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Mortality of Immigrants in Germany[1]

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Abstract

Several aspects determine the mortality of migrants. At first migrants are on average healthier than non-migrants. This "healthy migrant effect" is due to a self-selection process, chronically ill or disabled persons are less likely to migrate. Another selection process (unhealthy remigration effect, salmon bias effect) can be observed in case of remigration. These selection processes require a lower mortality of migrants, because only the fittest migrants are observable in the destination country, while the unhealthier groups rather stay in the country of origin. Further arguments are discussed (stress, social status, social integration, acculturation, health transition, biological and genetics aspects, environmental burden), when analyzing the interaction between migration and mortality.

Nearly all previous studies determined a lower mortality in migrant populations than in non-migrant populations. But these outcomes may due to a data lack. In Germany migrant mortality can hardly be calculated with official statistics, because this data show biases especially in migrant populations. Foreign nationals often fail to deregister at the local registry office when remigrate, that cause to an excessive number of the migrant population stock in Germany. Furthermore the number of deaths of migrants in Germany is underestimated, because migrants, who are not deregistered at the local registry office but remigrated and died abroad, are not included in the German death statistics. So, in case of analyzing immigrant mortality there is a double data lack. As a result migrant mortality will be underestimated. However, immigrant mortality studies based on official statistics should be interpreted carefully and should be adjusted by technical methods.

To estimate the mortality of migrants in Germany without data biases, other databases have to be used. Data from the German statutory pension insurance as well as data from the German central alien register (Ausländerzentralregister) are used in this study. These databases enable a non-biased estimation of the migrant mortality in Germany, selected by age, nationality, migration status and duration.

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[1] This paper is an English summary of 2 published papers (www.bamf.de/forschung). The arguments in this paper sole correspond to the author's opinion and must not agree with the Federal Office for Migration and Refugees (BAMF).

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1. Introduction

Mortality of migrants differs from mortality of non-migrants because of different living and social conditions (food, health care, working conditions) as well as different experiences in the country of origin. Numerous authors analysed the migrant mortality in classical immigration states as well as in several European countries (Krueger/ Moriyama 1967, Coleman 1982, Shuval 1982, Marmot/Adelstein/Bulusu 1984, Trovato 1985, Thomas/Caragas 1987, Kliewer 1992, Altenhofen/Weber 1993, Elkeles/Seifert 1993, Fabian/Straka 1993, Chaturvedi/ McKeigue 1994, Bollini 1995, Razum et al. 1998, Siahpush/Singh 1999, Abraido-Lanza et al. 1999, Harding 2000, Razum/ Rohrmann 2002, Jasso et al. 2004, Palloni/Arias 2004, Kyobutungi et al. 2005, Fennelly 2005, Ronellenfitsch et al. 2006, Zhang et al. 2006).

Migrants often show a lower mortality than the local population, in spite of the observed low socioeconomic status. This is a contradiction to the correlation of low socioeconomic status and high mortality known from several studies. Therefore, it is often referred as a “paradox”. Due to the immigrant group it is characterized as “Hispanic”, “Latino”, “Greek” or “Mediterranean” paradox.

But these results may due to a data lack. In Germany migrant mortality can hardly be calculated with official statistics, because these databases show biases especially in migrant populations. They often fail to deregister at the local registry office when remigrate, that cause to an excessive number of the migrant population stock in Germany. Furthermore the number of deaths of migrants in Germany is underestimated, because migrants, who are not deregistered at the local registry office but remigrated and died abroad, are not considered in the German death statistics. So, in case of analyzing immigrant mortality there is a double data lack. To estimate the mortality of migrants in Germany without data biases, other databases have to be used. Data of the German statutory pension insurance as well as from the German central alien register (Ausländerzentralregister) are used in this study.

2. Definitions

A migrant is a person who displaces his place of residence. A person is characterized as an international migrant when a national border is crossed and a minimum time is spended in the destination country. In Germany a person become migrant, when moving into a residence and registering at local registry office. Thus, minimum time of stay is not required. International definitions distinguish long-term from short-term migrants. Long-term migrants have to stay at least 12 months in the destination country „and who either must never have been in that country at least once continuously for more than

one year, must have been away continuously for more than one year since the last stay of more than one year" (UN 1998: 5). In contrast short-term migrants have to stay only 3 to 12 months in the destination country. Commuters, tourists and travelling persons are generally never characterized as migrants. Prior residence, migration reasons as well as the expected duration of stay also remain unconsidered in the German migration statistics.

This study includes persons, who have exclusively one or several foreign nationalities.[3] But it is problematic, if the persons themselves or the parents have the German nationality, but stayed much lifetime abroad. If the datasets make it possible, these persons of migrant origin are also included in the study. Other definitions are possible and are discussed controversially in the literature (BAMF 2007, Schimany 2007, Schenk 2007).

3. Mortality of Migrants – Theoretical Considerations

This study focuses upon the mortality of migrants and its determinants. But the mortality of a person is highly correlated with its morbidity. The more often a person suffer from diseases, the higher is the probability to die compared to a person who is concerned less by diseases. Therefore morbidity aspects are also discussed if it is necessary to explain the mortality of migrants.

3.1. Determinants on mortality of migrants

3.1.1. Statistical registration of migrants

To calculate the mortality it is generally required to determine the deaths and the population stock. The exact statistical registration of migrant deaths and migrant population stock is a special complexity (Weitoft et al. 1999, Palloni/Arias 2004). Especially the migrant population stock in Germany is overestimated in official statistics, because remigration is registered insufficient. Furthermore the deaths of migrants are underestimated, because deaths of migrants taking place outside Germany are not included in official deaths statistics. Due to the double data lack, there is an enormous underestimation of the mortality of migrants in Germany. Indeed, these data lacks cannot explain the total mortality difference between migrant and non-migrant population in Germany (Razum et al. 2000). Furthermore, biases in the migrant mortality occur, when age or nationality of migrants cannot be verified because of lost documents. Especially for refugees and asylum seekers these informations hardly can be controlled (Palloni/Arias 2004).

[3] When people have the german and another foreign nationality they are not included.

3.1.2. Selection processes at immigration

Selection processes at immigration are often used to explain the mortality differences between migrants and non-migrants which already described by Ravenstein (1885). These processes characterize the better health and mortality status of migrant persons in comparison to non-migrant persons (Ravenstein 1885, Lee 1966). Selection processes are possible at immigration and remigration. At immigration the process is characterized as healthy-migrant-effect. Thus, it is assumed that the (self) selection processes at migration lead to a temporarily lower mortality. The longer the length of stay, the lower is the mortality advantage compared to the non-migrant population. This decreasing mortality advantage is caused by the lower social status of the migrant population. As a result the origin better health status is lowering and finally be affected by the social status (Elkeles/Mielck 1997, Razum/Rohrmann 2002). Essentially the dimension of the healthy-migrant-effect is influenced by two determinants: geographical and economic distance (Jasso et al. 2004). The less the geograpical and economic distance, the less is the selectivity, because potential risks are minimized. If the „distance“ is much greater between countries, a potential migrant have to show special attributs (age, physical and psychical health).

Since 1949 migration to Germany was very variety, much more different migrant groups could be observed. Due to the immigrant group the healthy-migrant-effect should be different. For example the “guestworker”, immigrated to Germany from 1955 to 1973, were even medical checked in the country of origin (Mehle 1981, Altenhofen/Weber 1993, Elkeles/Seifert 1993). Because of this the healthy-migrant-effect is strengthened. Later, family unification were the typical immigration form, which the “normal” healthy-migrant-effect was observable. Further immigrant groups, ethnic Germans, Jews, Refugees, Asylum seekers etc., were observed in the last decades. The healthy-migrant-effect should be very different due to the migrant groups (Kohls 2008a). Until now empirical studies analysed this theme do not exist.

The selection processes at immigration might primarily affect the immigrant population itself und lowering with the length of stay (Williams 1993, Chaturvedi/ McKeigue 1994). In second and third immigrant generations mortality differences between immigrant and non-migrant population should not be observed any more. Rather social affected mortality differences should be become evident (Razum/Rohrmann 2002, Razum 2006).

Errors in interpretation can occur when analyzing healthy-migrant-effect. Thus, mortality can only be observed for huge migrant groups, for example Turkish migrants in Germany. Mortality of smaller migrant groups is hardly to analyse, because number of cases (deaths) are too less for significantly evidences. Thus, smaller migrant groups

have to be aggregated to maintain significant results. As a consequence mortality of smaller immigrant groups are hidden in favour of huge immigrant groups. A further problem is the heterogeneity within the total migrant population, because the proportion of low migrant mortality groups increases as a function of time (Dinkel/Kohls 2006).

3.1.3. Selection processes at remigration

Already Ravenstein (1885) verified in his „migration laws“, that after a big immigration wave a remigration wave can be observed a few years later. Besides, selection processes also occur at remigration (Dietzel-Papakyriakou 1987, Weber et al. 1990, Razum et al. 1998). These processes are often characterized as „salmon-bias-effect“ in academic discussion (Abraido-Lanza et al. 1999, Palloni/Arias 2004, Turra et al. 2005).

One possible reason to remigrate is weak health. Migrants remigrate rather when health issues are eminent. They expect better medical and psychological aid in the “well-known” country of origin (Dietzel-Papakyriakou 1987, Weber et al. 1990). This is often characterized as “unhealthy-remigration-effect” (Razum et al. 1998). Furthermore, migrants often remigrate when achieving a specific age limit, e.g. pension age (Abraido-Lanza et al. 1999). If diseases are observable additionally, the probability to remigrate highly increases (Dietzel-Papakyriakou 1987). Thus, it is the “last wish” for some migrants to spend their time left in the “well-known” country of origin (Courbage/Khlat 1996). Further reasons to remigrate are dissatisfaction as a result of unemployment, unfulfilled intentions, low social integration and permanent economic, politic or social discriminations (Fabian/Straka 1993, Abraido-Lanza et al. 1999).

Selective remigration processes can cause a methodical bias, characterized as „late-entry-bias“ (Clayton/Hills 1993). Thus, migrants are included in studies many years after immigration date. Between that date and the beginning of the study a selective part of the original migrant population remigrated unobserved. So, the migrant mortality seems to be below average.

3.1.4. Selection processes at work

The healthy-worker-effect is often consulted to explain migrant mortality (Razum et al. 1998). This selection process indicates, that working people are on average healthier than non-working people, especially in hard physical jobs. It is based on self-selection processes. Thus, only strong physical and health persons tend to accept hard jobs (McMichael 1976, Fox/Collier 1976).

The healthy-migrant-effect und the healthy-worker-effect are highly correlated. But the healthy-migrant-effect is more important when analyzing migrant mortality, because self-selection processes at migration occur before beginning a job. Thus, the healthy-worker-effect can be understood as a consequence of the selection process at migration (healthy-migrant-effect). Against it, the healthy-migrant-effect is eminent when analyzing differential mortality without consideration of migrants, because this effect can explain the self-selection and heterogeneity within the population.

3.1.5. Migration and stress

The physical and psychological health status is determined by period events as well as by enourmous changes in the social and cultural environment (Trovato/Clogg 1992). Besides, varied consequences are possible as a function of personal resources as well as from the social context (Faltermeier 2005). However, the causality between migration and stress is absolutely ambivalent. At first, stress in its varied forms (e.g. war, refugee) can even cause the decision to migrate. On the other hand stress can be understood as a result of the immigration, because unknown climate, social and cultural conditions rule in the destination country, which requires adaption processes (Hull 1979, Shuval 1982, Kasl/Berkman 1985, King/Locke 1987, Kliewer 1992). In this context, the prevalence in migrant mortality concerning external diseases (car accidents, suicide, homicide and other accidents) is much higher than in the non-migrant population (Marmot et al. 1984, Young 1987, Trovato/Clogg 1992).

