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ROSTOCKER ZENTRUM – DISKUSSIONSPAPIER
ROSTOCK CENTER – DISCUSSION PAPER

No.26

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

Anke Hannemann
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Februar 2009

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The mortality of non-Germans in Germany – 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 could be found until now. Health selection effects (Healthy Migrant Effect and Salmon Bias), acculturation, as well as data artifacts, are the theories mentioned most often in that context, and they are introduced and discussed in this working paper. Subsequently, we present own mortality estimates for non-Germans in Germany, based on data from the Official Statistics and the Central Register of Foreigners (*Ausländerzentralregister*, abbreviated AZR). These results are compared to estimates from further studies dealing with the mortality of foreigners in Germany. In particular, we examine to what extent our results resemble those of Kohls (2008b), who also worked with AZR and Official Statistics data.

Life expectancy at birth calculated from the Official Statistics shows average non-German-German differences of about 20.3 years (men) and 15.8 years (women) in the year 2004. Non-German-German differences are reduced to 4.6 (men) and 3.0 (women) years, when calculated with the AZR data. Due to the recent revision in the AZR, the life expectancy calculated from it; 80.8 years for men and 84.9 years for women, is considered to be more reliable.

Unfortunately, the data does not allow us to ascribe that 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, Germany, Central Register of Foreigners

1. Introduction

For more than a hundred years, the life expectancy in Germany has followed a generally increasing trend. Currently, life expectancy at birth is 76.6 years for men and 82.1 years for women (Statistisches Bundesamt 2007a). These values represent the average mean for Germans and non-Germans. If, for both subpopulations, separate life tables are calculated, we can see that non-Germans have fundamentally higher values than Germans (Altenhofen and Weber 1993, Lechner and Mielck 1998; Razum and Zeeb 1998, Kohls 2008b). As it is known from previous studies (Lampert et al. 2007, Helmert 2003, Klein et al. 2001) that a low socio-economic status is correlated with heightened mortality risks, and that foreigners¹ on average possess a lower socio-economic status than natives, these results are surprising. Even though this phenomenon was observed and studied in several industrialised countries, no consensus on the underlying causes has yet been reached.

In the following, we analyse the mortality of non-Germans living in Germany in the year 2004. To do this, we calculate life tables for that subpopulation; once with data from the Official Statistics, and then with an extract from the Central Register of Foreigners (*Ausländerzentralregister*, abbreviated AZR). The aim of our study is to provide new insights into the existence, the size, and the causes of the mortality advantage among foreigners.

2. Explanatory Theories

The most frequently discussed approaches regarding the mortality advantage of foreigners are health selection processes, acculturation, and data artifacts causing an overestimated life expectancy.

Health selection processes occur in conjunction with immigration (Healthy Migrant Effect) and return migration (Salmon Bias). That only healthy individuals take the risks connected to international migration, whereas sick or disabled persons are

¹ The term "foreigner" is used as equivalent to the term "non-German." In the Official Statistics, as well as in the Central Register of Foreigners, a foreigner is defined as a person not possessing German nationality. That includes stateless persons, but excludes Germans possessing a further nationality (Statistisches Bundesamt 2007b). The application of that definition generates a highly heterogeneous group of foreigners, which does not only consist of migrants, but also to some extent their children and grandchildren.

usually excluded from it, are the main assumptions behind the Healthy Migrant Effect. Thus, migrants have at least a temporal mortality advantage compared to the average population in the immigration country. Immigration laws and policies further enforce that process. For example, the German-Italian recruitment agreement from 1956 states that Italians who apply as guest workers must pass a health examination before receiving a work permit for Germany (ANBA 1956). In recruitment agreements with Spain and Greece (1960), Turkey (1961), Portugal (1964), and Yugoslavia (1968), this practice was retained. A health advantage for the guest workers recruited through 1973 was later confirmed by Lechner and Mielck (1998).

The Salmon Bias, which focuses on return migration, explains why the health advantage resulting from the Healthy Migrant Effect does not wear off completely. A desire to return to one's birthplace in old age or disease, is assumed to prevail among migrants (Anson 2004). If, as assumed, immigrants return to their home countries in old age or when seriously ill, return migrants would have a health status that is clearly worse than that of the remaining migrants. Compared to the situation in which return migration does not occur, the mortality of migrants in the immigration country would be lower (Turra et al. 2005). Empirically this effect was confirmed, for example, for return migrants from the United States. Palloni and Arias (2004) found a significantly worse health status for the Mexican return migrants, and Turra et al. (2005) found higher mortality risks for Latino return migrants, compared to those remaining in the U.S.

A different approach, the acculturation hypothesis, explains the foreigners' mortality advantage by favourable health behaviour. Its emphasis lies on characteristics that vary between natives and migrants as they are formed by the cultural orientation, and influence the health status. Acculturation refers to differences in behaviour, life style, and cultural and psycho-social characteristics, such as tobacco, alcohol, and drug consumption, physical fitness, diet, and social integration (Singh and Siahpush 2001). Those factors are, according to Scribner (1996), more important in determining the risk of chronic diseases than genetic, biological, or socio-economic factors. In those fields, migrants often have advantages compared to non-migrants. Abraído-Lanza et al. (1999), for example, point out that Latinos in the U.S. consume less alcohol, and Latino women smoke less than non-Latino whites. For Canada, evidence supporting better health behaviour of recently arrived immigrants was found as well (Hyman

2001). For Germany, the mortality advantages of second generation immigrants was explained by the traditional living arrangements and the supportive role of the family (Hermann and Mielck 2001).

Doubts about the existence or the size of the migrants' mortality advantage due to a bias in the mortality calculations are the basis of another explanatory approach. That bias results from an overestimation of the migrant population, which in turn leads to an underestimation of mortality among foreigners. In the case of Germany, it is known that the population numbers for the elderly in the Official Statistics are currently overestimated (Scholz and Jdanov 2006). The accuracy of that data depends on the compliance of the citizens (Statistisches Bundesamt 2007c) with the registration authorities. However, for fear of complications at re-entry, or because of ignorance, some of the moves abroad of foreigners are not reported. Therefore, registration authorities do not always have correct information concerning the residence status of a person (Jdanov et al. 2005; Haug 2005). As individuals who are kept in the register, but who are in fact not present, become statistically immortal, mortality analyses conducted using this data contain a systematic bias. For Sweden, Ringbäck Weitoft et al. (1999) therefore conclude "that Swedish mortality statistics are misleading for immigrants" (Ringbäck Weitoft et al. 1999, p. 736). That the overestimation of the population increases with age, and with the amount of time has elapsed since the last census, was shown for Germany by, for example, Jdanov et al. (2005). The maximum degree of overestimation is reached immediately before the following census, during which the bias in the population numbers can be detected. The findings of Luy (2007) indicate that the foreigners' mortality advantage in the Official Statistics measured 1987 after the last census is real. Unrealistic, however, is the observed increase in the following years.

