 -2003 and 2001 - 2004 as used for the life table calculation

Data Source	Sex	Average Population over the years	
		2000-2003	2001-2004
Official Statistics	Male	235,408	236,203
	Female	204,657	208,118
AZR	Male	227,487	226,050
	Female	204,559	214,133

Source: own calculations from the AZR extracts December 31, 2004 and June 30, 2005 and own calculations using data from the Official Statistics.

To estimate the probabilities of dying, the method developed by Farr (Flaskämper 1962) has been applied.[10] Life expectancy at age 95+, at which the tables were closed, was determined by the reciprocal of the death rate in that age group (Vallin and Caselli 2006). Infant mortality was calculated separately; cases of infant death were assigned a risk time of 0.2 years.

[9] The calculation of the life tables was done with Microsoft Excel. The editing and the determination of the population numbers in the AZR extracts was done using SPSS for Windows.

[10] For the estimation of the population at risk, not only the naturalisations, but also the number of arrivals and departures in Berlin, were taken into consideration. In contrast to the data from the Official Statistics, the average duration of stay for the migration events within the observation period could be calculated. In case of an arrival during the period 2000-2003, on average 1.9 years were spent in Berlin; in case of departure, 1.7 years were spent in Berlin; and in case of arriving and leaving Berlin within the period, 0.7 years were spent there. For the period 2001-2004 slightly differing average durations of stay, with 1.8 years for arrival and departure, were found. Source: own calculations from the AZR extracts December 31, 2004 and June 30, 2005

Despite the aggregation of four years each to the observation period, the number of cases of death, is still small, and might bear significant random variation. To rule that out, confidence regions for the life expectancy are estimated. Based on the formula developed by Chiang (Chiang 1984, p. 163), the variance of the life expectancy was calculated, and the confidence intervals were subsequently estimated under application of the approximation of the normal distribution. If, in the following, the 95% confidence intervals for life expectancy estimated from the AZR data and the Official Statistics are not overlapping, their difference is statistically significant.

Findings

1. The life expectancy of Germans and non-Germans in Berlin

Based on the data from the Official Statistics, life expectancy at birth of non-German men in Berlin is 96.4 years in 2000-2003, and 97.6 years in 2001-2004. For women, it is 94.1 years (2000-2003) and 95.5 years (2001-2004) (Table 4). These are implausibly high values, which exceed by far the highest life expectancy currently measured in the world (80 years for men in Iceland and 86 years for women in Japan (United Nations Statistics Division 2007)). However, as it is known that the population in the Official Statistics is overestimated, the unrealistically high life expectancy is not surprising.

Due to the revision in the AZR and the ensuing reduction of the population present in Berlin, life expectancy at birth calculated on that basis is lower. Nevertheless, the mortality analysis based on the AZR data provides tremendously high results for the life expectancy at birth of non-Germans. Values of 82.6 years (2000-2003) and 86.7 years (2001-2004) were calculated for men, and values of 85.6 years (2000-2003) and 86.3 years (2001-2004) were calculated for women (Table 4). Between the confidence intervals of the AZR and the Official Statistics, overlappings indicating that the differences in life expectancy between the two data sources are statistically significant could not be found.

Table 4: Life expectancy of the non-German population in Berlin at different ages with 95% confidence intervals – calculations from the Official Statistics and the AZR for the observation periods 2000-2003 and 2001-2004

	Data Source	Sex	e(0)		e(65)		e(85)	
2000-2003	Official Statistics	M	96.44	(94.89 – 97.98)	37.81	(36.11 – 39.50)	34.53	(32.65 – 36.41)
	Official Statistics	F	94.06	(93.03 – 95.09)	32.67	(31.62 – 33.72)	20.17	(19.16 – 21.18)
	AZR	M	82.60	(81.77 – 83.44)	22.40	(21.48 – 23.32)	12.94	(11.82 – 14.05)
	AZR	F	85.64	(84.91 – 86.37)	23.51	(22.76 – 24.26)	9.66	(8.99 – 10.33)
2001-2004	Official Statistics	M	97.66	(96.10 – 99.21)	39.07	(37.38 – 40.77)	35.17	(33.26 – 37.07)
	Official Statistics	F	95.45	(94.39 – 96.52)	33.88	(32.81 – 34.95)	22.05	(21.00 – 23.11)
	AZR	M	86.72	(85.72 – 87.71)	27.27	(26.18 – 28.36)	20.09	(18.87 – 21.32)
	AZR	F	86.25	(85.52 – 86.97)	23.71	(22.97 – 24.44)	10.26	(9.57 – 10.96)

Source: own calculations.