3.1.6. Migration and social status

Migrants are often confrontated with social aspects, besides health and economic factors (Collatz 1994, Bollini/Siem 1995, Siahpush/Singh 1999). Numerous studies found out, that persons with low social status show a high prevalence of cardiocascular diseases with high mortality and morbidity rates (Oppolzer 1986; Marmot et al. 1991; Elkeles/Seifert 1993, 1996; Klein 1993a, 1993b; Steinkamp 1993; Voges 1996; Elkeles/Mielck 1997; Helmert et al. 2002). According to this a low social and economic status cause to an increasing mortality risk and lower life expectancy.

3.1.7. Migration and length of stay

The linking between migration decision and length of stay is narrowly connected with the discussion about adaption of migrants in the destination country. It is often characterized as an acculturation process (Kliewer 1992, Jasso et al. 2004) or assimiliation

process (Jasso et al. 2004). Therefore migrants use the well-known life style and behaviour of the country of origin as well as the social network and the benefits of ethnic communities in the destination country (Abraido-Lanza et al. 1999, Palloni/Arias 2004). Migrants are thereby protected against the (potential unhealthy) life style of the destination country. As a result they have a better health and lower mortality than the non-migrant population (Abraido-Lanza et al. 1999, Palloni/Arias 2004). For this reason it is often observed a convergence between migrant and non-migrant mortality, influenced by the length of stay in the destination country (Kliewer 1992). It is explained by change from healthy to unhealthy food, health and risk behaviour, but also by socioeconomic discrimination in the destination country (Kliewer 1992, Razum/Rohrmann 2002, Jasso et al. 2004).

3.1.8. Migration and health

Health status as well as its impacts on migrant mortality was already analyzed in the 1960s in Germany, short after the beginning of the recruitment of guestworkers. Besides, the incidence of typical infectious diseases at migrants were examined essentially (Mehle 1981, Kentenich et al. 1984). Later, the focus was on studies about food, health behaviour, health care and their impacts on migrant mortality (Collatz 1989, Zeeb et al. 2000, Schenk 2002). Studies about the (negative) impacts of high working intensity and bad working conditions of migrants were also performed. Especially the high prevalence of chronically ill migrant as well as early pension age gave reasons for this research (Altenhofer/Weber 1993, Elkeles/Seifert 1993, Becher et al. 1997).

3.1.8.1. Causes of deaths

Numerous studies showed that migrant suffer more from infectious diseases than non-migrants (Mehle 1981, Marmot et al. 1984, Korporal 1990). E.g. the prevalence of tuberculosis is higher for migrants than for non-migrants. It is attributed to the fact that immigrants often got the primary infection in the country of origin (Haas et al. 2006). Therefore specific migrant groups (ethnic Germans form former Sovietunion, refugees, asylum seekers) are committed to preventive tuberculosis screening, whose advantage is controversial (Bales et al. 2003, Coker 2004). Although the incidence of tuberculosis at migrants is higher in any age group, no difference can be observed in total mortality between migrants and non-migrants. Merely in the higher ages (65 and older) migrant mortality concerning tuberculosis is clearly higher than for non-migrants (Haas et al. 2006).

As a result of insufficient store and cooling systems for nutrition, which is typical for less developed countries, another fact arises that immigrant from these countries often suffer from gastro-intestinal cancers. The responsible virus “helicobacter pylori” can grow especially in insufficiently stored food. By long-term exposure with this virus the prevalence is high in gastro-intestinal cancers (Rothenbacher et al. 1998). Other diseases occur subnormal at migrants. Thus migrants show cardiovascular diseases far less than non-migrants, although the risk factor “adipositas” is twice as high (Kurth/Schaffrath-Rosario 2007). This is justified by different food customs, especially concerning the choice of fat acid. Thus more unsaturated vegetable fat is consumed in Meditterranean states, while in Western and Central Europe rather the consumption of saturated animal fat dominates (Courbage/Khlat 1996, Kouris-Blazos 2002). In fact there are still controversial medical discussions about the causal effects of Mediterranean nutrition on mortality (Danesh et al. 2007).

The mortality differences between migrants and non-migrants as well as between several migrants groups often linked to the macro-model of health transition or epidemiologic transition (Omran 1971, Razum/Twardella 2002). This model describes the transition from high mortality patterns with high prevalence in infectios diseases and high infant and pregnant mortality to a lower mortality pattern with mainly chronic, non-infectious diseases (Omran 1971, Dinkel 1989, Razum/Twardella 2002, Schimany 2003, Kohls 2008a). More or less definable interphrases exist between initial stage and final stage, similar to the model of demographic transition, first described by Notestein (1945). Therefore high-developed countries of Western Europe and North-America have already reached the final stage of the health transition, while less developed states, like almost all countries of Africa, are still at the beginning of this transition.

3.1.8.2. Health behaviour

The differences at the macrolevel between migrants and non-migrants, shown in different mortality patterns, are influenced at last by life-style caused differences on the individual (micro) level. Besides, the health behaviour consists of food and risk behaviour as well as of risk and health consciousness. It can be supposed, that migrants adapt the health behaviour of the destination country with increasing length of stay. Thus, e.g. immigrants from the former Sovietunion have a roughly identical cigarette and alcohol consumption than the German population. However, the ingestion of the daily alcohol amount results from high-alcohol drinks (Aparicio et al. 2005). In other studies about alcohol and cigarette consumption about of migrants no higher consumption could be proved (Schenk 2002, Zeeb et al. 2002, Settertobulte 2005). Among the Turkish migrants there were different smoking patterns in the 1960 and 1970s. Turkish immigrants

showed a lower incidence in lung and larynx cancer, although the proportion of smokers was higher than in the German population. It is justified to the tabac consumption per day, which was much lower than in the German population (Zeeb et al. 2000, Razum/Twardella 2004).

3.1.8.3. Health care

The inequality of health care between migrants and non-migrants as well as the social affected usage of health care were already discussed shortly after the beginning of the first wave of guest worker immigration in the 1960s (Mehle 1981, Collatz 1989, Lechner/Mielck 1998, Schenk 2007). Ethnic Germans from the former Sovietunion and other immigrants differ barely from the non-migrants concerning the use of health care (Aparicio et al. 2005). However, several studies found out that ethnic Germans from the former Sovietunion take part subnormal in cancer screenings. Language problems, lacking information as well as cultural differences support this behaviour (Duncan/Simmons 1996, Zeeb et al. 2004, Aparicio et al. 2005). Screenings concerning dental health and vaccination are also claimed subnormal by young immigrants (Gesundheitsamt Nürnberg 1997). It can be due to the fact that migrants avoid preventive medical checks because such checks were unusual in the country of origin (Schenk 2002).

3.1.9. Environmental burden and toxin

Migrants from less developed countries might have been suffering more from environmental poisons and toxins than migrants from higher developed countries because environmental protection laws and their implementations do not agree with them of high-developed countries. E.g. the toxins emerge from insufficient cooling and transport possibilities. The long-term consequence of the permanent exposure can be gastro-intestinal cancers, which occur above average in the destination country (Rothenbacher et al. 1998). Other burdens by environmental poisons, toxins or ray charges are even very likely (Zeeb/Razum 2006). Indeed, the linking to the selection hypotheses are taken into consideration. If the migrants have survived the charges by environmental poisons and toxind in the country of origin, these persons have arisen as a “beneficiary” of a selection process. As a result they might show an above-average health. Studies analyzing this hypothese have not been published up to now.

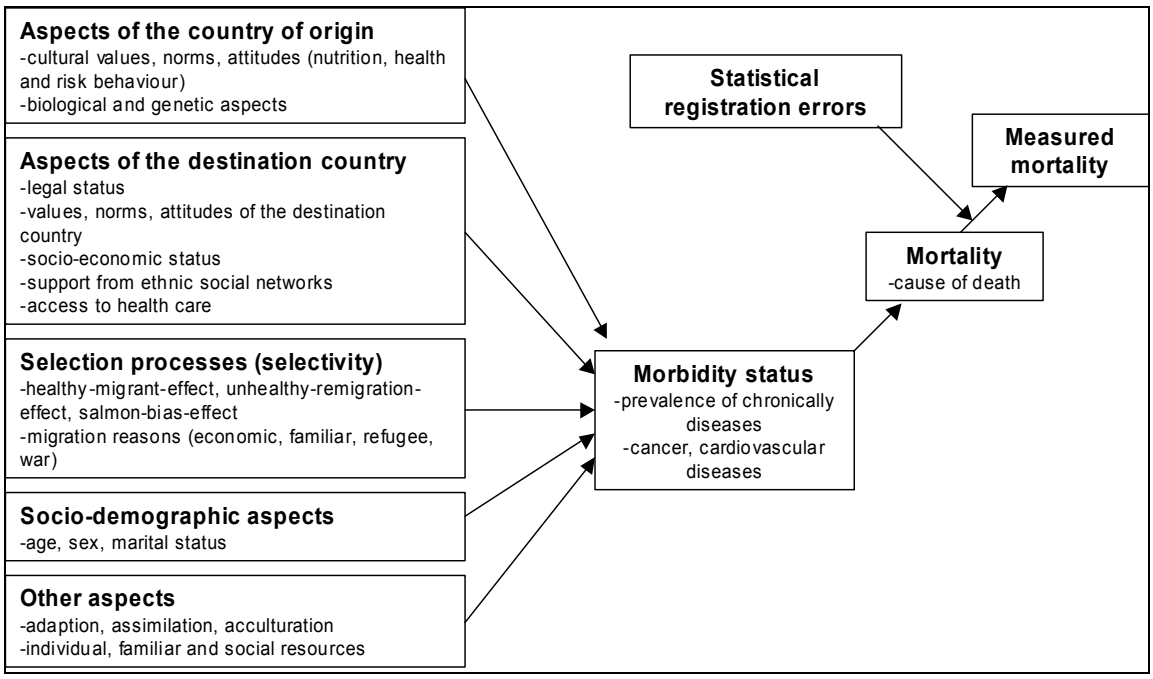
3.1.10. Biological and genetic impacts

Biological and genetic impacts on migrant mortality are discussed as a central theme rather seldom. Genetic anomalies often occur in populations from certain geographic regions, which can be typical adaptations to local conditions (Zeeb/Razum 2006, Schenk 2007). Thus the mutations, which can lead to the sickle cell illness, are to be found in African tropical contries. Indeed, persons with this genetic anomaly are more resistant against malaria than persons without this mutation (Dickerhoff et al. 1998, Trovato 2003). In addition, persons from Turkey and Middle East occur bad constellations of the blood lipids as well as accumulation of congenital metabolism diseases (Hergenc et al. 1999, Schenk 2007).

3.2. Model of determinants on migrant morbidity and mortality

A broad model to explain the mortality and morbidity of migrants must bring together the explanation hypotheses systematically. An analysis basis that encloses all potential determinants is thereby created. The following model is suggested in summary of the previous section and based on Trovato (2003) and Schenk (2007) (fig. 1). On this occasion, single determinants were summarized to better clarity. Thus, the mortality of migrants is influenced by aspects of the country of origin, aspects of the destination country, selection processes, socio-demographic aspects as well as other factors, whereas the relevance of the impacts changes as a function of the length of stay.

Fig. 1: Model of determinants on migrant morbidity and mortality



Source: own figure based on Trovato (2003) and Schenk (2007).

4. Data sets and empirical results

The research deficits were caused by missing databases in the field of migrant mortality in Germany. Previous studies exclusively based on official statistics that, however, show errors especially at migrant populations. Hence, beside the official statistics, other databases are introduced to potentially analyze the migrant mortality in Germany.

4.1. Data Sets

4.1.1. Official death statistics, cause of death statistics

The most important database of migrant mortality analyses is the official death statistics, which was founded already in 1870 with data of the age and cause of death. Since 1971 deaths also were differentiated by single age and nationality. Stratification by cause of death is possible only for five-year age groups. Thus, detailed analyses (with single age, nationality, cause of death, marital status etc.) can be realized only in special evaluations in the German Federal Statistical Office. The registration status and the place of death also matter beside the nationality to the official death statistics because only deaths are included who have also taken place in Germany (Richter 2006). Nevertheless, this database is the most often used base of morbidity and mortality analyses in Germany.