A mortality advantage of non-Germans living in Germany was also confirmed by Kohls (2008b). In his recently published working paper, he used data from the Central Register of Foreigners and calculated life expectancy among other mortality parameters. So far, only the results for the year 2006 have been published. They indicate an advantage which is lower than Luy's results (2007) suggested. In this study, we work with the same data source as Kohls (2008b), but with a slightly different methodology, and present results for 2004.

In contrast to the above mentioned studies, calculations based on data from the German Pension Scheme (Kibele et al. 2008) suggest that there is no mortality advantage among foreigners. According to their results, non-German pensioners aged 65+ even have slightly higher mortality than German men.

3. Data and Method

An instrument to measure mortality is the period life table. It offers, through the parameter life expectancy, a value which provides a summary of the mortality conditions prevailing in a given calendar year in an observed population. Based on the assumption that mortality conditions do not change, and therefore truly hypothetical, the life expectancy at age x gives the number of years each person attaining age x can expect to live (Chiang 1984). In the following, life tables for the Official Statistics and the AZR are 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 permanently² 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. Thus, the AZR contains the most comprehensive stock of individual data on foreigners in Germany. In contrast, the Official Statistics are based on census data and continuous updating. All foreigners who register their residence, regardless of the length of their stay, are included in the Official Statistics (Opfermann et al. 2006). Hence, the Official Statistics should report a higher number of non-Germans than the AZR. Such a difference exists in the data analysed. However, while in the years until 2004, the population numbers of the Official Statistics and the AZR were close, the difference in these numbers is much greater today³. The main reason for this larger discrepancy is the revision in the AZR, which started in 2000 and was completed in 2004. In that process, all information in the AZR was synchronised with the information in the registers of the local foreigner authorities (*Ausländerbehörden*).

² Usually more than three months (Opfermann et al. 2006)

³ Population on December 31, 2003:

Official Statistics – 7,341,800 AZR – 7,334,800 Difference – 7,000

Population on December 31, 2004:

Official Statistics – 7,288,000 AZR – 6,717,100 Difference – 570,900

(Source: Statistisches Bundesamt 2007b)

These authorities are responsible for decision making and sanctioning in accordance with the aliens law (AuslG § 63), by, for example, issuing or denying residence permits. In cases where discrepancies in information were found, the data from the local authorities was adopted, as it was considered more up-to-date. Today only the cases recoded in moves abroad on January 1, 2004 can be identified as affected by the revision. That procedure was applied when more than one data record was found for a single foreigner, or when foreigners were registered as present in Germany, but were actually no longer present⁴ (Opfermann et al. 2006). In the Official Statistics, the results of the revision were not considered (Statistisches Bundesamt 2007b). As a consequence, the AZR data is currently much more accurate than the Official Statistics. However, as not all local foreigner authorities took part in the revision, and about 4.5% of the AZR data records were not included (Opfermann et al. 2006), we can assume that the register is not free from data artifacts.

Another advantage of the AZR relative to the Official Statistics stems from the personal reference of the data. In the updating process in the Official Statistics, all events are counted, but are not linked to individuals. Therefore, the number of moves to and from Germany does not equal the number of migrants. The AZR data, on the other hand, allows us to reconstruct parts of the migration history of the individuals, and to determine the average length of stay in the year of arrival or departure. This, in turn, makes it possible to estimate the risk time spent in Germany in years of arrival and departure, which is not given in the Official Statistics.

Another difference between the Official Statistics and the AZR is found in the registration of the cases of death. While those occurring in Germany are implemented in both data sources, the cases of death among foreigners which occurred abroad are only included in the AZR (Kohls, 2008a). This leads to a higher number of cases of death of foreigners compared to the Official Statistics. On the other hand, it can be assumed that, in the AZR, the number of infant deaths is underestimated, as mourning parents often fail to register the birth and death of their baby (Kohls 2008b).

3.1. The data processing

⁴ About 534,000 cases according to Opfermann et al. (2006)

To determine the probabilities of dying, which are the starting point for the life table calculation, information about the population at-risk in the observed period is needed. While the Official Statistics provided population data for each December 31 in a form ready for analysis⁵, the AZR data has to be edited to obtain the required population numbers.

The AZR extract given to the Max Planck Institute for Demographic Research for the purposes of statistical analysis was drawn on the reference day December 31, 2005. It contains 11.7 million anonymous individual data sets, each representing one foreigner. The data provided do not allow us to identify individuals. For each foreigner, information about nationality, sex, birthday, day of first entry into Germany, current residence status, day of last residence status change, the local foreigners department, and the federal state are provided. Crucial for the determination of the presence during the observational period is the variable current residence status. It possesses the values 'first entry', 'transfer from another authority' (i.e., arrival from a different federal state), 're-entry from abroad', 'move abroad', 'move to an unknown place', 'no longer present', and 'death'; and indicates if a foreigner is present in Germany on the reference day December 31, 2005. Moreover, the variable current residence status allows us to trace backwards the migration history of the foreigners. While a procedure such as this is constrained by certain limitations, it is the only way to conduct the analysis. One of these limitations 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), the data of a person registered 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, 2005 only contains cases of death from the year 2001 onwards, restricting the observation period to the years 2001-2005.

A further limitation of the observation period results from the time lag in the AZR. The occurrence of the migration events and the implementation in the AZR do not proceed simultaneously. Hence, an extract drawn on December 31 does not contain

⁵ Given is the sex and age structure (single ages with the last age group 90+) of the Germans and non-Germans on December 31 of the years 2003 and 2004, and the cases of death of the year 2004 subdivided into the same categories. Additionally, for the illustration of the development of the life expectancy of non-Germans in Germany between 1981 and 2006, data collected by Dr. R. Scholz, containing data from the Official Statistics (population numbers and cases of death in 5-year age groups) was used.

all residence status changes of the past year. That means that the population present on December 31, 2005 cannot be reproduced correctly with the extract generated on December 31, 2005. For that reason, the analysis will not include the year 2005. Further constraints on the observation period arise from the practice of overwriting the residence status with every migration event. The migration history of the individuals between first entry and reference day therefore cannot be reconstructed precisely. As a consequence, assumptions have to be made when determining the number of the non-German population. To keep the degree of uncertainty that this implies as low as possible, the analysis was restricted to a single year, 2004. In Figure 1, the procedure used in determining the population numbers is illustrated.

Given the problems which result from the overwriting of the residence status, we did not attempt to estimate the length of stay of the foreigners. Because having data on length of stay is a requirement for analysing the influence of a Healthy Migrant Effect, direct evidence for that effect cannot be provided in the following.