Another astonishing outcome is the difference in life expectancy between the two observed time periods: While the difference is rather small for women (+0.6 years in

the period 2001-2004, compared to 2000-2003), it is, with a gain of 4.1 years in 2001-2004, enormously high for men compared to 2000-2003. Even more impressive is the rise in the further life expectancy at age 85: it rose about 7.2 years, from 12.9 to 20.1 years, in the period 2001-2004. Increases in life expectancy of this magnitude are not realistic. Results such as these lead to the assumption that no real mortality gain is displayed, only changes in the average population and case of death numbers. Especially in the upper ages, mortality calculations are highly sensitive to changes; it is precisely those age groups which are represented by only a small number of cases, and which therefore introduce uncertainty to the analysis. However, compared to the Official Statistics, the population numbers in the AZR are much more reliable, in particular among the upper ages. The revision in the AZR reduced the number of registered non-Germans dramatically at those ages. As a consequence, the difference in life expectancy between the Official Statistics and the AZR grows with age. It ranges from 13.8 years (at birth) to 21.6 years (at age 85) for men, and from 8.4 years (at birth) to 10.5 years (at age 85) for women in the period 2000-2003[11].

When the life expectancy of non-Germans is compared to that Germans in both AZR and Official Statistics (Table 5), the mortality advantage of the former can clearly be seen. With values of about 74.9 years (period 2000-2003) and 75.3 years (period 2001-2004) of life expectancy at birth for men, and 80.9 and 81.1 years of life expectancy for women in the respective periods, the Germans score much lower. In the period 2000-2003, the life expectancy at birth of German men is 7.7 years lower (or 4.7 years lower for women) than that of non-German men in the AZR; in the period 2001-2004, the difference is larger: 11 years for men and 5.2 years for women.

[11] For the period 2001-2004 the range goes from 10.9 years (at birth) to 15.1 years (at age 85) for men and 9.2 years (at birth) to 11.8 years (at age 85) for women.

Table 5: Life expectancy of the German population in Berlin at different ages, with 95% confidence intervals – calculations from the Official Statistics for the observation periods 2000-2003 and 2001-2004

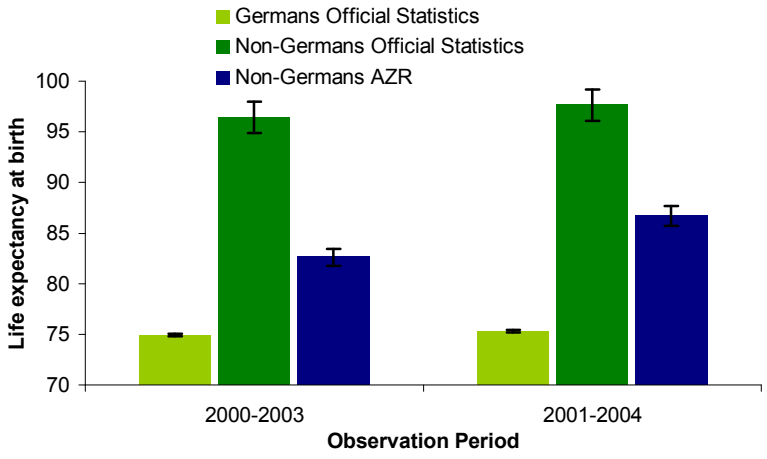
Observation Period	Sex	E(0)		e(65)		e(85)	
2000-2003	Male	74.93	(74.80 – 75.06)	16.05	(15.95 – 16.15)	5.63	(5.55 – 5.71)
	Female	80.93	(80.82 – 81.04)	19.46	(19.38 – 19.54)	6.45	(6.41 – 6.50)
2001-2004	Male	75.29	(75.17 – 75.42)	16.26	(16.16 – 16.36)	5.78	(5.69 – 5.87)
	Female	81.10	(80.98 – 81.21)	19.57	(19.48 – 19.65)	6.48	(6.43 – 6.53)

Source: own calculations.

Due to the higher population and case of death numbers, life expectancy for Germans fluctuates much less between the observation periods than it does among non-Germans. At the same time, the confidence intervals are narrower.