4.1.2. Central Alien Register (Ausländerzentralregister, AZR)

All foreigners officially registered in Germany are recorded in the nationwide central alien register (Ausländerzentralregister, AZR), including information about age, sex, nationality, date of immigration, registration status and time of death. A disadvantage of the register is that after naturalization all individual informations are immediately extinguished. Besides all individual data is also completely cancelled from the AZR if the time of death dates back more than 5 years. So, long-term migrant mortality analyses are not possible.

4.1.3. Statutory pension insurance (Gesetzliche Rentenversicherung, GRV)

Migrant mortality analyses are also possible based on data of the statutory pension insurance (GRV). Detailed individual informations are recorded in the GRV, e.g. age, sex, nationality or career history. The GRV databases show a very high validity because the registration status of a pensioner depends directly on a pension payment (Scholz 2005). Status changes, e.g. death, immigration, emigration, are thereby documented exactly. A

disadvantage of the database is that the persons in the GRV do not represent the German population because certain groups like self-employed, officials or also housewives are not included.

4.1.4. Statutory health insurance, hospital statistics

Since 2001 a new database is available as a result of the act of the reform of the risk structure compensation scheme in the statutory health insurance with individual demographic and health informations about members of the statutory health insurance. However, the nationality or the migration status is not included, although at least the nationality is recorded routinely. Hence, migrant mortality analyses are only possible with special evaluations lead-managed by the compensory health insurances funds (Geyer/Peter 1999).

Indeed, nationality is observed in the hospital statistics. However, is encoded not the nationality, but the place of residence (Razum/Zeeb 1998, German Federal Statistical Office 2007). Immigrants registered in Germany are characterized therefore as "Germans", while Germans registered abroad are ranked as a "migrant". Hence, migrant mortality analyses based on hospital data are not possible.

4.1.5. Institution for statutory accident insurance and prevention (Berufsgenossenschaft)

The institution for statutory accident insurance and prevention collects health data to check the entitlements to insurance benefits. Besides, the nationality is also evaluated, which detailed analyses of occupational accidents, travel accidents as well as company-medical examinations are possible (Becher et al. 1997). However, migrant mortality analyses based on this data are hardly possible because deadly occupational accidents are very rare in these days.

4.1.6. Data from cross-sectional and panel surveys

The Socio-Economic Panel (SOEP), a panel survey started in 1984, is one of the most important databases in social research. In principle migrant mortality analyses are possible with it. Indeed, only few migrant deaths occurred since 1985 whereby the results of migrant morbidity and mortality analyses are barely significant.

In the annually microcensus, a representative 1 % nationwide survey, sociodemographic and health issues are observed, which, however, only allow conclusions about

migrant morbidity. Other databases, e.g. the Alterssurvey or the Bundesgesundheitssurvey likewise contain information about migrant morbidity and mortality whom, however barely significant results admit on account of the case numbers as well as of the selection processes.

4.1.7. Case-Control-studies in epidemiology

Case-control-studies are standard in epidemiological research to compare groups with an attribute to groups do not show the attribute (Breslow/Day 1987, Clayton/Hills 1993). Nationality is also observed in these studies. Significant results are not deducible because of the low case number and the selection processes in the studies until now.

4.2. Quantitative studies concerning migrant mortality in Germany

Migrant mortality studies are unusually rare in Germany, in spite of the high number of 6.75 million migrants - many other European countries have a smaller population. It may due to the restricted quantity of suitable and available databases. The statistical offices still registered early that the immigrants show a different demographic pattern in comparison to the German population. This was also discussed in several publications, but which were not systematical (German Federal Statistical Office 1951, 1966, 1971, 1974a, 1974b).

4.2.1. All migrant groups

Numerous studies based on official statistics found out that the infant migrant mortality were higher than the German infant mortality since 1970 (Weber et al. 1990, Korporal 1990, Mammey 1990, Mammey/Schwarz 1995, Roloff 1997). The causes of this higher mortality are the increased prevalence of infectious diseases and innate malformations, which can be a result of deficits in the health care of pregnant migrants. Moreover, migrants have shortlier pregnancy duration than Germans that also can raise the migrant infant mortality (Weber et al. 1990).

Studies based on official death statistics showed that migrant mortality in the younger ages (age 1 to 16) were higher than for German children (Weber et al. 1990, Korporal 1990, Mammey 1990, Linke 1995, Roloff 1997). It may due to the increased risk of migrant’s children to die as a follow of an accident. However no differences are noticeable in other causes of death between both population groups, e.g. external causes, poisoning or cancer. However, German mortality in the ages between 16 to 25 years is slightly

higher than migrant mortality, while Germans from 25 to 65 years have a clearly higher mortality than migrants (Weber et al. 1990, Mammey 1990, Altenhofen/Weber 1993, Linke 1995, Roloff 1997). This trend can be also ascertained in the causes of death mortality. Only the traffic accident mortality as well as maternal mortality was for migrants higher than for Germans, but mostly in younger ages.

Migrant mortality studies based on compulsory health insurance and SOEP showed also a low mortality of migrants, but the results were barely significant on account of the low case numbers (Helmert et a. 2002, Razum/Rohrmann 2002). Razum et al. (1999) examined the maternal mortality based on official cause of death statistics and found out that migrants dies exceptionally often as a result of a pregnancy. However, since 1980 this higher maternal mortality has clearly decreased that is to be led back to the support of the pregnant health care especially for migrants (Razum et al. 1999). Hence, other factors, like the parity and/or socioeconomic status, might be responsible for the observable mortality difference between migrant and German women. The mortality of the migrants in the ages above 65 has not been analysed up to now yet systematically because the case number of the elder migrants as well as the number of migrant deaths were too small. Roloff (1997) showed with official death statistics that the migrant mortality was approx. 60% lower than the non-migrants mortality in the age groups over 60. However, on account of the systematically errors in the old migrant population the validity of this analysis is considerably limited. Scholz (2005) used the databases of the statutory pension insurance and found out that migrant pensioners show a clearly lower mortality than German pensioners. Salzmann/Kohls (2006) analyzed in a rather methodical article also the migrant mortality in the statutory pension insurance and could likewise prove a higher German mortality in comparison to migrant population. However, the authors showed that as a result of the small case numbers the observed differences between migrants and non-migrants are not clearly significant.

4.2.2. Specific migrant groups

The analysis of migrant mortality for specific migrant groups in Germany is extremely difficult because the classification of nationality is only dichotomous in official statistics. In fact, migrant mortality has been analysed only for the greatest migrant groups in Germany so far, Turkish migrants and ethnic Germans from the former Sovietunion.

4.2.2.1. Turkish Migrants

Presently Turkish migrants are with 1.74 million the greatest migrant group in Germany. Their proportion amounts to approx. 26%. Razum et al. (1998) examined the mortality of

Turkish migrants in Germany from 1980 to 1994 based on official statistics and compared it to the mortality of the German population as well as to the Turkish population in Turkey. Thus, Turkish migrants in Germany had a lower mortality than the German population as well as a much lower mortality compared to the Turkish population in Turkey. The mortality differences between Germans and migrants were greater in higher ages. The first Turkish migrant generation in Germany, which was in 1994 older than 45 years showed a 50% lower mortality than the German population. Indeed, the second generation, which was in 1994 younger than 35 years had likewise a low mortality, however, it was only approx. 20% lower than the German population.

In another study Razum et al. (2000) examined the mortality of Turkish migrants in Germany based on the SOEP. The authors ascertained also a low mortality of the Turkish migrants compared to the German population, which is barely significant, however, on account of the small case numbers and selection processes. Razum et al. (1998) analysed the cardiovascular mortality based on official death statistics and showed that the Turkish mortality was lower than the German mortality (Porsch-Oezcueruemez et al. 1999). Indeed, the differences were not so strongly between migrant and non-migrant as in the analysis of the total mortality and men showed greater differences than women.

Zeeb et al. (2002) analyzed the cancer mortality based on official cause of death statistics from 1980 to 1997. Besides, the authors found out that Turkish persons showed much lower cancer mortality than German persons. But while the cancer mortality of Germans decreased overtime, it easily increased for Turks. The most frequent cause of death of all cancers equally were lung, followed by gastro-intestinal cancer. Women died most often from breast cancer, followed by gastro-intestinal cancer and lung cancer. The subnormal cancer mortality of Turkish migrants is often explained by the health transition that indicates that less-developed countries have a different cause of death pattern than high-development countries.

Razum/Zeeb (2004) analysed furthermore the suicide mortality of the Turkish population based on a special evaluation of the official statistics. The authors ascertained a clearly subnormal suicide mortality by Turkish migrants in comparison to the German population. Besides, the Turkish men showed a higher risk to die from suicide than Turkish women. The age group of the 10 to 17-years-old Turkish girls was an exception that had increased suicide mortality in comparison to German girls and Turkish boys of the same age group. The generally low suicide mortality of Turkish migrants is influenced by aspects of the country of origin (attitudes to suicide) and strong social cohesion within the family, which also cause the low suicide mortality in Turkey. However, the strong social cohesion as well as conflicts concerning tradition and modernization can be a reason, why young Turkish girls show high suicide mortality (Razum/Zeeb 2004).

4.2.2.2. Ethnic Germans from former Sovietunion (Aussiedler)

The analysis of the mortality of ethnic Germans from the former Sovietunion (Aussiedler) is practically very difficult because these migrants assume the German nationality automatically by acceptance of the ethnic German status. Thus they are distinguishable no more from the German population.

Kyobutungi et al. (2005) examined the migrant mortality of ethnic Germans from the former Sovietunion based on a follow-up-study (Klug et al. 2003). The results were surprisingly: The mortality of these migrants was significantly lower than the non-migrant population of North Rhine-Westphalia. In comparison to the population of the country of origin the mortality was lower even about the factor 2 to 4. The authors also analyzed the deaths of external causes (accidents, suicide) and found out that these migrants die more often by external causes than the non-migrant population of North Rhine-Westphalia. In direction was to be observed that the accident mortality was in younger ages higher than in older ages and the suicide mortality declined with increasing length of stay. Other impacts, like age, sex and family status were likewise analyzed. Indeed, the case numbers decreased clearly with increasing stratification by which the results reached no more the necessary significance level.

Using the same database the same authors analyzed the cardiovascular mortality of the ethnic Germans from the former Sovietunion (Ronellenfitsch et al. 2006, Becher et al. 2007). They expected a very high cardiovascular mortality because of the observable crisis cardiovascular mortality in the country of origin. In fact, the ethnic Germans from the former Sovietunion showed a lower cardiovascular mortality than the German population, whom were extremely low in higher ages and long length of stay. The explanation of this surpring fact could be that this migrant group was an especially selected population in the country of origin, which shows special health, risk and social behavior in comparison to the majority of the formerly Soviet population. This also could be ascertained in the Jewish population in Moscow (Shkolnikov et al. 2004).

5. Empirical results

5.1. Migrant mortality analyses based on official statistics[4] from 1961 to 2006

5.1.1. Total mortality

The mortality differences between migrants and Germans can be shown in the official statistics particularly with the crude death rate (CDR). Thus the CDR of migrants is always much lower (both sexes) since 1961 than those of the German population (tab. 1). In 2006 CDR for Germans shows a value of 10.1 deaths per 1,000 residents (women: 11.1 per 1,000), while for foreign men a value of 2.9 deaths per 1,000 residents (women: 1.8 per 1,000) is measured. Using this measure the mortality of male Germans is about 3.5 higher than for migrants, with female German it is even 6.1 times as high as for migrants (tab. 1).