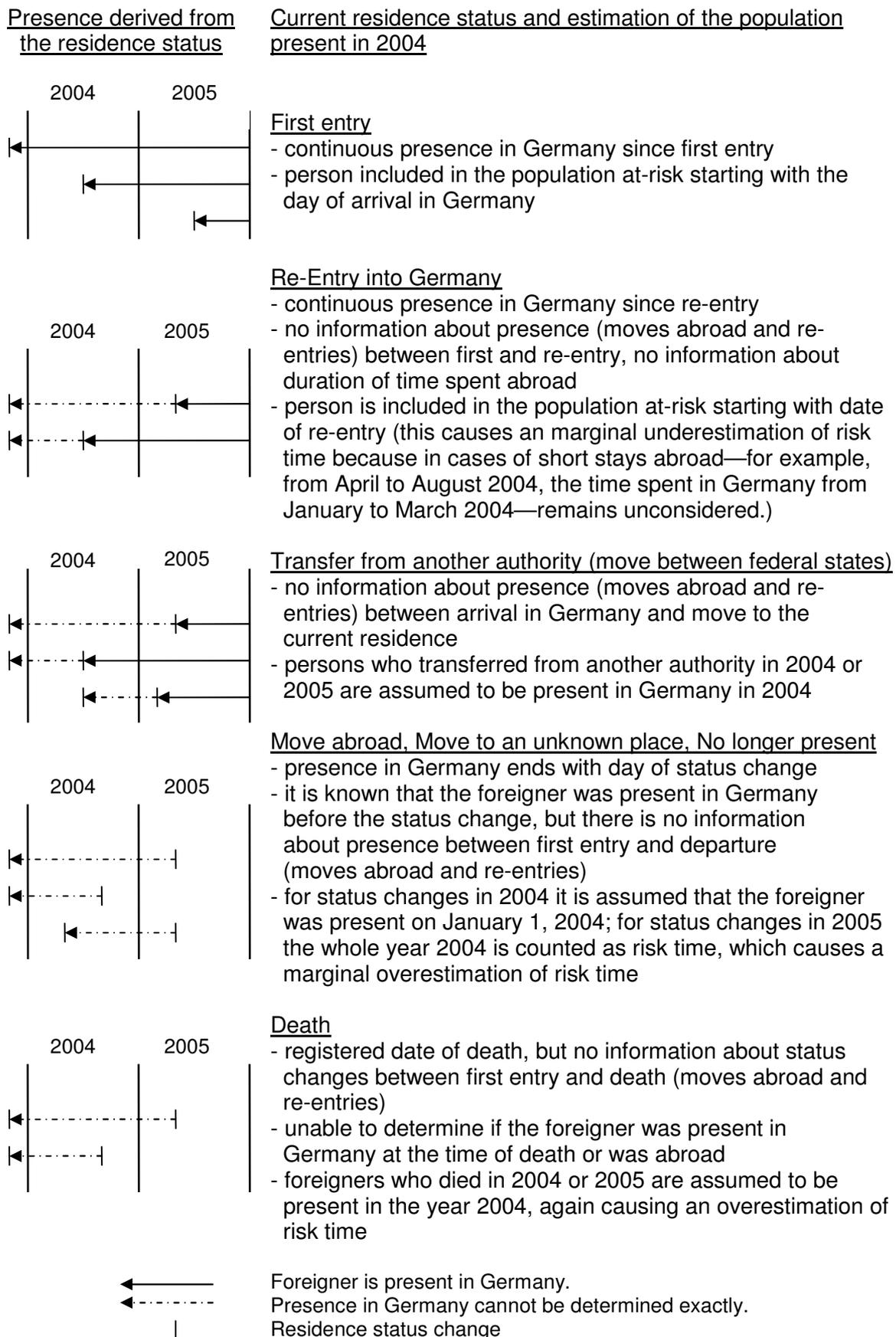
When comparing the AZR data to the Official Statistics naturalisations must also be considered. As prescribed in the law (AZRG, §36 (2)), data of naturalised individuals is removed directly from the AZR. A backward analysis therefore provides an underestimation of the number of foreigners. Therefore, the number, age- and sex-structure of the naturalised foreigners was obtained from the Official Statistics⁶ and considered in the analysis.

Another issue that must be considered before we can determine the population number from the AZR extract are the missing values in the date variables. Information on the time of first entry, the last residence change, and birth are essential in the reconstruction of the population and its age structure on a given date. The missing or implausible values in these variables make modifications necessary⁷. In the data sets, a missing day was set to the 15th, a missing month to June, and, when both information were missing, the date was set to June 30.

⁶ Number of naturalisations in Germany: 127,153 (2004) and 117,241 (2005); Source: Official Statistics

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

figure 1: The presence in Germany in 2004 by current residence status according to the AZR abstract 2005, December 31



Source: own illustration

Missing year values in the variables 'date of first entry' and 'date of last residence change', which are needed to determine the presence of a foreigner on a given date, were not completed. Instead assumptions concerning the presence of a foreigner in the year 2004 were made. Foreigners with the residence status 'first-entry', 're-entry from abroad', or 'transfer from another authority' were assumed to be present when year of first entry and year of the last residence change were missing, or when one date was missing and the other indicated an arrival in 2003 or earlier. In addition, foreigners for whom the year of first entry was not given, and who emigrated or died after 2004, were assumed to be present. Any other combination of missing year values lead to an exclusion from the at-risk population in the observation year.

Having determined the population number with the modified AZR data, assumptions concerning missing birth years have to be made, as the age structure cannot otherwise be calculated. As it is assumed that foreigners with missing birth years⁸ do not differ on average from those for whom birth year information was provided, their age structure is adopted. The same procedure was applied in cases where the sex was not specified (5,753 foreigners)⁹.

3.2. The population numbers in the AZR and in the Official Statistics

Population numbers for the life table calculation from the AZR and the Official Statistics are listed in Table 1.

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

Year	Official Statistics*		AZR	
	Male	Female	Male	Female
2004	3,840,068	3,501,752	3,558,531	3,227,014
2005	3,786,456	3,501,524	3,515,810	3,244,313

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

As mentioned before, the huge differences between the Official Statistics and the AZR result mainly from the revision in the AZR. Foreigners who were registered more

⁸ Missing birth years: 952 (population on January 1, 2004), 942 (population on January 1, 2005)
⁹ The completing assumptions for the date and sex variable do not have a significant influence on the mortality calculations.

than once, or who had left Germany while still listed as present in the AZR, were removed from the population present, and were assigned the residence status 'move abroad' on January 1, 2004. Moreover, the differing registration policies of foreigners in the Official Statistics and the AZR lead to unequal population numbers.

Table 2: Cases of death of the non-German population in 2004 in the Official Statistics and the AZR extract 2005

Year	Official Statistics		AZR	
	Male	Female	Male	Female
2004	10,154	5,975	11,513	6,535

Source: Official Statistics and own calculations from the AZR extracts December 31, 2005

The difference of 1,919 cases of death between the two data sources is mainly caused by the cases of death from abroad, which are recorded in the AZR, but not in the Official Statistics. However, that difference does not reflect the number of cases of death from abroad in the AZR, as it is also caused by the different number of cases of infant death in the two data sources.

Thus, for the life table calculation, a higher number of cases of death and a smaller number of at-risk were included in the AZR, which, in turn, results in lower life expectancy in the AZR than in the Official Statistics.

By subdividing the AZR population and case of death numbers into nationality groups, further information concerning differences between the foreigners in Germany can be obtained. In the immigration process, foreigners from outside the European Union and non-industrialised countries have higher obstacles to overcome than those migrating within the EU. According to the Healthy Migrant Effect, it is expected that the former will have lower mortality than those from the EU countries. In addition, non-Germans coming from non-industrialised countries have higher incentives to remain in Germany permanently, and also to remain registered when leaving to travel abroad. Among this group, the number of erroneous cases should therefore be higher, and the underestimation of their mortality should be higher as well.