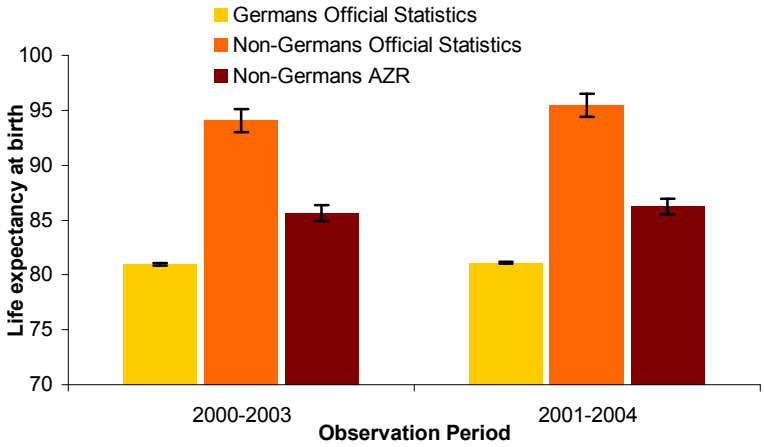
In Figures 3.1 and 3.2, the gradation between the life expectancy at birth of Germans and non-Germans, and between non-Germans in the AZR and the Official Statistics, is illustrated. It is lowest for the Germans and highest for non-Germans estimated from the Official Statistics. The values for the non-Germans in the AZR lie in-between. Overlappings of the 95% confidence intervals do not occur, confirming that all observed differences in life expectancy are statistically significant.

Figure 3.1: Life expectancy of German and non-German men at birth, with 95% confidence intervals – calculations for Berlin from the Official Statistics and the AZR for the observation periods 2000-2003 and 2001-2004



Source: own calculations, own illustration.

Figure 3.2: Life expectancy of German and non-German women at birth with 95% confidence intervals – calculations for Berlin from the Official Statistics and the AZR for the observation periods 2000-2003 and 2001-2004



Source: own calculations, own illustration.

In comparison to the results of Kohls (2008b), who also analysed the mortality of non-Germans based on the AZR data, but for whole Germany, the life expectancy presented in this paper for Berlin is higher. For the year 2006, Kohls calculated for life expectancy at birth values of about 80.9 years for men and 84.9 years for women. Reasons why higher values for both sexes were estimated in Berlin could include the different observation period or differences in the nationality composition of the non-German population. Neither potential explanation could be validated. However, for the Turkish population, which is the numerically most important foreigner group in Berlin [12], separate life tables were calculated. This was not done for other nationalities, as their numbers of cases of death are too small.

2. The life expectancy of Turkish nationals in Berlin

Turkish nationals represent the largest group of non-Germans in Berlin. While the Official Statistics do not allow us to differentiate between the foreigners' nationalities, the individualised AZR data does. Thus two more sets of life tables – one for Turkish nationals and one for all other nationals, each separated by sex – were calculated. The life table calculation proceeded analogously to the tables for all foreigners in the AZR; naturalisations and migration events during the observation period were also taken into consideration.

[12] 30.5% of all non-Germans registered in Berlin on January 1, 2004 are Turkish nationals. (own calculations from the AZR extract December 31, 2004)

Table 6: Life expectancy of the non-German population in Berlin separated into Turkish and non-Turkish nationals at different ages with 95% confidence intervals – calculations from the AZR for the observation periods 2000-2003 and 2001-2004

	Sex	Nationality	e(0)		e(65)		e(85)	
2000-2003	M	All Foreigners	82.60	(81.77 – 83.44)	22.40	(21.48 – 23.32)	12.94	(11.82 – 14.05)
		Turkish	79.85	(77.68 – 82.03)	19.82	(17.31 – 22.33)	7.67	(4.04 – 11.30)
		Non-Turkish	82.82	(81.89 – 83.75)	22.43	(21.42 – 23.43)	13.21	(12.06 – 14.37)
	F	All Foreigners	85.64	(84.91 – 86.37)	23.51	(22.76 – 24.26)	9.66	(8.99 – 10.33)
		Turkish	88.08	(85.76 – 90.41)	26.39	(23.90 – 28.88)	10.72	(8.19 – 13.25)
		Non-Turkish	85.38	(84.58 – 86.19)	23.11	(22.31 – 23.92)	9.59	(8.90 – 10.28)
2001-2004	M	All Foreigners	86.72	(85.73 – 87.71)	27.27	(26.18 – 28.36)	20.09	(18.87 – 21.32)
		Turkish	85.71	(83.06 – 88.35)	26.86	(23.80 – 29.93)	20.21	(16.32 – 24.10)
		Non-Turkish	87.15	(86.04 – 88.25)	27.43	(26.23 – 28.62)	20.07	(18.80 – 21.35)
	F	All Foreigners	86.25	(85.52 – 86.97)	23.71	(22.97 – 24.44)	10.26	(9.57 – 10.96)
		Turkish	92.16	(89.96 – 94.37)	29.75	(27.45 – 32.06)	14.00	(11.70 – 16.30)
		Non-Turkish	85.95	(85.16 – 86.74)	23.30	(22.51 – 24.10)	10.18	(9.46 – 10.89)

Source: own calculations.