In the study period the age structure of the migrants was considerably younger than those of the German population. Hence, the CDR is a much-restricted measurement on account of their strong dependence on age structure. However the direct method death rate (DMDR)[5] represents the mortality without "interference" of the particular age structure. Thus male Germans show in 2006 a DMDR[6] of 7.4 deaths per 1,000 residents (women: 4.6 per 1,000), while for male migrants a value of 3.8 deaths per 1,000 residents (women: 2.5 per 1,000) is measured (tab. 1). Using this measurement the German mortality is twice as higher as for migrants (both sexes). Thus, the relative mortality difference between both population groups is much lower than in case of calculate the CDR. The CDR and DMDR of male German sank from 1971 to 2006 continuously (fig. 2, 3). The trend of the DMDR of female German proceeded similarly. The small increase of the CDR of female Germans till 1990 is caused by the age structure, which is older than for the male population.

[4] In this study only the former Federal German Republic is included to avoid breaks in the time-series. In fact death of migrants are rarely in the New Laender because of the small migrant population stock.
[5] See Chiang (1984).
[6] In the following the DMDR is always characterized as the direct method death rate measured by the WHO standard population for Europe from 1976.

Tab. 1: Selected mortality measures of Germans and migrants in the Federal Republic of Germany[1] (Official statistics) from 1961 to 2006, both sexes

	1961[2]	1970	1975	1980	1985	1990	1995	2000	2005	2006
Men										
Crude death rate, $d_{t,M}$, per 1.000										
Germans	11,2	13,3	13,4	12,7	12,3	11,7	11,2	10,5	10,2	10,1
Migrants	5,9	3,1	2,5	2,3	2,1	2,2	2,2	2,5	2,9	2,9
Relation	1,90	4,31	5,37	5,51	5,90	5,23	5,21	4,25	3,56	3,51
Direct method death rate, $d_{t,st,M}$, per 1.000										
Germans	n.a.[3]	14,7	14,4	12,8	11,8	10,8	10,0	8,7	7,7	7,4
Migrants	n.a.	10,5	7,7	6,1	4,8	5,7	4,8	4,3	4,0	3,8
Relation	n.a.	1,40	1,86	2,11	2,45	1,91	2,07	2,02	1,90	1,93
Standardized mortality ratio, $SMR_{t,M}$, Reference: Germans										
Germans	n.a.	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Migrants	n.a.	0,7198	0,5744	0,5515	0,4373	0,5521	0,5113	0,5138	0,5127	0,5034
Relation	n.a.	1,39	1,74	1,81	2,29	1,81	1,96	1,95	1,95	1,99
Life expectancy[4], $e_{0,t,M}$, in years										
Germans	n.a.	67,3	68,0	69,8	71,4	72,6	73,6	75,3	76,8	77,2
Migrants	n.a.	70,9	74,8	77,4	80,3	79,1	80,7	81,6	82,2	82,7
Relation	n.a.	3,6	6,8	7,6	8,9	6,5	7,0	6,3	5,4	5,5
	1961	**1970**	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**	**2006**
Women										
Crude death rate, $d_{t,F}$, per 1.000										
Germans	11,2	11,7	12,2	12,0	12,3	12,5	12,2	11,5	11,2	11,1
Migrants	5,9	2,6	1,9	1,4	1,3	1,3	1,3	1,6	1,8	1,8
Relation	1,90	4,45	6,36	8,33	9,45	9,65	9,08	7,09	6,37	6,07
Direct method death rate, $d_{t,st,F}$, per 1.000										
Germans	n.a.	9,5	8,9	7,7	6,9	6,3	5,8	5,2	4,8	4,6
Migrants	n.a.	6,7	4,6	3,1	2,5	3,1	2,8	2,8	2,5	2,5
Relation	n.a.	1,42	1,95	2,45	2,72	2,06	2,10	1,87	1,89	1,85
Standardized mortality ratio, $SMR_{t,F}$, Reference: Germans										
Germans	n.a.	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Migrants	n.a.	0,7642	0,6193	0,4768	0,3646	0,5172	0,4895	0,4994	0,4485	0,4514
Relation	n.a.	1,31	1,61	2,10	2,74	1,93	2,04	2,00	2,23	2,22
Life expectancy[4], $e_{0,t,F}$, in years										
Germans	n.a.	73,8	74,8	76,8	78,2	79,2	80,1	81,3	82,2	82,5
Migrants	n.a.	77,2	80,9	84,2	86,0	85,1	85,8	85,6	86,2	86,2
Relation	n.a.	3,4	6,1	7,5	7,8	6,0	5,7	4,3	4,0	3,7

Source: own calculations based on data of the German Federal Statistical Office.

[1] 1961-1997: former Federal Republic of Germany (Old Laender).
1998-2006: former Federal Republic of Germany (Old Laender) and East Berlin.
[2] Linke (1995:128), not analyzed by sexes.
[3] n.a. = Not available.
[4] Using Chiang-Formula, ${}_nf_x$ from the German Life Table 1986/88.

The decline of the migrant's CDR and DMDR was not synchronically to the German population. While the CDR decreased from 1970 to 1986 at first and stagnated then till 1994, it increased from 1995 to 2006 even easily (both sexes). It is justified by the rather irregular age structure of the migrant population and, hence, should not be overstated. The DMDR with its age-adjusting represents the migrant mortality pattern more dependably. Thus there was at first a strong decline of the DMDR from 1971 to 1974 which steady dropping followed up to 1986. However a strong increase of the DMDR was to be observed in the years 1987 and 1988 as a result of the census in Germany. Because of that especially the migrant population stock was corrected considerably down (Fleischer 1989). Thus, the reduction of the migrant population stock leads with unchanged death numbers automatically to a rising DMDR what could be clearly observed in the years 1987 and 1988. The causes of the overestimation of the migrant population stock were the missing deregistration of emigrating foreigners as well as the non-consideration of naturalizations (Fleischer 1989).

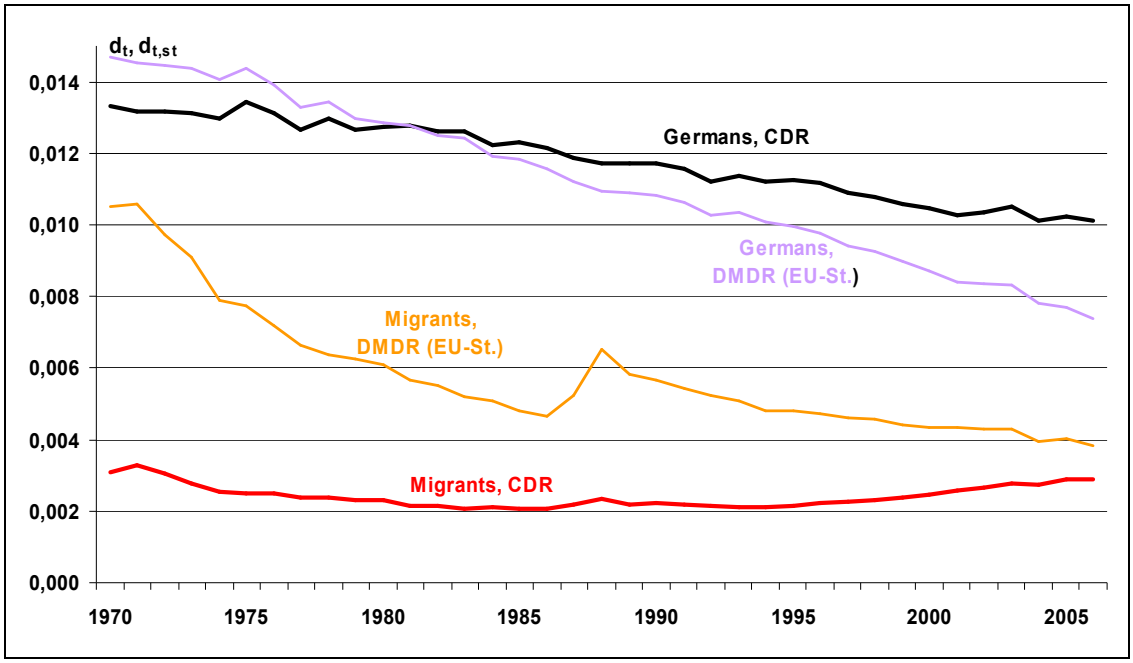
A non-biased comparison of the mortality of migrants and Germans was possible in 1988 because that year's migrant population stock were already corrected by the census in 1987. Hence, in 1988 DMDR of the German population was only 1.7 times as high as for the migrant population. From 1989 to 1990 the relative mortality of the Germans increased once more because the biases of the migrant population stock became more important attended by a declining DMDR of migrants. After 1990 the relative mortality difference between Germans and migrants decreased again (both sexes), so that in 2006 the DMDR of the Germans was about 1.9-times higher than for the migrant population.

Another form of (indirect) standardization measures is the standardized mortality ratio (SMR)[7] with it same mortality patterns could be ascertained as in standardized death rate (tab. 1). Another measurement of mortality analysis is the life table. Therewith it is possible to age-standardize the mortality pattern of a population and cumulate it in the indicator "expectation of life at age 0".[8] In fig. 4 can be shown that the trend of life expectancy corresponds to the results of DMDR (fig. 2, 3).

[7] In German academic literature also charakterized as "Methode der erwartungsmäßigen Ereignisse" (Flaskämper 1962). Flaskämper (1962) said, that already Tetens introduced the measurement in 1785 in actuarial science. In early English literature also named as "comparative mortality index" (Spiegelman 1955). Today is common "standardized mortality ratio" (SMR) (Chiang 1984).

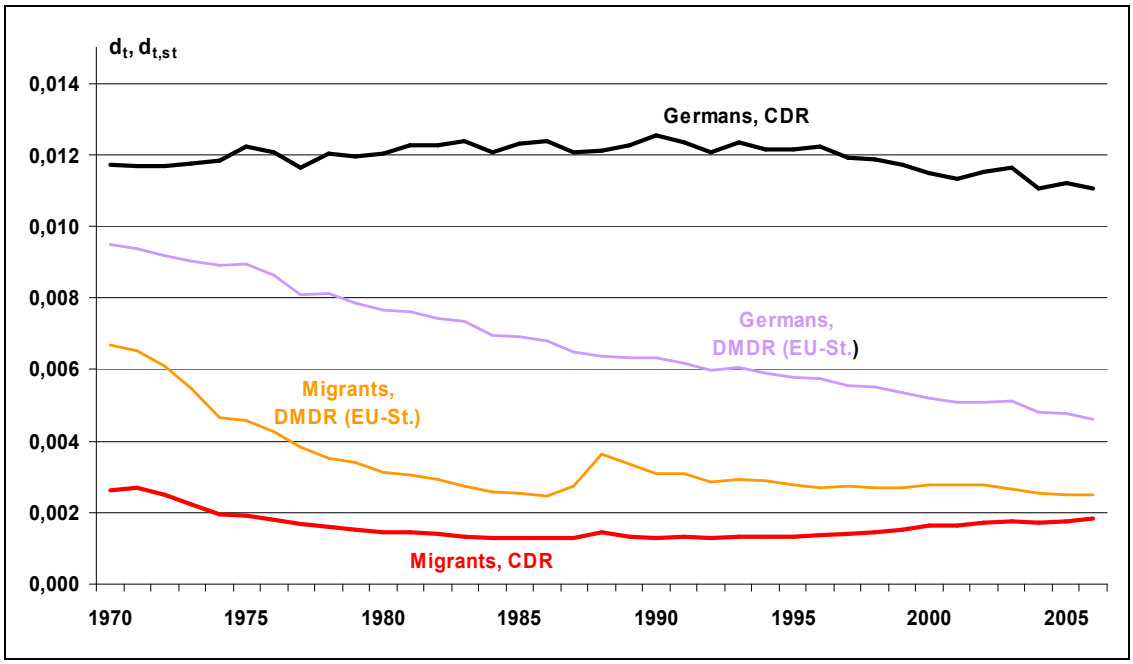
[8] The computation of life expectancy can be referred in demographic literature (see Flaskämper 1962, Spiegelman 1955, Feichtinger 1973, Pollard 1974, Esenwein-Rothe 1982, Chiang 1984, Preston et al. 2001).

Fig. 2: CDR and DMDR[1] of Germans and migrants in the Federal Republic of Germany[2] (Official statistics) from 1970 to 2006, men



Source: own calculations based on data of the German Federal Statistical Office.