Unfortunately, analysis by nationality is difficult due to the small case numbers. Only for Turkey is the number of cases of death in 2004 high enough to allow for the

calculation of separate life tables. For this reason, in addition to Turkey, two broad nationality groups are contrasted: OECD countries and non-OECD countries¹⁰.

For the life table calculation, the number and age structure of the cases of death by nationality were obtained by splitting the data of the Official Statistics according to the structure of the cases of death in the AZR. The naturalisations by nationality were taken from the Official Statistics (Statistisches Bundesamt 2006, Tab. 4 and Statistisches Bundesamt 2005, Tab. 17)¹¹.

3.3 The life tables

The life tables for Germans and non-Germans were generally calculated for single ages and both sexes. At the same time, however, the tables separated by nationality groups are calculated for five-year age groups¹². To estimate the probabilities of dying, the method developed by Farr (Flaskämper 1962) was used¹³. Life expectancy at age 90, the point 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, and cases of infant death were assigned a risk time of 0.2 years.

To ensure statistical significance of the observations and to rule out random deviation, confidence regions for the life expectancy are estimated. Based on the formula developed by Chiang (1984), the variance of the life expectancy was calculated, and the confidence intervals were subsequently estimated under application of the approximation of the normal distribution¹⁴. When, in the following, the confidence intervals for the life expectancy estimated from the AZR data and the Official

¹⁰ OECD Countries: Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Sweden, Spain, United Kingdom, Australia, Iceland, Japan, Canada, Mexico, New Zealand, Norway, Poland, Switzerland, South Korea, Slovakia, Czech Republic, Hungary, United States (Turkey and Germany are not included).

Non-OECD countries: all countries except the OECD countries (Turkey and Germany are not included).

The two groups together do not add up to all cases, as stateless persons and persons with unknown nationality were not considered.

¹¹ As the naturalisations are given in age groups, which do not completely correspond with the age groups needed for the analysis, they are transformed according to the structure of the population present on January 1, 2004 and 2005.

¹² The calculation of the life tables was done with Microsoft Excel. The editing and the determination of the population numbers in the AZR abstract was done using SPSS for Windows.

¹³ For the estimation of the population at-risk, not only the naturalisations, but also the number of moves to and from Germany, were taken into consideration. In contrast to the data from the Official Statistics, the average length of stay for the migration events within a year could be calculated. In the year of arrival, on average 43% of the year was spent in Germany; in the year of departure, 47% was spent in Germany; and in case of arrival and departure within 2004, 23% was on average spent in Germany.

Source: own calculation, AZR extract 2005, December 31

¹⁴ The computation of the variance of the life expectancy can be followed stepwise at Chiang 1984 (pages 163-164).

Statistics, or between the different nationality groups, do not overlap, their difference is statistically significant.

4. Findings

4.1. The life expectancy of Germans and non-Germans in the Official Statistics

Based on the data from the Official Statistics, life expectancy at birth of non-Germans in Germany is 96.5 years for men and 97.6 years for women in the year 2004 (table 3). These are impressively high values which exceed by far the life expectancy of German men (76.2 years) and women (81.8 years). They also exceed the values measured in Japan (86 years for women) and Iceland (80 years for men), which are currently the highest in the world (United Nations Statistics Division, 2007). However, even more impressive than the values for the life expectancy at birth are those at age 85. Non-German men at that age can expect to live an additional 34.8 years, compared to 5.7 years for German men, a difference of 29.1 years. For women, that difference is, at 19.0 years (25.3 years for non-German women and 6.3 years for German women), slightly smaller.

Table 3: Life expectancy of the German and non-German population in Germany at different ages with 95% confidence intervals – calculations from the Official Statistics for the year 2004

Observed Population	Age 0	Age 65	Age 85
Germans Male	76.18 (76.17 – 76.19)	16.58 (16.58 – 16.59)	5.65 (5.63 – 5.66)
Germans Female	81.82 (81.81 – 81.82)	20.03 (20.03 – 20.04)	6.29 (6.28 – 6.29)
Non-Germans Male	96.51 (96.41 – 96.62)	37.79 (37.67 – 37.91)	34.76 (34.62 – 34.91)
Non-Germans Female	97.60 (97.52 – 97.68)	36.26 (36.17 – 36.34)	25.28 (25.19 – 25.38)

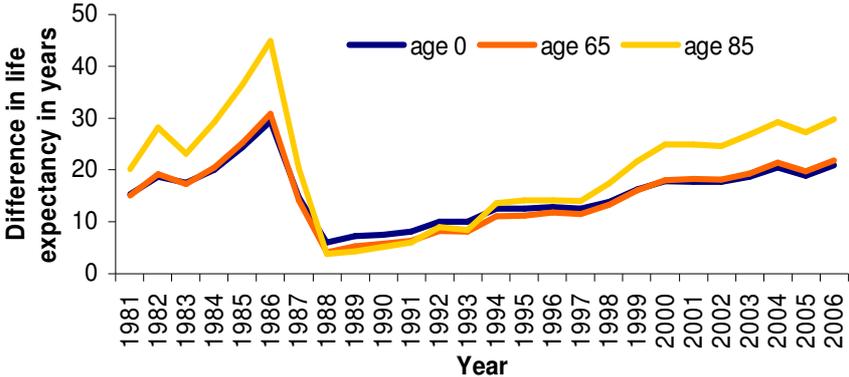
Source: own calculations

The high values of the non-Germans are not surprising considering that their number is overestimated in the Official Statistics. The influence of that overestimation on life expectancy can be followed in Figures 2.1 and 2.2. The difference in the life expectancy of Germans and non-Germans from 1981 to 2006 is illustrated. In 1987, the year of the last census in Germany¹⁵, after which the population number of the

¹⁵ In the former West Germany, the last census took place in 1987; in the former East Germany, in 1981.

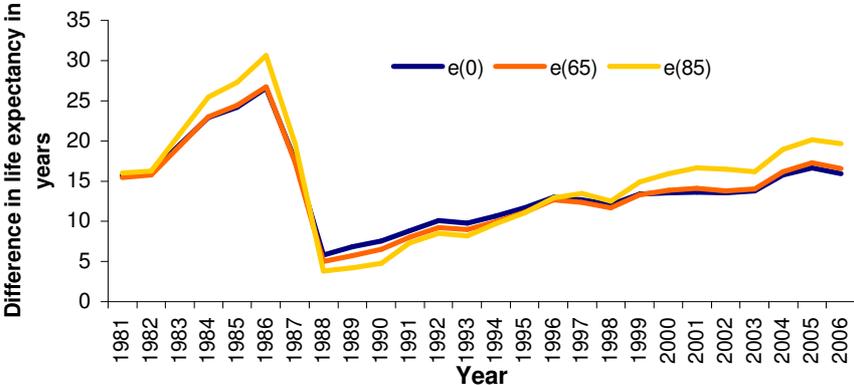
non-Germans was adjusted downwards (Statistisches Bundesamt 2002), this difference plunges. Since that year, a continuous increase can again be seen. The gap is largest for the oldest age group, but it has not yet reached the size of the difference seen in 1986, immediately before the last census.