While Turkish men have a lower life expectancy than non-Turkish men, the opposite is the case for Turkish women (Table 6). A higher life expectancy in all age groups and both observation periods was measured for Turkish women, compared to non-Turkish women. This advantage accounts for several years. In the observation period 2001-2004, Turkish men only show higher values than non-Turkish men for the age groups 80, 85, and 90.

However, most of the differences between Turkish and non-Turkish nationals are not statistically significant. The 95% confidence intervals fail to overlap only between Turkish and non-Turkish women (all ages) in the observation period 2001-2004, and men aged 85 in the observation period 2000-2003. Hence, a statistical significance of the difference between Turkish and non-Turkish can only be confirmed for those observations. All other differences could also be due to random deviation.

Explanations for the high life expectancy of Turkish women in the observation period 2001-2004 still need to be found. Furthermore, explanations for the high life expectancy of male foreigners in Berlin have to be found, as Turkish men are obviously not the cause of the high values.

3. Further Findings

3.1. The time lag

In addition to the quantitative analysis of the time lag in the abstract of December 31, 2004, its influence on the parameter life expectancy was also studied. Therefore, two life tables for the year 2004 were calculated: one with the population numbers estimated from the extract of December 31st, 2004 and one in which the extract of June 30, 2005 was used. As a consequence, a difference in life expectancy at birth of about 9.1 years for men and 5.6 years for women was found. It is predominantly caused by the smaller number of cases of death in the extract of 2004 (Table 2). Thus the importance of carefully defining the observation period when analysing register data must again be emphasised.

3.2. The revision in the AZR

As mentioned above, the revision in the AZR provoked a substantial reduction in the register population. However, only those individuals who were found to be not present in Berlin, and who therefore received the residence status 'moved abroad' on January 1, 2004 can be identified as affected by the revision. All other data modifications in connection with the revision, such as other changes of the residence status, cannot be identified.

The subsequent descriptive analysis of the 88,462[13] data sets labelled as moves abroad on January 1, 2004 will give information on weak points in the register, especially in connection with the updating of the data. For that, two characteristics were chosen: the sex and the age structure.

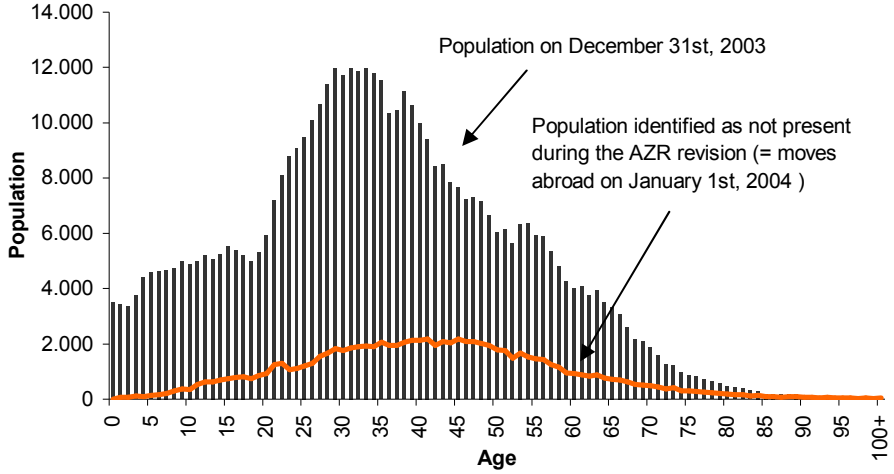
While the gender breakdown of the non-German population present on January 1, 2004 is roughly equal (52% men to 48% women), the gender ratio of the foreigners who were found to be not present shifted towards men. Yet the share of men in the latter category (64% men to 36% women) is much higher than of the population present, indicating a higher error rate in the data sets of men.

Taking a look at the age structure of the moves abroad on January 1, 2004, we can see that nearly all ages are affected, but the emphasis lies on the adult aged between 25 and 50 years (Figure 4.1). At the same time, the share of these individuals in the population present before the revision is highest in the upper ages.