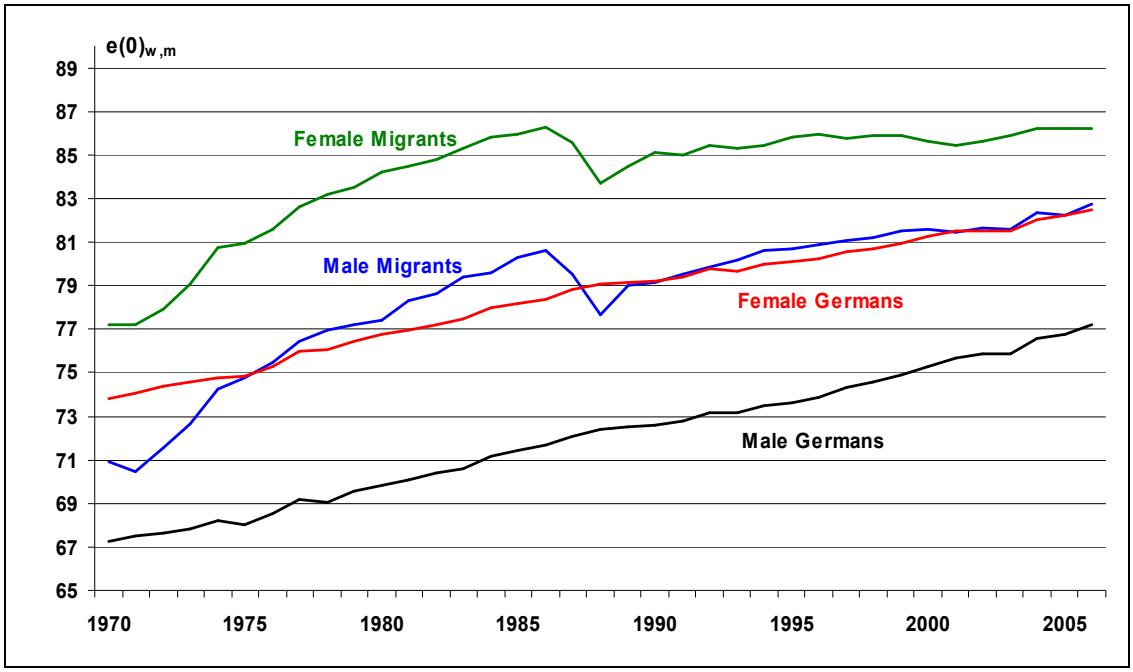
Fig. 3: CDR and DMDR[1] of Germans and migrants in the Federal Republic of Germany[2] (Official statistics) from 1970 to 2006, women



Source: own calculations based on data of the German Federal Statistical Office.

[1] Standard population: Europe, WHO 1976.
[2] 1970-1997: former Federal Republic of Germany (Old Laender).
1998-2006: former Federal Republic of Germany (Old Laender) and East Berlin.

Fig. 4: Life expectancy[1] of Germans and migrants in the Federal Republic of Germany[2] (Official statistics) from 1970 to 2006, both sexes



Source: own calculations based on data of the German Federal Statistical Office.

[1] Using Chiang-Formula, ${}_nf_x$ from the German Life Table 1986/88.
[2] 1970-1997: former Federal Republic of Germany (Old Laender).
1998-2006: former Federal Republic of Germany (Old Laender) and East Berlin.

Thus it can be found out that in 1971 the difference of life expectancy between male Germans and male migrants was approx. 3 years. After that year the difference continuously increased and amounted in 1986 about 9 years. In 1988 the spread of the life expectancy dropped drastically to 5.3 years due to the corrected migrant population stock as a follow of the census 1987. From 1988 to 1990 the difference rose again and sank from 1994 to 2006 slowly from 7.1 to 5.5 years. The women's trend ran similarly, indeed, the differences were not so extreme between the German and migrant population. While from 1971 to 1986 a continously increase from 3.2 to 7.9 years was observed, a drastic reduction to 4.6 years followed till 1988. From 1988 to 1990 a temporally increase to 6.0 years could be noticed. Afterwards the difference of the life expectancy between female German and migrants sank slowly to 3.7 years till 2006.

5.1.2. Causes of death analyses from 1980 to 2006

The mortality trends in causes of death can be described best if these are presented together. Thus it is recognizable that since 1980 the prevalence of cardiovascular diseases has clearly decreased because this cause of death declined strongly (fig. 5; 6). It can be summarized that the mortality decreased in external causes and cardiovascular diseases exceptionally, while the mortality in cancer and other causes has sunk rather

subnormal. The trends of German and migrant mortality proceeded uniformly. Thereby the migrant mortality has decreased in external causes far stronger in comparison to the cancer mortality. In contrast the cancer mortality of female migrants increased from 1980 to 2006 even about 20%. According to this the percentage of this cause rose continuously. Thus the causes of death concerning to cancer became majority in migrant population, while in the German population most deaths are still caused by cardiovascular diseases.

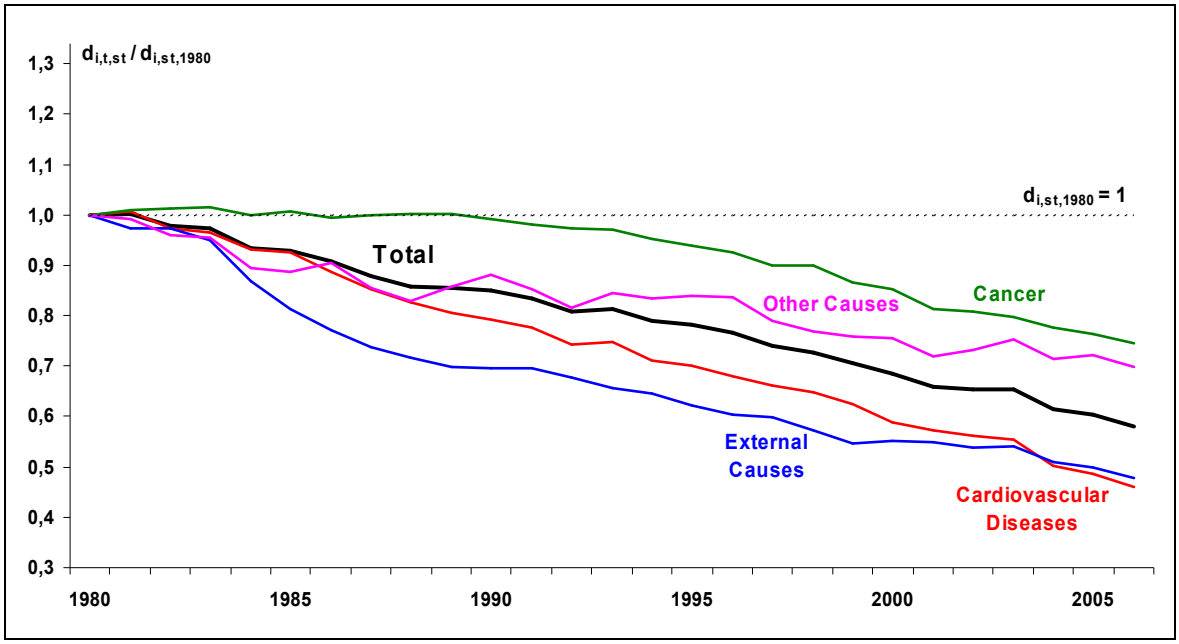
However, it must be considered that the mortality in causes of death is considerably influenced by the errors in migrant population stocks and migrant death statistics. If additional selection processes are relevant, e.g. that persons with cardiovascular diseases rather remigrate than cancer diseased persons, so would affect to the results substantially. Such studies have not been presented due to missing databases, up to now.

5.1.3. Conclusion

The present analysis confirms equal studies that in the official statistics the mortality of adult migrants is much more lower than the mortality of adult Germans, while younger migrants show a higher mortality than the German children (Weber et al. 1990, Korporal 1990, Mammey 1990, Mammey/Schwarz 1995, Roloff 1997).

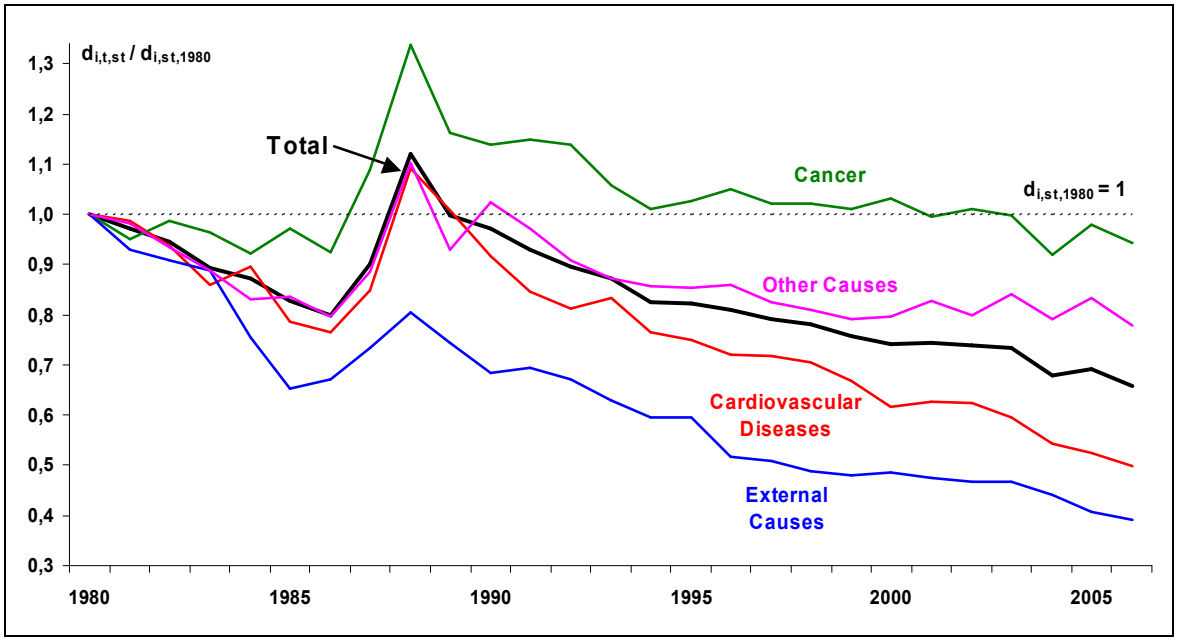
The causes of death analyses prove that with roughly all causes of death the Germans show a higher mortality than migrants (Altenhofen/Weber 1993). Indeed, the mortality of the younger migrants is little higher in each cause of death than the mortality of the younger Germans. However, the correction of the migrant population stock as a result of the census in 1987 also shows that on account of the overestimated migrant population the observed migrant mortality must have been distorted between both census dates in 1970 and 1987 considerably. And the longer the census dated back, the greater was the distortion. But also after the census in 1987 the migrant mortality might be underestimated because the overestimation in the migrant population stock became more relevant due to failed deregistration of migrants. A large-scaled correction of the central alien register (AZR) from 2000 to 2004 showed that especially the migrant population stock is overestimated in the German official statictics (Opfermann et al. 2006). Only a new census could correct the errors in migrant population stocks, which is not intended before 2011 (Heinzel 2006). Hence, a comparative study of the mortality of migrants and Germans is currently not practible with official statistics.

Fig. 5: Trends of Germans DMDR[1] of selected causes of deaths in the Federal Republic of Germany[2] (Official statistics) from 1980 to 2006, men, ($d_{i,st,1980}$ =1)



Source: own calculations based on data of the German Federal Statistical Office.

Fig. 6: Trends of migrants DMDR[1] of selected causes of deaths in the Federal Republic of Germany[2] (Official statistics) from 1980 to 2006, men, ($d_{i,st,1980}$ =1)



Source: own calculations based on data of the German Federal Statistical Office.