Figure 2.1: Non-German - German difference in life expectancy at birth and the ages 65 and 85 in the Official Statistics for the years 1981* – 2006, Male



Source: own calculations; own illustration; *1981 – 1991: only Federal Republic of Germany

Figure 2.2: Non-German – German difference in life expectancy at birth and the ages 65 and 85 in the Official Statistics for the years 1981* – 2006, Female



Source: own calculations; own illustration; *1981 – 1991: only Federal Republic of Germany

4.2. The life expectancy of non-Germans in the AZR

Due to the recent revision in the AZR and the ensuing reduction of the non-German population present—and which is, therefore, at-risk—life expectancy calculated on that basis is lower. At birth, it is 80.8 years for men and 84.9 for women (Table 4). The gradation between the values from the AZR and the Official Statistics is bigger for men (15.7) than for women (12.7), and grows with age (17.6 and 13.7 years for men and women at age 65, and 25.3 and 16.4 years at age 85). There is no case in

which the confidence intervals of AZR and Official Statistics overlap, indicating that the values measured are significantly different.

Table 4: Life expectancy of the non-German population in Germany at different ages with 95% confidence intervals – calculations from the AZR for the year 2004

Observed Population	Age 0	Age 65	Age 85
AZR Male	80.79 (80.49 – 81.08)	20.16 (19.86 – 20.46)	9.51 (9.14 – 9.89)
AZR Female	84.86 (84.55 – 85.16)	22.56 (22.27 – 22.85)	7.20 (8.60 – 9.17)

Source: own calculations

As the life expectancy of the non-Germans is smaller in the AZR, the difference when compared with the German population also is smaller. The mortality advantage of the foreigners still exists, but is clearly reduced. At birth it is 4.6 years for men and 3.0 for women, or 77% and 81% lower than the differences measured between non-Germans and Germans in the Official Statistics. Moreover, life expectancy calculated from the AZR is lower than the minimum difference measured by the Official Statistics after the last census, which was 6.0 years for men and 5.8 years for women. With differences of 4.6 years (men) and 3.0 years (women), the results of the AZR analysis represent a considerable deviation. Therefore, this study cannot (in contrast to Luy (2007)) confirm that the difference in the Official Statistics in the census year is realistic.

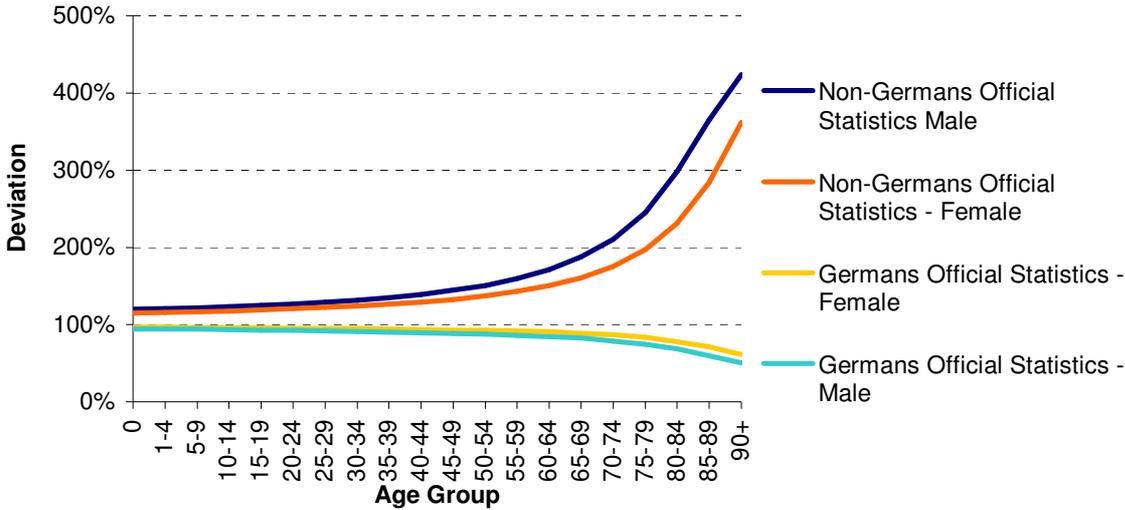
In comparison to the mortality analysis of Kohls (2008b), who analysed AZR data for 2006, only a small deviation was found. He found a life expectancy at birth of 81.0 years for non-German men in 2006 (women 84.5 years), and of 80.8 years (women 84.9 years) in 2004. In addition to the different observation period, methodological aspects also cause the difference in the estimated values. Kohls, for example, does not consider naturalisations in his calculations. In contrast to the rather small deviation in the values estimated from the AZR, the estimates for the life expectancy calculated for non-Germans from the Official Statistics vary strongly. Kohls' values lie significantly below those estimated in the present study¹⁶. It is supposed that this huge difference results from the method applied in closing the life table. The choice

¹⁶ Life expectancy at birth for the foreign population estimated from the Official Statistics for the year 2006:
 Kohls: men - 82.2 years; women - 86.2 years
 Own calculations: men - 97.7 years; women - 98.2 years
 Life expectancy at birth for the German population estimated from the Official Statistics for the year 2006:
 Kohls: men - 77.0 years; women - 82.5 years
 Own calculations: men - 76.9 years; women - 82.2 years

of the last open age group, as well as of the method used to estimate the probability of dying, have a significant influence on the parameter life expectancy.

In Figure 3, the growing deviation with age between the life expectancy of the AZR population and the Germans and non-Germans in the Official Statistics is illustrated. As can be seen, the highest age groups show the biggest differences in life expectancy. While German men reach 94% (women 96%) of the life expectancy at birth estimated for foreigners in the AZR, they only reach 50% (women 61%) at age 90+. These high non-German – German differences form a contrast to the results found by Kibele et al. (2008). Their calculations, together with data from the German Pension Scheme, indicate a slightly smaller life expectancy among non-German men older than 65 years.

Figure 3: Percental deviation of the life expectancy of Germans and non-Germans in the Official Statistics to the life expectancy measured for non-Germans in the AZR for the year 2004, by age groups and sex



Source: own calculations; own illustration

The differences between Official Statistics and AZR—non-Germans aged 90+ have, according to the calculations from the Official Statistics, a further life expectancy that is 4.2 times higher (men) or 3.6 times higher (women) than in the AZR—are, for the most part, caused by the AZR revision and the associated reduction of the register population. Details of the revision are presented in the following paragraph.

4.3. The revision in the AZR

Mistakes in the AZR arise through lack of updating, duplication of data records due to unclear spelling of names, and failure to register arrivals and departures. Analogous problems (especially the not-registered moves abroad) exist with the updating of data in the Official Statistics. Therefore it is assumed that erroneous data records have similar characteristics in both data sources, and that they also have a similar impact on the population structure.