[13] own calculation from the AZR extract December 31, 2004

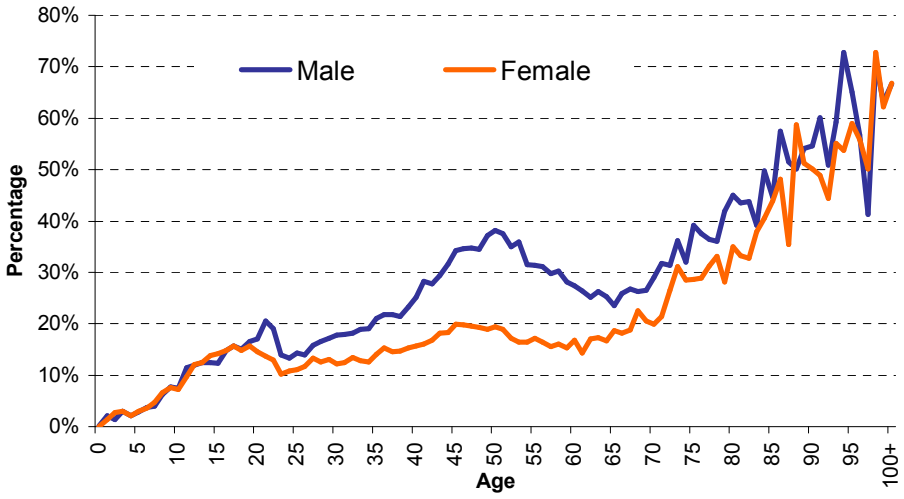
In Figure 4.2 the extent to which each age is affected is illustrated. While at age 20 about 17% of the men and 15% of the women in the AZR population were identified as not present, the equivalent percentages are 38% and 19% at age 50, and 45% and 35% at age 80. Above age 90 the proportion lies above 50%. A total of 979 non-Germans were older than 90, while 548 of them were classified as not present during the revision. This results in a significant reduction of the population in the higher ages. In that age group, in which population numbers are small and most cases of death occur, a high share of data sets was erroneous before the register revision.

Figure 4.1: The age structure of the non-German population in the AZR on December 31, 2003 (n=483,728) and the non-Germans (n=88,462) identified as not present during the AZR revision



Source: own calculation, own illustration.

Figure 4.2: Share of the non-German population identified as not present during the AZR revision (n= 88,642) on the population present on December 31, 2003 (n=483,728) before the revision



Source: own calculation, own illustration.

Discussion

This study confirms that, in Berlin, foreigners have a mortality advantage over Germans. The average difference in life expectancy at birth over the two observation periods between the subpopulations is about 9.6 years for men and 4.9 years for women. However, this advantage is clearly smaller than indicated by the Official Statistics. The lower life expectancy of non-Germans in the AZR is, at the same time, the more reliable one, as it is based on population data recently revised. In the years 2000-2004, all AZR data was reviewed and checked for wrong information by matching the register data with those of the local foreigner authorities. These authorities are responsible for decision making and for sanctioning in accordance with the alienslaw (AuslG § 63), by, for example, issuing or denying residence permits. However, should their data contain errors, they are passed on to the AZR. Moreover, not all local foreigner authorities took part in the revision; a small percentage of data (4.5%) was not checked during that process (Opfermann et al. 2006). Therefore, it seems plausible that there are still inaccuracies in the AZR.
Despite this, the AZR data is a much more valid data base for mortality analysis than the Official Statistics data.
Furthermore, we can see from the revision that the data quality is most likely to decline with growing age. In the age groups after retirement, in which most cases of death occur, the highest proportion of foreigners registered in the AZR but not present in Berlin was found. But even after the revision, the life expectancy of non-Germans at age 65 is on average about 54% (men) and 21% (women) higher than the life expectancy of Germans. Thus the values estimated with the AZR lie clearly above those estimated by Kibele et al. (2008). Using pension statistics for the period 1995-2004, they estimated a further life expectancy of 15.0 years for foreign men at age 65, which is slightly lower than the value for German men of 15.6 years. In contrast, the AZR data for Berlin provides a life expectancy of 22.4 years for non-German men over the period 2001-2003. While the pension statistics data is highly reliable - probably more reliable than the AZR data - it does not include the total foreigner population, as not every foreigner aged 65+ is eligible for a German pension. The differing results for the life expectancy between the data sources result at least partly from the differences in the observed population. A similar effect may also explain the discrepancy with Kohls' findings (2008b). Kohls also analysed AZR

data, but he estimated slightly lower values for the life expectancy of the non-German population in the year 2006 for the whole of Germany.
Furthermore, for every comparison of the AZR data with the Official Statistics, their differing registration criteria have to be kept in mind. Due to these criteria, there have to be more non-Germans registered in the Official Statistics, as seasonal workers and short-term migrants who stay for less than three months are included in the Official Statistics, but not in the AZR. As these subgroups of foreigners add only few cases of death, they present an additional factor explaining the higher life expectancy in the Official Statistics compared to the AZR. But in the highest age group, seasonal workers cannot be the reason for the much higher population numbers in the Official Statistics.