[1] Standard population: Europe, WHO 1976.
[2] 1970-1997: former Federal Republic of Germany (Old Laender).
1998-2006: former Federal Republic of Germany (Old Laender) and East Berlin.

5.2. Migrant mortality analyses based on the Central Alien Register (AZR) from 2003 to 2006

5.2.1. Total mortality

A migrant CDR of 3.3 male deaths per 1,000 residents arises from the AZR as well as 2.0 deaths per 1,000 migrant women (tab. 2). It is clearly higher than the CDR measured with data from official statistics (tab. 1). After age-standardization a DMDR amounts to 5.0 deaths per 1,000 male migrants as well as 3.4 deaths per 1,000 female migrants. The relative mortality Germans to migrants lies with 50% (men) or 34% (women) about 50 percentage points lower than in the calculation based on official statistics (tab. 1). Another mortality measurement is the standardized mortality ration (SMR). Only less difference is observable in comparison to the DMDR.

Beyond it, it is possible to calculate the life expectancy of migrants based on data from the AZR and to compare it to the results of official statistics. Thus the life expectancy of male migrants amounts in 2006 approx. 81.0 as well as about 84.5 years with female migrants. This is 4 years (men) and 2 years (women) higher than in German population. The difference is approx. 1.8 (men) and 1.7 (women) years under the values calculated with official statistics.

It can be ascertained furthermore (tab. 2) that since 2003 the migrant mortality increased in the AZR and so the mortality difference between migrants and Germans decreased continously. This trend was influenced especially by the correction of the migrant population stock in the AZR at the end of the year 2004. The conclusion is that the migrant mortality in the years 2003 and 2004 is strongly distorted. A detailed analysis would not be meaningful. However a more realistic migrant mortality pattern can be illustrated in the years 2005 and 2006. Hence, detailed migrant mortality analyses are presented in the following merely for 2005 and 2006.

Tab. 2: Selected mortality measures of Germans and Migrants in the Federal Republic of Germany (AZR) from 2003 to 2006, both sexes

	2003	2004	2005	2006
Men				
Crude death rate, $d_{t,M}$, per 1.000				
Germans	10,6	10,2	10,3	10,3
Migrants	3,1	3,2	3,4	3,3
Relation	3,45	3,19	3,01	3,09
Direct method death rate, $d_{t,st,M}$, per 1.000				
Germans	8,5	8,0	7,8	7,5
Migrants	4,3	4,3	5,4	5,0
Relation	1,99	1,84	1,45	1,50
Standardized mortality ratio, $SMR_{t,M}$, Reference: Germans				
Germans	1,0000	1,0000	1,0000	1,0000
Migrants	0,5415	0,5780	0,6748	0,6629
Relation	1,85	1,73	1,48	1,51
Life expectancy[1], $e_{0,t,M}$, in years				
Germans	75,7	76,3	76,6	77,0
Migrants	80,6	80,7	80,4	81,0
Relation	5,0	4,4	3,9	4,0
	2003	**2004**	**2005**	**2006**
Women				
Crude death rate, $d_{t,F}$, per 1.000				
Germans	11,7	11,1	11,3	11,1
Migrants	1,9	2,0	2,0	2,0
Relation	5,99	5,48	5,52	5,46
Direct method death rate, $d_{t,st,F}$, per 1.000				
Germans	5,1	4,8	4,8	4,6
Migrants	3,3	3,3	3,6	3,4
Relation	1,58	1,48	1,34	1,34
Standardized Mortality Ratio, $SMR_{t,F}$, Reference: Germans				
Germans	1,0000	1,0000	1,0000	1,0000
Migrants	0,5328	0,5668	0,6889	0,6961
Relation	1,88	1,76	1,45	1,44
Life expectancy[1], $e_{0,t,F}$, in years				
Germans	81,5	82,0	82,2	82,5
Migrants	84,4	84,4	84,3	84,5
Relation	2,9	2,4	2,2	2,0

Source: own calculations based on data of the AZR and the German Federal Statistical Office.

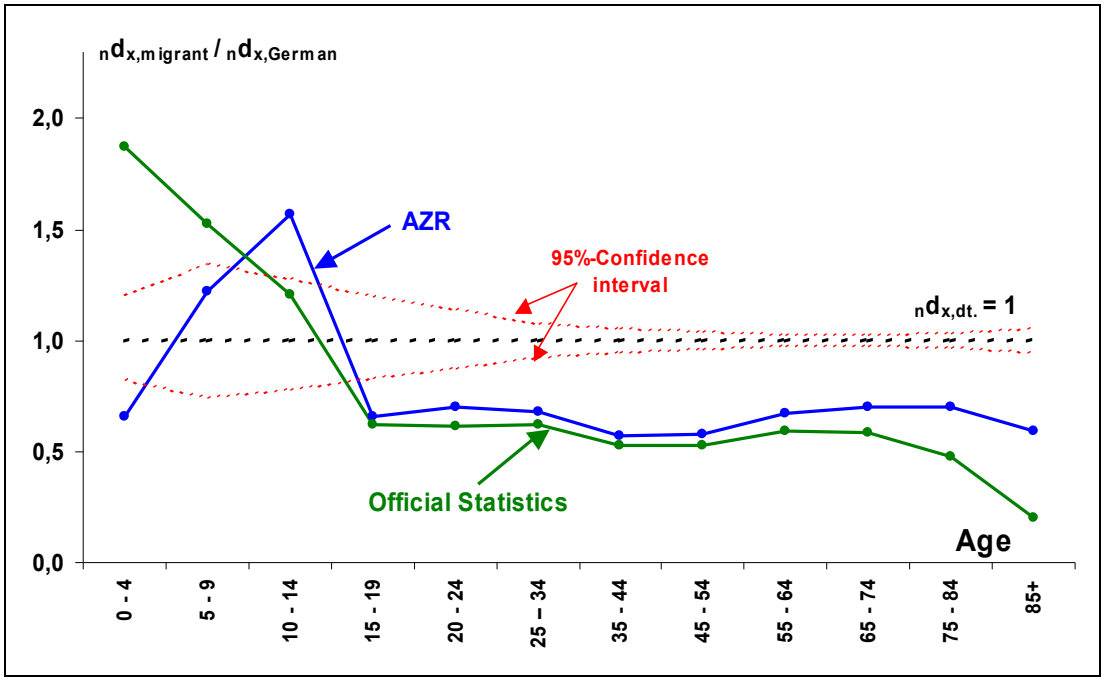
[1] Using Chiang-Formula, ${}_nf_x$ from the German Life Table 1986/88.

5.2.2. Age-specific mortality

The infant mortality of migrants could not be determined on account of missing single age data in the AZR. However, in the youngest age group of the 0 to 4 years-old children the migrant mortality is in the AZR much lower than in the official statistics (fig. 7). This difference is caused by the specific infant mortality. The registration of died infants thereby will often omit in the AZR (Kohls 2008a). In comparison the mortality in the age group of the 10 to 19 year-old is higher in the AZR than in the official statistics. In the age groups from 10 to 64 years the age-specific death rate is in the AZR on average about 10% higher than in the official statistics (both sexes). Besides, the differences increase with higher ages. Thus the old-age-mortality above age 85 in the AZR is approx. 2.5-times higher than in the official statistics.

The mortality differences between the German and migrant population can be considered at first as significant. Thus is no relative mortality value from the AZR and the official statistics within the confidence interval in fig. 7. However, therefore can be only excluded at first that the results due to less case numbers. The fact that the mortality between the German and migrant population really differs, however, is determined also by the fact, to what extent the researcher is trusted the used data. Thus the present study demonstrates that the migrant mortality analyses based on official statistics are distorted obviously. Verifying by a statistical test in this case is not allowed. Nevertheless, confidence intervals are helpful to find out that (mortality) differences not only come about by less case numbers (observed deaths).

Fig. 7: Age-specific mortality differences ($_nd_{x,Germans}$ = 1) between Germans and migrants in the Federal Republic of Germany (Official statistics, AZR) and 95%-confidence intervals, 2005/2006, men



Source: own calculations based on data of the AZR and the German Federal Statistical Office.

5.2.3. Mortality of specific migrant groups

5.2.3.1. Total mortality

In contrast to official statistics a mortality analysis of single migrant groups is possible in the AZR because the nationality is listed and analyzable. Besides, it is not meaningful to distinguish single nationalities because the significance of the results would not be ensured. Merely Turkish migrants can be single-examined because they represent about one quarter of the total migrant population in Germany.

In this study, beside the Turkish one it is distinguished between persons from the former Yugoslavian[9] as well as persons from the former guestworker countries[10]. Beyond it, the migrants from the neighbouring countries of Germany with free-movement in EU[11] as well as persons from other European countries[12] are analyzed. Migrant groups from America, Africa, Asia as well as from other countries of the world[13] complete it. Altogether the mortality can be examined thus by nine migrant groups. If it is meaningful, in addition, single nationalities are also analyzed taking into account the significance of the results.

Turkish migrants with 5.574 (men) and 2.448 (women) show the highest number of deaths in 2005/2006, that are a percentage of 23.6% (men) as well as 18.3% (women) of all migrant deaths in the AZR. This is not surprising, because Turkish migrants represent approx. 27% (men) and 25% (women) of all migrants in the AZR. However only 531 deaths (men) as well as 216 deaths (women) from African migrants were registered in 2005/2006. Few or no deaths were observed in younger age groups in spite of the aggregation of 2005 and 2006 as well as from nine migrant groups that complicates a mortality analysis on account of missing significance clearly.

In tab. 3 are plotted selected mortality measures for all migrant groups in Germany for 2005 and 2006. It is to be found out that all migrant groups show lower CDR than the German population. The lowest CDR is to be observed in each case with African as well as Asian migrants due to a very young age structure. The top CDR shows in each case the migrant group of the neighbouring countries of Germany which have a relatively "old" age structure. Hence, the mortality measurements, which eliminate the age-structure effect, are to be calculated again.

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[9] Bosnia-Herzegovina, Croatia, Slovenia, Serbia-Montenegro, Macedonia as well as persons with nationality of the former Yugoslavia.
[10] Greese, Italy, Portugal, Spain.
[11] Belgium, Denmark, France, Luxembourg, the Netherlands, Austria as well as Liechtenstein and Switzerland.
[12] All other European countries without Turkey.
[13] Australia and Oceania, stateless persons, persons with unknown nationality as well as persons with fragmentary or missing data.

Tab 3: Selected mortality measures of migrant groups in the Federal Republic of Germany (AZR), 2005/2006, both sexes

Neighbouring countries of Germany	Turkey	Former Yugoslavia	Former guest-worker countries	Other European states	Africa	America	Asia	Other states	Comparison: Germany (Official statistics)
Men									
Crude death rate, $d_{t,M}$, per 1.000									
6,7	3,0	3,9	4,0	3,1	1,6	3,8	1,5	6,3	10,3
Direct method death rate, $d_{t,st,M}$, per 1.000									
5,8	4,8	5,2	4,9	4,9	3,5	4,5	3,9	8,2	7,8
Standardized mortality ratio, $SMR_{t,M}$, Reference: Germans									
0,7363	0,7001	0,7377	0,6271	0,6141	0,5678	0,5717	0,5478	1,0075	1,0000
Life expectancy[1], $e_{0,t,M}$, in years									
79,9	80,9	80,2	81,3	81,3	82,5	82,0	82,3	76,0	77,1
Women									
Crude death rate, $d_{t,F}$, per 1.000									
5,3	1,5	2,2	2,0	2,1	1,0	2,5	1,1	4,9	11,2
Direct method death rate, $d_{t,st,F}$, per 1.000									
3,9	3,0	3,7	2,9	3,3	2,6	3,2	3,1	5,1	5,1
Standardized Mortality Ratio, $SMR_{t,F}$, Reference: Germans									
0,7702	0,6823	0,8175	0,5887	0,6597	0,8229	0,6177	0,6345	0,9706	1,0000
Life expectancy[1], $e_{0,t,F}$, in years									
83,9	84,9	83,5	85,3	84,7	85,5	85,1	84,8	80,8	82,2

Source: own calculations based on data of the AZR and the German Federal Statistical Office.