The subsequent descriptive analysis of the 480,758¹⁷ data records labelled as moves abroad on January 1, 2004 in the AZR will provide information about their characteristics. With that goal in mind, their sex and the age structure was examined for specifics. Additionally, differences between the nationality groups introduced above (OECD countries, non-OECD countries, Turkey) will be analysed.

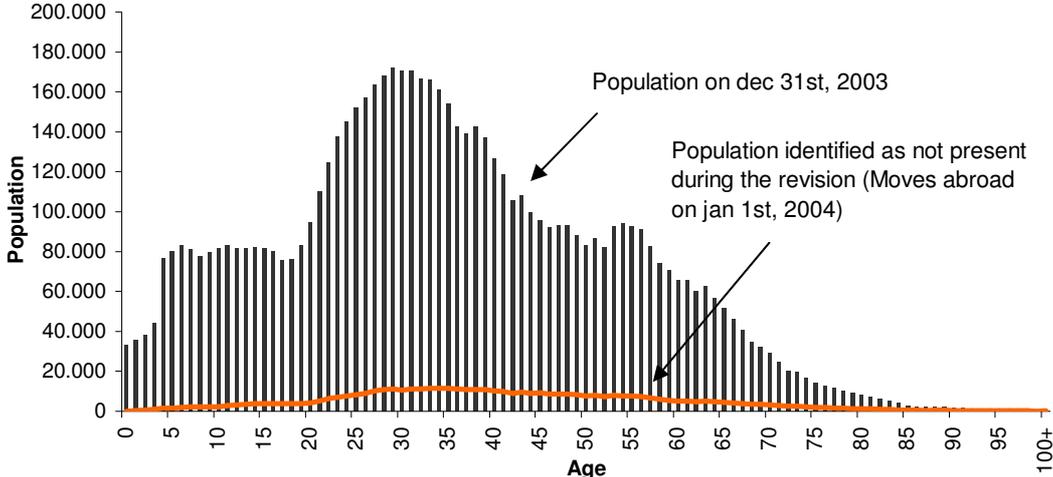
While the gender breakdown of the non-German population present on January 1, 2004 is roughly equal (52% men to 48% women), the gender ratio of the foreigners with the residence status move abroad on January 1, 2004 is shifted towards men. Because the share of men (61% men to 39% women) with this status is much higher than in the population present, a higher error rate in these data records is probable.

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 the foreigners with a move abroad on January 1, 2004 is, among all registered foreigners, highest at the upper ages. In Figure 4.2, the extent to which each age is affected is illustrated. While at age 20, about 5% of the men and 4% of the women in the AZR population were identified as not present, the equivalent percentages are 12% and 6% at age 50, and 19% and 12% at age 80. Past age 90 the proportion is 36% and 26%. Of the 9,455 non-Germans older than age 90, 2,815 were classified as not present during the revision. This leads to a significant reduction of the population at the higher ages. In that age group, in which population numbers are small and most cases of death occur, a high share of the data records was erroneous before the register revision.

¹⁷ The number of the moves abroad on January 1, 2004 is 480,758 in the analysed abstract. It is not consistent with the number quoted by Opfermann et al. (2006), about 534,000. Unfortunately the cause of that difference is unknown.

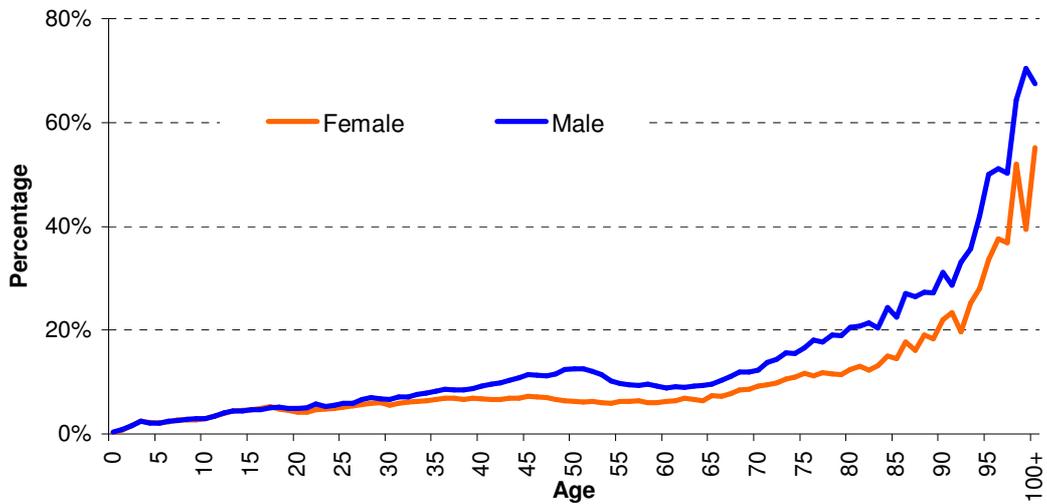
In Figure 4.3, the consequences of the revision for the nationality groups are illustrated. Between OECD and non-OECD countries, differences are small and not systematic over the ages. For both groups there is a slow rise until age 70, at which point about 12% of the population was found to be not present. After that age, the share increases and peaks at age 98, with 55% and 66% erroneous data records (OECD and non-OECD countries). That development is to some extent surprising. Based on the assumption that foreigners from non-industrialised countries have higher incentives to not register departures, we expected to find a systematic difference between the OECD and non-OECD countries.

Figure 4.1: The age structure of the non-German population in the AZR on December 31, 2003 (n=7,123,037) and the foreigners identified as not present (n=480,758) during the AZR revision



Source: own calculations; own illustration

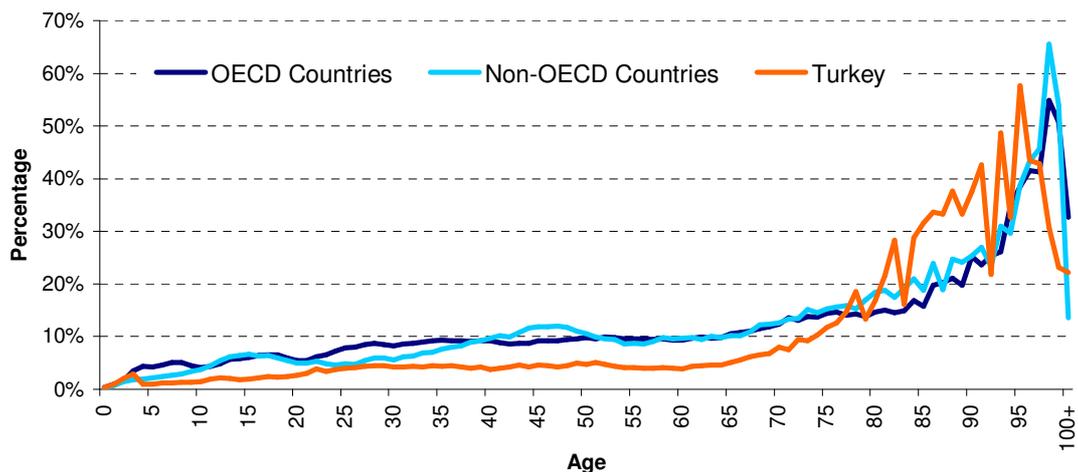
Figure 4.2: Share of the foreigners identified as not present (n= 480,758) during the AZR revision on the AZR population present on December 31, 2003 (n=7,123,037) before the revision, separated by sex



Source: own calculations; own illustration

For Turkey, a slightly different pattern was found. The share of the moves abroad on January 1, 2004 is, compared to the OECD and non-OECD countries, smaller at the young and middle ages, and is less than 8% at age 70. However, after age 70 it rises more steeply and peaks at age 95, when it reaches 58%.