Limitations in the analysis of the AZR data emerge by the determination of the population at risk. Due to the overwriting of the migration history and the instant removal of naturalised individuals from the register, it is practically impossible to reconstruct the exact number of foreigners in Berlin for previous dates. The backward estimation of the population at risk therefore includes a certain inaccuracy. There is, therefore, room for improvement when analysing data from the AZR.
In addition, the time lag, which was illustrated by a comparison of the two AZR files reveals a problem common in all registers. The time required for processing the data means that, not only for previous dates, but also on the reference day, the population present cannot be estimated accurately. In the Berlin AZR data from 2004, the time lag constitutes an enormous share of the events in the last three months. The mortality calculations respond very sensitively to it. An overestimation of more than nine years for men and more than five years for women in life expectancy at birth was measured when applying the data containing that time lag. Therefore, observation periods have to be carefully defined when working with AZR data.
Despite the above mentioned restraints, the AZR offers a more accurate data basis, and should therefore be preferred to the Official Statistics when analysing the mortality of non-Germans. To maintain the data quality in the AZR a continuous revision of the register is recommended.

Concerning the potential explanations for the lower mortality among foreigners, a deduction of the observed mortality advantage of non-Germans in the AZR data to

one of the explanatory approaches could not be fully achieved. However, the characteristics of the mortality advantage suggest that there is a Salmon Bias effect operating. Health selection in return migration after retirement may explain lower mortality among foreigners than among natives, especially in the upper ages. Health selection through a Healthy Migrant Effect could not be confirmed. As this selection process is correlated to the duration of stay, which was not determined, an analysis of the Healthy Migrant Effect was therefore not conducted. The definition of non-Germans also makes it difficult to analyse this effect, as it includes not only migrants who just arrived in Germany, but also migrants who arrived 20, 30, or 50 years ago, as well as those who were born in Germany and never migrated, but who do not possess German nationality. A separation of these groups would, as has been recommended in other publications (Haug 2005, Elrick 2005), contribute greatly to the analysis. Concerning acculturation, it is not possible to determine to what extent there is an influence on migrant mortality. As there is no information given concerning health behaviour or social integration, an evaluation along these lines could not be attempted.

References:

Abraído-Lanza, A.F., Dohrenwend, B.P., Ng-Mak, D.S., Turner, J.B. (1999):
The Latino Mortality Paradox: A Test of the „Salmon Bias“ and Healthy Migrant Hypotheses. American Journal of Public Health 89(10), 1543-1548.

Altenhofen, L., Weber, I. (1993):
Mortalität der ausländischen und der einheimischen Bevölkerung in der Bundesrepublik Deutschland. Soz. Präventivmed 38, 222-230.

Amtliche Nachrichten der Bundesanstalt für Arbeitsvermittlung und Arbeitslosenversicherung (ANBA) (1956):
Vereinbarung zwischen der Regierung der Bundesrepublik Deutschland und der Regierung der italienischen Republik über die Anwerbung und Vermittlung von italienischen Arbeitskräften nach der Bundesrepublik Deutschland. ANBA 2, 4. Jahrgang.

Gesetz über das Ausländerzentralregister (AZRG) vom 2. September 1994:
BGBl I 1994, 2265: zuletzt geändert durch Artikel 4 des Gesetzes zur Steuerung und Begrenzung der Zuwanderung und zur Regelung des Aufenthalts und der Integration von Unionsbürgern und Ausländern (Zuwanderungsgesetz) vom 30. Juli 2004 (BGBl. 2004 I S. 1950), Artikel 4 des Gesetz zur Neuregelung von Luftsicherheitsaufgaben vom 11.01.2005 (BGBl. I S. 78), Artikel 2 Abs. 11 des Gesetzes zum Internationalen Familienrechtes vom 26.01.2005 (BGBl. I 2005, S. 162), Artikel 2 des Gesetzes zur Änderung des Aufenthaltsgesetzes und weiterer Gesetze (BGBl. 2005 I S., 721), Artikel 24 des Gesetzes zur Umbenennung des Bundesgrenzschutzes in Bundespolizei vom 21.06.2005 (BGBl. I S. 1818).

Gesetz über die Einreise und den Aufenthalt von Ausländern im Bundesgebiet (AuslG) (1990):
BGBl I 1990, 1354, 1356, zuletzt geändert durch Artikel 13 des Gesetz zur Bekämpfung der Schwarzarbeit und damit zusammenhängender Steuerhinterziehung vom 23.Juli 2004 (BGBl. I 2004 S. 1842).