[1] Using Chiang-Formula, ${}_nf_x$ from the German Life Table 1986/88, If x< 20 and n<5, ${}_nd_x$ of total migrants is used.

The DMDR show that no more the migrant group of the neighbouring countries of Germany have the highest mortality. Instead, the migrant group of the persons from the remaining world has the top mortality (men: 8.2 per 1,000; women: 5.1 per 1,000). However, the migrant group from the remaining world represents an especially heterogeneous group whereas the persons without data concerning nationality dominate. The lowest DMDR of male migrants are observed for Africans (3.5 per 1,000) and Asians (3.9 per 1,000). African Women (2.6 per 1,000) as well as Asian Women (3.1 per 1,000) likewise show a low mortality.

In several age groups and migrant groups generally no deaths could be observed. The calculation of the DMDR is actually not possible in this case, considered strictly methodically. Hence, the computation of at least one other mortality measure, which takes into consideration this aspect, is necessary. The standardized mortality ratio (SMR) fulfils this condition. The German population is the reference group (=1.000). A result of

0,7001 for the Turkish men indicates that it is observed only 70.01% of Turkish deaths in 2005/2006, which would have been expected if the Turkish men had shown the identical mortality pattern like the Germans. The really observed mortality of the Turkish ones was lower than those of the Germans.

Asian men showed with SMR of 0.55 the lowest value of all migrant groups. Africans, Americans as well as migrants from the former guestworker states and other European States had similar values of approx. 0.60. Men from the neighbouring states of Germany (0.74), from former Yugoslavian states (0.74) as well as from other states (1.01) showed the highest SMR in 2006. Women from the former guestworker states (0.59) held the lowest SMR, followed by Americans (0.62) and Asians (0.63). Only Africans (0.82) as well as women from the other states (0.97) had clearly higher SMR.

The results of life expectancy correspond widely to the results of SMR. Asian (82.3) and African (82.5) men showed the top life expectancy, while all migrants average a value of 80.7 years. Migrants from the neighbouring countries of Germany (79.9) and from former Yugoslavia (80.2) displayed substandard values. By contrast male Germans had a life expectancy of 77.1 years. Women from the former guestworker states (85.3) showed a high life expectancy as well as women from Africa (85.5), America (85.1) or Turkey (84.9). Women from the neighbouring countries of Germany (83.9) as well as from former Yugoslavia (83.5) had subnormal values. Female and male migrants from the heterogeneous group of the remaining world (other states) displayed lowest life expectancy that even was under the German values.

Beside the Turks other nationalities were examined concerning their mortality. To firm the confidence level of the results, a summarized analysis from 2003 to 2006 was realized. Huge differences occurred concerning mortality within the total migrants in Germany. Merely stateless migrants (SMR: men: 1.07; women: 1,11) and women from Black Africa (1.30) showed a higher mortality than the German population. This indicates that leads insecure living conditions (stateless persons) to a bad health status and to raised mortality. Why women from Black Africa had an increased mortality, is not to be clarified definitely. Thus these women have mostly overcome great distances (geographics, economics, politics), which are started only by healthy persons who show a low mortality then in the destination country. However, it can be the case that typical diseases or environmental burden in the country of origin led to a raised mortality in Germany. In this context a detailed cause of death analysis would be helpful which is not possible on account of restricted data protection laws up to now.

In addition the mortality of Thai women lies under the German mortality, but approx. 50% higher than the total female migrants. Referring to the selection hypothesis this could be explained by the fact that Thai women often immigrate due to marriage. There-

fore these women could not benefit from the healthy-migrant-effect. Another fact could be that Thai women in the first years after immigration participate subnormal in the German health insurance system on account of low language skills.

Men from Kazakhstan, Georgia and Kyrgyzstan displayed an approx. 50% higher mortality than the total migrants in Germany. It coulb be caused by the unhealthy life-style in the country of origin. In other studies is also mentioned that persons from the former Sovietunion show a high mortality compared to Central European since beginning of the 1990s which is to be led back primarily to risk and unhealthy behavior (Shkolnikov 2004, Becher et al. 2007). In addition, Belgians had increased mortality that lie, however, still clearly under the German mortality. Here it could be supposed that on account of the small distance to Germany no more healthy-migrant-effect is effective. Then this would have to apply to all neighbouring countries of Germany equally but it is not the case (tab. 3).

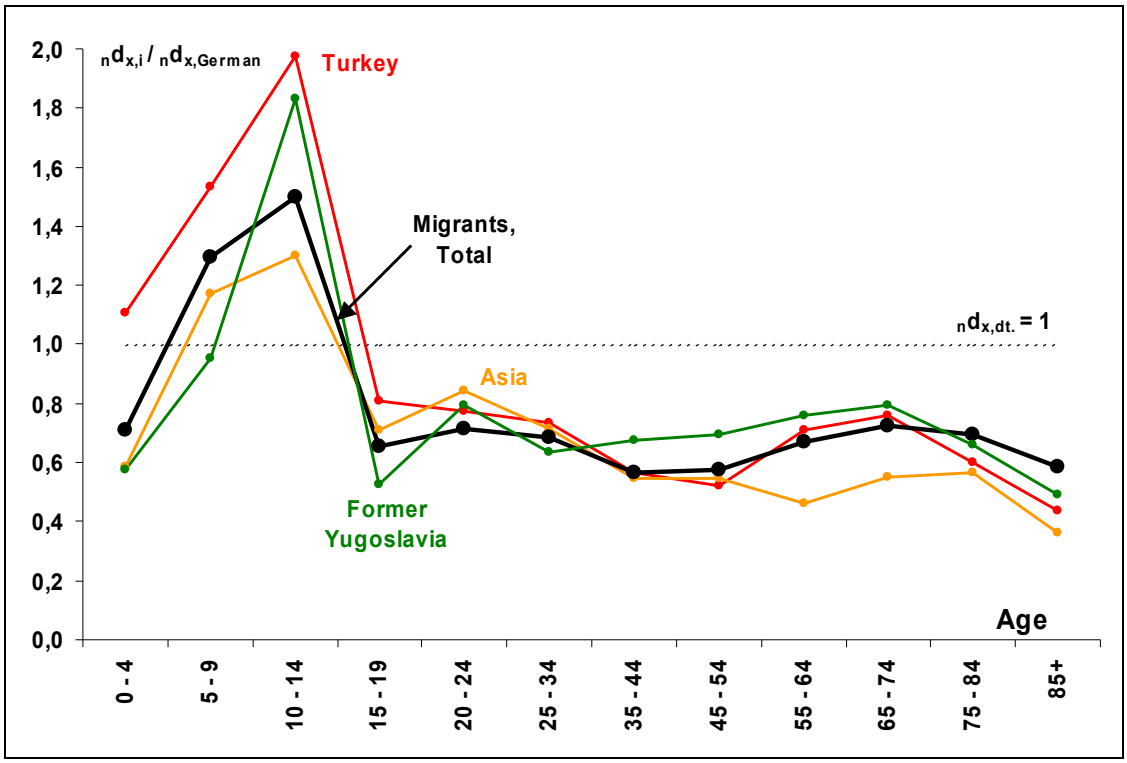
Special attention should be given to migrants from Iraq and Afghanistan because a part from them has experienced traumatic (war) scenes. Referring to the hypothesis that stress factors negatively affect morbidity and mortality these persons had to show a high mortality in Germany. However, male migrants from these countries display a much lower mortality than the Germans as well as a slightly lower mortality than the total migrant population. Indeed, Iraqi and Afghan women had a clearly low mortality compared to Germans, however, in comparison to all female migrants merely average mortality values are to be amounted. Therefore can be concluded that immigration from states with huge geographic, economic and political distance to Germany is possible only for persons who had above-average health.

5.2.3.2. Age-specific mortality

In fig. 8 and 9 the age-specific mortality of selected migrant groups is confronted to the respective German mortality in 2005/2006 ($_nd_{x,German}$ = 1). The mortality differences in the youngest age group of 0 to 4 year-old are not illustrated because of the insufficient registration of died infants. In the higher age groups of 5 to 14 year-old is to be found out reliable that the German mortality is lower than the migrant mortality (both sexes). Besides, Turkish and African children showed the highest age-specific death rates. In any higher age groups the German population showed however a higher mortality, although there are rather different mortality patterns. Thus Asian men displayed lowest mortality in all age groups above age 45, while the migrants from former Yugoslavia had the highest age-specific death rates. In the age groups above 75 years the migrants from the neighbouring countries of Germany as well as from the remaining world had

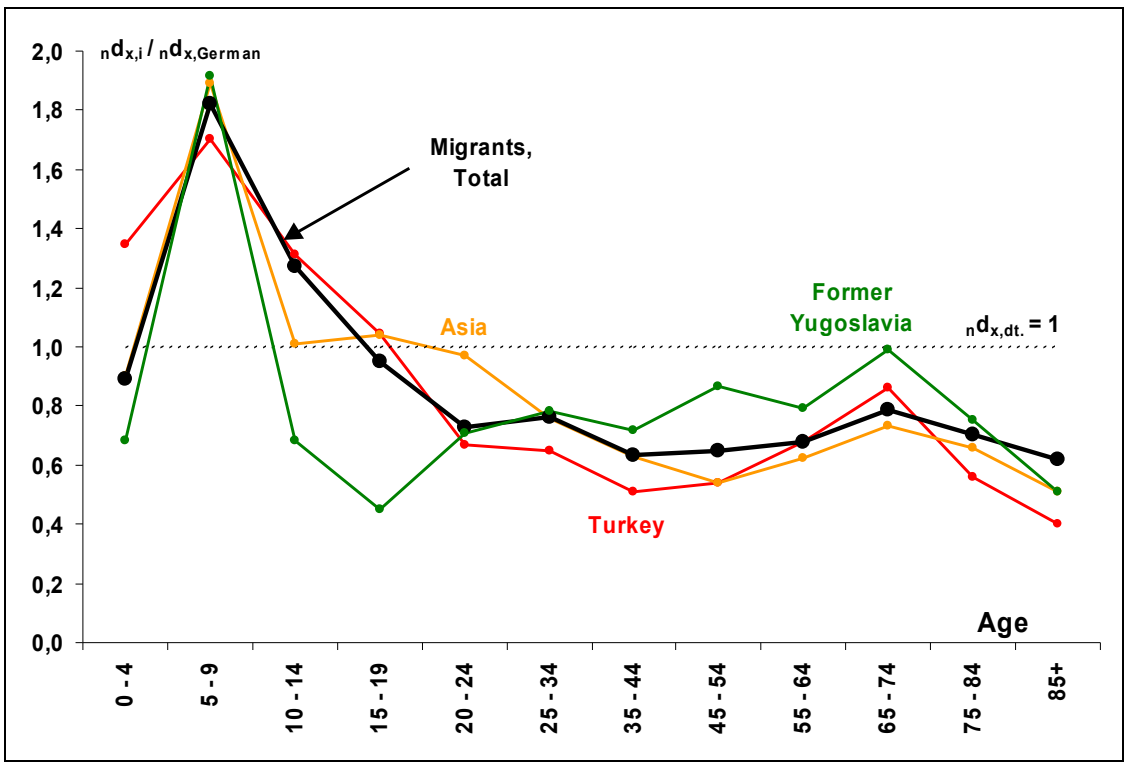
the highest mortality. The Turkish men showed in the higher age groups average mortality, only the younger Turks had an increased mortality risk (fig. 8).

Fig. 8: Age-specific death rates ($_nd_{x,German}$ = 1) of selected migrant groups (AZR) and Germans (Official statistics), 2005/2006, men



Source: own calculations based on data of the AZR and the German Federal Statistical Office.

Fig. 9: Age-specific death rates ($_nd_{x,German}$ = 1) of selected migrant groups (AZR) and Germans (Official statistics), 2005/2006, women



Source: own calculations based on data of the AZR and the German Federal Statistical Office.