Figure 4.3: Share of the foreigners identified as not present (n= 480,758) during the AZR revision on the AZR population present on December 31, 2003 (n=7,123,037) before the revision, by nationality



Source: own calculations; own illustration

4.4. Life expectancy by nationality

Of the observed nationality groups, Turkish men have the highest life expectancy, while men from OECD countries have the lowest (Table 5). At 80.8 years, their life expectancy at birth lies about 1.6 years below that of Turkish men, and 0.9 year under the value of men from non-OECD countries. For women, a similar pattern is found. Turkish women have the highest life expectancy, followed by women from non-OECD countries and women from OECD countries.

Table 5: Life expectancy of the non-German population in Germany at different ages and separated by nationality with 95% confidence intervals – calculations from the AZR for the year 2004

Sex	Nationality	e(0)	(95% CI)	e(65)	(95%CI)	e(85)	(95% CI)
Male	OECD	80.80	(80.38 – 81.22)	19.80	(19.42 – 20.18)	9.07	(8.62 – 9.52)
	Non OECD	81.70	(81.12 – 82.29)	21.52	(20.90 – 22.13)	11.26	(10.48 – 12.04)
	Turkey	82.40	(80.99 – 83.81)	22.10	(20.53 – 23.66)	12.05	(9.55 – 14.54)
Female	OECD	84.94	(84.50 – 85.37)	22.38	(21.99 – 22.78)	8.49	(8.13 – 8.85)
	Non OECD	85.04	(84.53 – 85.56)	22.87	(22.36 – 23.38)	9.33	(8.84 – 9.82)
	Turkey	87.51	(86.31 – 88.72)	25.56	(24.30 – 26.81)	13.26	(11.93 – 14.58)

Source: own calculations

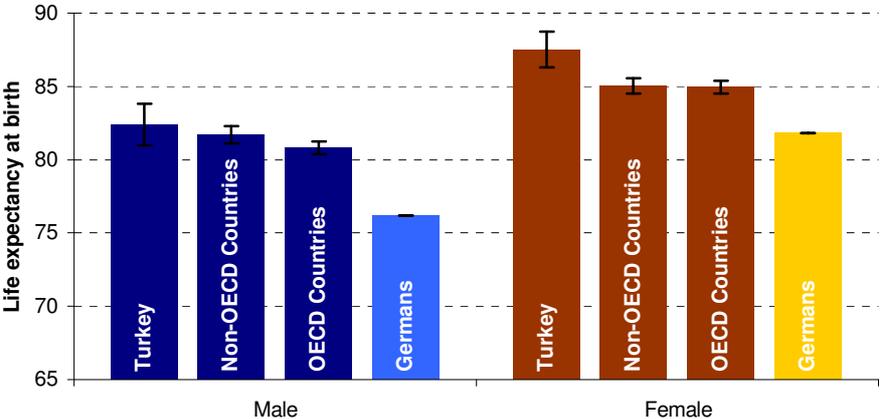
The 95% confidence intervals confirm the statistical significance of the advantages in life expectancy among every foreigner group when compared with the German population. Also, the advantages enjoyed by Turkish women over women from OECD and non-OECD countries is statistically significant. On the other hand the higher life expectancy of women from non-OECD countries over those from OECD countries, and men from Turkey over those from non-OECD countries is not statistically significant.

In Figures 5.1 and 5.2, the gradation between the observed groups is illustrated. Compared to the values calculated for foreigners from OECD countries, those from non-OECD countries and Turkey reach higher values, while the Germans clearly reach lower values.

Compared to the population in the home country, the observed nationality groups also show advantages. In 2004, Turkish men in Turkey had a life expectancy of 68.8 years (OECD 2006), which is 13.6 years lower than in Germany. Smaller differences are to be found for men from OECD countries. Their life expectancy in Germany lies

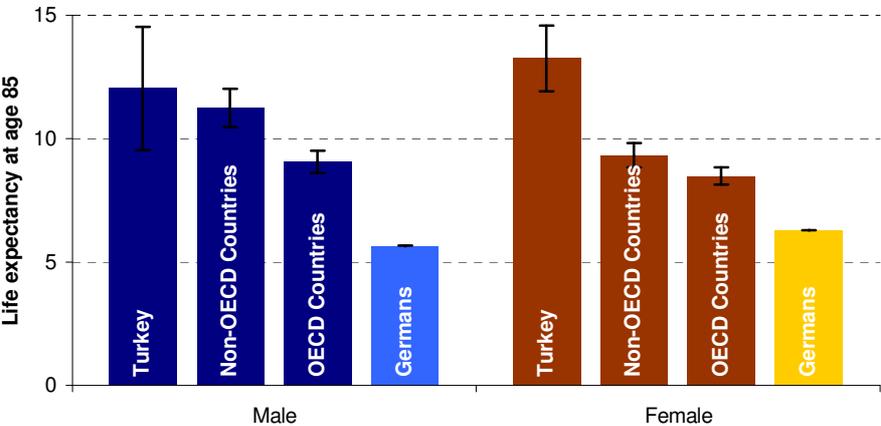
about 5.1 years above the 75.7 years that were measured for men in OECD countries in 2005¹⁸.

Figure 5.1: Life expectancy at birth for non-Germans in the AZR separated by nationality groups with a comparison to the life expectancy of the German population estimated from the Official Statistics for the year 2004



Source: own calculations; own illustration

Figure 5.2: Life expectancy at age 85 for non-Germans in the AZR separated by nationality groups with a comparison to the life expectancy of the German population estimated from the Official Statistics for the year 2004



Source: own calculations; own illustration

¹⁸ Unfortunately a reference value for the life expectancy in non-OECD countries could not be investigated.

Discussion:

As expected, the life expectancy of non-Germans in Germany is clearly lower when calculated on the basis of the AZR than on the Official Statistics. The lower population number in the AZR (about 570,000 fewer foreigners in the AZR on January 1, 2004) causes that difference. Especially in the age groups after retirement, in which the revision of the AZR caused a drastic reduction of the population numbers, and where mortality is highest, the difference between the AZR and the Official Statistics is highly distinctive. At the same time, it is known that, because of the recent revision, the AZR currently offers the more accurate data. Therefore, the difference between AZR and Official Statistics; 16% (men), and 13% (women) lower life expectancy at birth in the AZR, can be interpreted as minimum degree of overestimation in the Official Statistics.