Durchführungsverordnung zum Ausländerzentralregistergesetz (AZRG-DV) vom 17. Mai 1995:
BGBl I. S. 695: zuletzt geändert durch Artikel 36 des dritten Gesetzes für moderne Dienstleistungen am Arbeitsmarkt vom 23.12.2003 (BGBl. I S. 2848), Artikel 3 der Verordnung zur Durchführung des Zuwanderungsgesetzes vom 25.11.2004 (BGBl. I S. 2945), Artikel 5 des Gesetzes zur Neuregelung von Luftsicherheitsaufgaben vom 11.01.2005 (BGBl. I S. 78), Artikel 7 des Gesetzes zur Änderung des Aufenthaltsgesetzes und weiterer Gesetze (BGBl. 2005 I S. 721), Artikel 76 des Gesetzes zur Umbenennung des Bundesgrenzschutzes in Bundespolizei vom 21.06.2005 (BGBl. I S. 1818), Artikel 1 der Verordnung zur Änderung der Aufenthaltsverordnung und der AZRG-Durchführungsverordnung vom 14.10.2005 (BGBl. I S. 2982).

Bos, V., Kunst, A.E., Keij-Deerenberg, I.M., Garssen, J., Mackenbach, J.P. (2004):
Ethnic inequalities in age- and cause-specific mortality in the Netherlands. International Journal of Epidemiology 33, 1112-1119

Bundesverwaltungsamt (2008):
http://www.bva.bund.de/nn_372236/DE/Aufgaben/Abt__III/InnereSicherheitAuslaender/AZR/azr-node.html?__nnn=true; page opened may 28th, 2008.

Chiang, C.L. (1984):
The life table and ist applications. Robert E. Krieger Publishing Company, Malabar, Florida.

Elrick, J. (2005):
Foreigners, Immigrants, and Persons with a Migration Background. What kind of official data are needed in Germany? Social Science & Medicine 54, 1379-1388.

Feinleib, M., Lambert, P.M., Zeiner-Henriksen, T., Rogot, E., Hunt, B.M., Ingster-Moore, I. (1982):
The British-Norwegian Migrant Study – Analysis of Parameters of Mortality Differentials Associated with Angina. Biometrics 38, 55-71.

Flaskämper, P. (1962):
Bevölkerungsstatistik. Grundriss der Sozialwissenschaftlichen Statistik, Teil II: Besondere Statistik. Probleme, Methoden und wichtigste Ergebnisse der Hauptzweige der Sozialwissenschaftlichen Statistik, R. Meiner, Hamburg.

Haug, S. (2005):
Die Datenlage im Bereich der Migrations- und Integrationsforschung. Working Paper 1/2005. Bundesamt für Migration und Flüchtlinge, Nürnberg.

Helmert, U. (2003):
Subjektive Einschätzung der Gesundheit und Mortalitätsentwicklung. Gesundheitswesen 65, 47-54.

Hyman, I.(2001):
Immigration and Health. Health Policy Working Paper Series, Working Paper 01-05, Health Canada.

Jdanov, D.A., Scholz, R.D., Shkolnikov, V.M. (2005):
Official population statistics and the HMD estimates of populations aged 80+ in Germany and nine other European countries. Demographic Research 13, 335-362.

Kibele, E., Scholz, R., Shkolnikov, V.M. (2008):
Low migrant mortality for men aged 65 and older: fact or artifact? European Journal of Epidemiology 23(6), 389-393.

Klein, T., Schneider, S., Löwel, H. (2001):
Bildung und Mortalität. Die Bedeutung gesundheitsrelevanter Aspekte des Lebensstils. Zeitschrift für Soziologie 30(5), 384-400.

Kohls, M. (2008a):
Healthy-Migrant-Effect, Erfassungsfehler und andere Schwierigkeiten bei der Analyse der Mortalität von Migranten. Eine Bestandsaufnahme. Working Paper 15. Bundesamt für Migration und Flüchtlinge, Nürnberg.

Kohls, M. (2008b):
Leben Migranten wirklich länger? Eine empirische Analyse der Mortalität von Migranten in Deutschland. Working Paper 16. Bundesamt für Migration und Flüchtlinge, Nürnberg.