When interpreting the differences in life expectancy between non-Germans in the AZR and the Official Statistics, the registration criteria in the two data sources have to be taken into consideration. Due to these criteria, the number of non-Germans registered in the Official Statistics must be higher compared to the AZR, as seasonal workers and short term migrants who stay for less than three months are included in the former, but not in the latter. Nevertheless, seasonal workers, who do not influence population numbers at the upper ages, cannot cause the higher population numbers after age 65 in the Official Statistics. As this is where the largest differences between AZR and Official Statistics in life expectancy were found, the influence of those individuals is assumed to be small.

An accurate attribution of the observed non-German-German mortality advantage in the AZR to one of the explanatory approaches was not achieved.

A further data bias in the revised AZR probably exists, as not all of the local foreigner authorities took part in the revision of the AZR¹⁹. Therefore not all data was controlled for accuracy, and it must be assumed that there are still foreigners in the register who do not live in Germany anymore. Moreover, errors in the data of the local foreigner authorities are passed on to the AZR – if, and to what extent, such errors exist is unknown. In addition, the high number of registration authorities that provide the AZR

¹⁹ Of the 647 local foreigner authorities that existed at the beginning of the revision, 596 took part in the revision (Opfermann et al. 2006)

with data is itself probably a factor affecting data quality. Diverse name spelling might, for example, lead to double registration, and hence to over-registration. In any case, it is not possible to prove with the data given that the entire mortality advantage of foreigners (4.6 years in life expectancy at birth for men, 3.0 years for women) results solely from data biases.

Concerning acculturation, neither of the data sources allow for analysis. As there is no information given concerning health behaviour or social integration, that approach was not evaluated in the present analysis. Conclusions concerning the Healthy Migrant Effect were also not reached. Health selection effects due to immigration are highly correlated to the length of stay. As deletion rules in the AZR require making assumptions concerning the presence of the individual, exact length of stay cannot be estimated using that data. However, further research is possible here. Differences in life expectancy between Turkish residents in Germany and the values measured in Turkey (13.6-year difference for men in life expectancy at birth, and a 13.9-year difference for women) seem nevertheless too high to be fully explained by a Healthy Migrant Effect, especially when we consider that the last big immigration wave took place in the early 1980s, and that the effect wears off with time.

The characteristics of the mortality advantage of non-Germans over Germans rather suggest that a Salmon Bias is operating. Health selection in return migration after retirement probably explains the low mortality of foreigners at the upper ages. Unfortunately, in the highest age groups, the population numbers are small. As numerically significant migration to Germany started in the 1960s, and most migrants arrive in their twenties, the majority are still of working age. Currently, the senior migrant population in Germany is growing, but is still small. Estimations for the mortality of elderly non-Germans are therefore based on small numbers.

Kibele et al. (2008) calculated the life expectancy for elderly foreigners in Germany with data from the German Pension Scheme. That data is highly reliable, as it is linked to pension payment. They measured a further life expectancy of 15.0 years for foreign men aged 65 for the period 1995-2004. The AZR data, in contrast, provides a value of 20.2 years in the year 2004. While the Pension Scheme data is more reliable than the AZR data, as it is better controlled, not every foreigner aged 65+ is eligible for a German pension. Therefore, the differing results between the data sources stem, at least to some extent, from the differences in the observation population. The limitations of this study suggest that the life expectancy of foreigners measured with

data from the AZR is slightly overestimated, but that the AZR data nevertheless provide essentially better values than the Official Statistics.

For further research using the AZR data, it is recommended that a period of longer than one year be analysed. This would allow for a more detailed analysis, including, for example, the construction of smaller nationality groups. To simplify the mortality analysis and to increase its accuracy, it would be helpful if the residence status was not overwritten. Keeping records of residence changes for a period of five years, as well as cases of death, would allow researchers to analyse a period of five years with one extract. The same applies for the naturalisations. If data of naturalised individuals were kept in the register for five more years, the analysis would be facilitated enormously.

For a better estimation of the influence of a Salmon Bias, it would be helpful if the cases of death were classified by location: 1. in Germany, and 2. abroad. By analysing the correlation between emigration data and death, it would be possible to estimate to what extent health selection effects at return migration exist.

Overall, the mortality analysis with data from the AZR, although limited, provides more reliable values for the life expectancy of non-Germans than the Official Statistics. The AZR is therefore seen as a valuable data source for analysing the mortality of foreigners in Germany.

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
- Anson, J. (2004):
The Migrant Mortality Advantage: A 70 month follow-up of the Brussels Population. European Journal of Population 20, 191-218
- Bundesverwaltungsamt (2008):
http://www.bva.bund.de/nn_372236/DE/Aufgaben/Abt__III/InnereSicherheitAuslander/AZR/azr-node.html?__nnn=true; page opened may 28th, 2008
- Chiang, C.L. (1984):
The life table and its applications. Robert E. Krieger Publishing Company, Malabar, Florida
- 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)
- 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
- Gesetz über die Einreise und den Aufenthalt von Ausländern im Bundesgebiet (AuslG):
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)

- 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 Familienrecht 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)
- 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
- Hermann, N., Mielck, A. (2001):
Der Gesundheitszustand von deutschen und ausländischen Kindern: Warum ist Mehmet gesünder als Maximilian? Gesundheitswesen 63, 741-747
- 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

- 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
- OECD (Hrsg.) (2006):
OECD in Figures 2006-2007 Edition, OECD Publications
- 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. (2006):
Of Salmon and time travellers – musing on the mystery of migrant mortality. International Journal of Epidemiology 35, 919-921
- 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
- Scholz, R.D., Jdanov, D.A. (2006):
Nutzung der Daten des Forschungsdatenzentrums der Rentenversicherung zur wissenschaftlichen Mortalitätsanalyse – Verfahren zur Korrektur der Bevölkerungsbestände der amtlichen Statistik im hohen Alter in Deutschland. In: Deutsche Rentenversicherung Bund (Hrsg.): DRV Schriften Band 55/2006, 200-211

- 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.) (2002):
http://web.archive.org/web/20040101-20041231re_/http://www.destatis.de/zensus/vz_87.htm; page opened January, 20th, 2008
- Statistisches Bundesamt (Hrsg.) (2005):
Fachserie 1 Reihe 2. Bevölkerung und Erwerbstätigkeit. Ausländische Bevölkerung sowie Einbürgerungen 2004. Wiesbaden
- Statistisches Bundesamt (Hrsg.) (2006):
Fachserie 1 Reihe 2.1. Bevölkerung und Erwerbstätigkeit. Einbürgerungen 2005. Wiesbaden
- Statistisches Bundesamt (Hrsg.) (2007a):
Sterbetafel 2004/2006 Deutschland;
<http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Statistiken/Bevoelkerung/GeburtenSterbefaelle/Tabellen/Content100/SterbetafelDeutschland,property=file.xls>; page opened December 10th, 2007
- Statistisches Bundesamt (Hrsg.) (2007b):
Fachserie 1 Reihe 2. Bevölkerung und Erwerbstätigkeit. Ausländische Bevölkerung. Ergebnisse des Ausländerzentralregisters 2006. Wiesbaden
- Statistisches Bundesamt (Hrsg.) (2007c):
Qualitätsbericht Wanderungsstatistik. Wiesbaden
- 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