Korporal, J., Geiger, A. (1990):
Zur gesundheitlichen Lage der ausländischen Bevölkerung in der Bundesrepublik Deutschland. In: Weber, I., Abel, M., Altenhofen, L., Bächer, K., Berghof, B., Bergmann, K.E., Flatten, G., Mecheelis, W., Müller, P.J.: Dringliche Gesundheitsprobleme der Bevölkerung in der Bundesrepublik Deutschland: Zahlen – Fakten – Perspektiven. Baden-Baden, Nomos Verlagsgesellschaft, 577-601.

Lampert, T., Kroll, L. E., Dunkelberg, A. (2007):
Soziale Ungleichheit der Lebenserwartung in Deutschland. Aus Politik und Zeitgeschichte 42, 11-18.

Lechner, I., Mielck, A. (1998):
Die Verkleinerung des „Healthy-Migrant-Effects“: Entwicklung der Morbidität von ausländischen und deutschen Befragten im sozioökonomischen Panel 1984-1992. Gesundheitswesen 60, 715-720.

Luy, M. (2007):
Estimating the Migrant Survival Advantage from Orphanhood of Second Generation Migrants. Diskussionspapier No. 17, Rostocker Zentrum zur Erforschung des Demografischen Wandels.

McKay L., Macintyre S., Ellaway, A. (2003):
Migration and Health: A Review of the International Literature. Occasional Paper No. 12, MRC Social & Public Health Sciences Unit, Glasgow.

Opfermann, H., Grobecker, C., Krack-Roberg, E. (2006):
Auswirkung der Bereinigung des Ausländerzentralregisters auf die amtliche Ausländerstatistik. Wirtschaft und Statistik 5/2006, 480-494.

Palloni, A., Arias, E. (2004):
Paradox lost: Explaining the hispanic adult mortality advantage. Demography 41(3), 385-415.

Razum, O., Zeeb, H., Akgün, H.S., Yilmaz, S. (1998):
Low overall mortality of Turkish residents in Germany persists and extends into a second generation: merely a healthy migrant effect? Tropical Medicine and International Health 3(4), 297-303.

Razum, O., Rohrmann, S. (2002):
Der Healthy-migrant-Effekt: Bedeutung von Auswahlprozessen bei der Migration und Late-entry-Bias. Gesundheitswesen 64, 82-88.

Razum, O., Sahain-Hodoglugil, N.N., Polit, K. (2005):
Health, Wealth or Family Ties? Why turkish work migrants return from Germany. Journal of Ethnic and Migration Studies 31(4), 719-739.

Ringbäck Weitoft, G., Gullberg, A., Hjern, A., Rosén, A. (1999):
Mortality statistics in immigrant research: method for adjusting underestimation of mortality. International Journal of Epidemiology 28, 756-763.

Scribner, R. (1996):
Paradox as Paradigm – The Health Outcomes of Mexican Americans. American Journal of Public Health 3, 303-304.

Sharma, R.D., Michalowski, M., Verma, R.B.P. (1990):
Mortality differentials among immigrant populations in Canada. International Migration 28(4), 443-450.

Singh, G.K., Siahpush, M. (2001):
All-cause and cause-specific mortality of immigrants and native born in the United States. American Journal of Public Health 91(3), 392-399.

Statistisches Bundesamt (Hrsg.) (2007):
Fachserie 1 Reihe 2. Bevölkerung und Erwerbstätigkeit. Ausländische Bevölkerung. Ergebnisse des Ausländerzentralregisters 2006. Wiesbaden.

Tietze, K. (2006):
Friede, Freude, Gastarbeiter. Die Haltungen der Parteien gegenüber Ausländern in den Jahren 1955-1969. PoliThesis, Diskussionspapiere des Instituts für Politikwissenschaft und der Graduate School of Politics GraSP-Münster.

Tsugane, S., Gotlieb, S.L., Laurenti, R., Souza, J.M.P., Watanabe, S. (1989):
Mortality and cause fo death among first-generation Japanese in Sao Paulo, Brazil. International Journal of Epidemiology 18(3), 647-651.

Turra, C.M., Elo, I.T., Kestenbaum, B., Ferguson, B.R. (2005):
Is there a Salmon-Bias Effect? Mortality Differentials by Place of residence among Primary Social Security Beneficiaries in the United States. Paper presented at the 2005 Annual Meeting of the Population Association of America.

UN Statistics Division (2007):
http://unstats.un.org/unsd/demographic/products/socind/health.htm; page opened june 10th, 2008.

Vallin, J., Caselli, G. (2006):
The Hypothetical Cohort as a Tool for Demographic Analysis. In: Caselli, G., Vallin, J., Wunsch, G.: Demography (Hrsg.): Analysis and Synthesis. Vol.1. Amsterdam, Elsevier, 163-167.