Turkish women also showed the trend of raised mortality in the younger ages. In higher age groups they had a rather subnormal mortality. Asian women correspond approximately to the mortality of total female migrants. In contrast women from former Yugoslavia displayed in younger age groups low mortality, but in the age of 35 to 84 year-old a clearly above-average age-specific death rate (fig. 9).

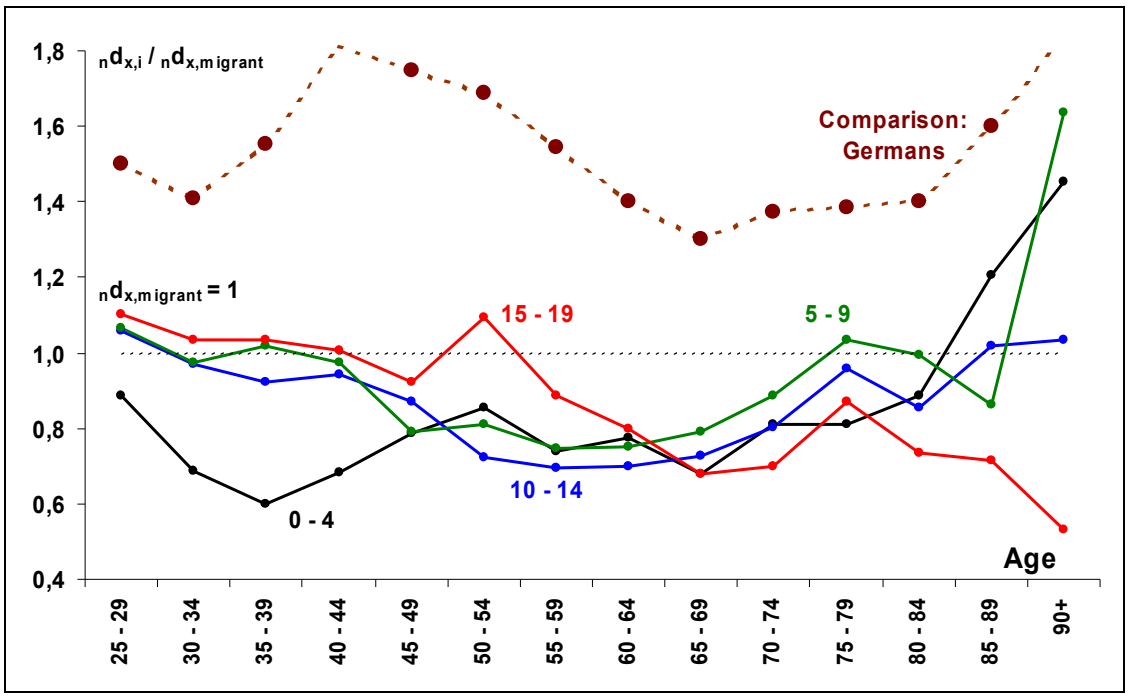
5.2.4. Migrant mortality and length of stay

It was already shown in theoretical considerations that the length of stay determines the mortality of migrants because the duration is an adequate indicator for the adaptation processes of migrants in the destination country (food, risk, social and health behavior). Thus mortality differences between migrants and non-migrants should disappear with increasing length of stay or should be determined by other factors (e.g. social status).

Fig. 10 and 11 represent the correlation between migrant mortality and duration. Besides, the broken line characterizes the age-specific migrant mortality without consideration of duration and is consistent therefore with the value 1 ($_nd_{x,German} = 1$). All other lines compare to it. Furthermore the age-specific mortality of Germans is charted to make dimensions clear. At first the relative mortality of the persons with duration of 0 to 4 years is subnormal in the age groups of 25 to 44 year-old. However the age group of 45 to 59 year-old shows a higher relative mortality and the persons above age 85 had a clearly higher mortality (fig. 10). This might be accounted by the different health structure of the migrants. Referring to the healthy-migrant-hypothesis younger migrants should have an above-average health that lead to a subnormal mortality in the destination country.

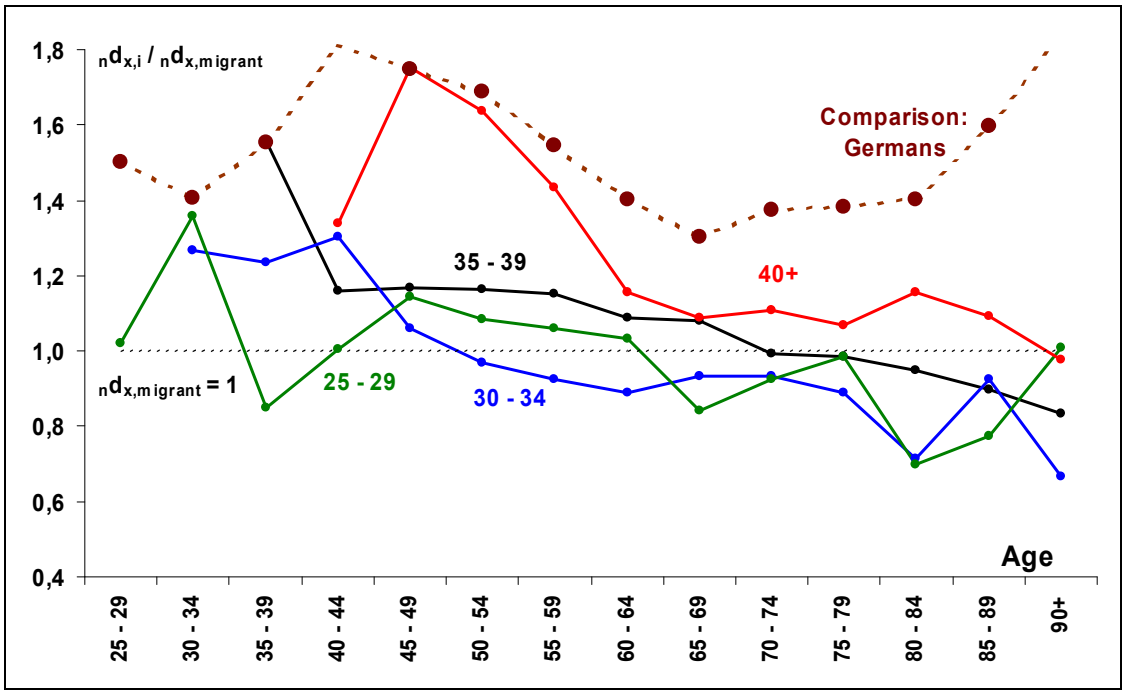
In the comparison between migrants with duration of 0 to 4 years and 5 to 19 years becomes clear that in the age group of 25 to 44 years persons with shorter duration showed the lowest mortality. This can be a result of immigration concerning to labour market which have a better health status than immigration not concerning to labour market. In the age group of above 85 an opposite trend can be observed that is determined by the different usage of health care. Thus persons with shorter duration have mostly less German language skills and cannot use therefore the health care completely. Furthermore migrants could already have pre-existing diseases, which were medicated in the country of origin insufficiently. However, it becomes evident that also migrants with longer duration still show a lower mortality than the German population.

Fig. 10: Age-specific mortality differences ($_nd_{x,migrant}$ = 1) between Germans and migrants in consideration of duration (0 - 19 years) in the Federal Republic of Germany (Official statistics, AZR), 2005/2006, men



Source: own calculations based on data of the AZR and the German Federal Statistical Office.

Fig. 11: Age-specific mortality differences ($_nd_{x,migrant}$ = 1) between Germans and migrants in consideration of duration (25 and more years) in the Federal Republic of Germany (Official statistics, AZR), 2005/2006, men



Source: own calculations based on data of the AZR and the German Federal Statistical Office.

Another trend is to be ascertained at migrants with duration of 25 and more years. Thus younger migrants (men) who were already long-residents or even born in Germany displayed an above-average mortality (fig. 11). Migrants with duration above 40 years had in the age group of 45 to 59 even roughly the same mortality like the German population of the same age. Migrants with less duration (25 to 39 years) showed in higher age groups even a rather subnormal mortality. In comparison the correlations between female migrant mortality and duration cannot be evidenced clearly. Thus women with duration of 0 to 34 years had no appreciable mortality differences compared to the mortality without consideration of duration. Only the women in the age group between 35 and 99 years who are already residents more than 35 years showed an increased mortality (without fig.).

The observed trends of above-average mortality with long duration confirm the hypothesis that adaptation processes lead to a convergence of mortality patterns between migrants and the German population. The migrants who were even born in Germany, in addition, show above-average mortality that would confirm the hypothesis that second generation immigrants benefit no more from the healthy-migrant-effect.

In the mortality analysis in consideration of duration merely the mortality of all migrants could be examined. Besides, determinants of single nationalities could not be included that might influence the migrant mortality concern to duration. Thus several great immigration waves were to be observed in the past (guestworker in the 1960s and 1970s, the refugees from former Yugoslavia at the beginning of the 1990s or the immigration of the ethnic Germans during the 1990s). If these migrant groups have typical mortality pattern in each case, this should strongly influence the migrant mortality. As long as this cannot be controlled, the results of this study have to be considered carefully.

5.3. Migrant mortality analyses based on data from the statutory pension insurance (GRV) from 1994 to 2006

The large database of the statutory pension insurance (GRV) can be used for scientific analyses since the introduction of the research data center in 2004.[14] The GRV databases show a very high validity because the registration status of pensioners depends directly on pension payments. Status changes, e.g. death, immigration, emigration, are thereby documented exactly. Indeed, is to be noted that the persons in the GRV represent 92% (men) or 95% (women) of the German resident population above age 65, but nevertheless they do not show the population representative (Scholz 2005). It is explained by the fact that certain groups like self-employed, officials or also housewives are not included in the GRV.

5.3.1. Total mortality of migrants above age 60

In 2005 the migrant CDR (men) above age 60 was 34.9 deaths per 1,000 residents (women: 25.3 per 1,000), while the German CDR (men) amounted 42.5 deaths per 1,000 residents (women: 36.1 per 1,000). So, the German mortality is higher than the migrant mortality by the factor 1.22 (men) or 1.43 (women). The migrant CDR was always lower than the German CDR in the period from 1994 to 2006. Age-structure differences still exist, thus the calculation of the DMDR is necessary again. The migrant DMDR amounted 38.6 deaths per 1,000 residents (women: 21.0 per 1,000) in 2005, while the German DMDR showed 41.2 deaths per 1,000 persons (women: 24.2 per 1,000) (tab. 4). The German mortality is merely around 6.8% (men) higher than the migrant mortality (women: 15.0%).

The results of the analysis using SMR correspond completely to the results using DMDR (tab. 4), therefore a detailed analysis is not necessary. Measuring life expectancy is also to be found out that the mortality differences were diminishing continuously between Germans and migrants since 1994. Indeed, the migrant life expectancy at age 60 increased from 18.8 to 20.2 years in the period from 1994 to 2005. At the same time the German life expectancy at age 60 rose from 17.6 to 19.8 years whereby the difference between migrants and Germans decreased from 1.1 to 0.4 years. The female difference in life expectancy at age 60 between migrants and Germans sank in the same period from 2.0 to 0.9 years (tab. 4).

[14] Special thanks to Prof. Dr. Reiner H. Dinkel (Chair of Demography, University of Rostock) for providing the data in the research project ”Mortalitätsanalyse gesetzlich Rentenversicherter in Deutschland“. Also special thanks to the research data center of the statutory pension insurance in Würzburg under direction of Dr. Michael Stegmann for very the helpful cooperation.

Tab. 4: Selected mortality measures of Germans and migrants in the Federal Republic of Germany (AZR), 2005/2006, both sexes

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Men													
Crude death rate, $d_{t,M,60+}$ per 1.000													
Germans	0,0551	0,0528	0,0522	0,0495	0,0475	0,0457	0,0453	0,0438	0,0439	0,0447	0,0424	0,0425	0,0419
Migrants	0,0435	0,0420	0,0422	0,0414	0,0406	0,0398	0,0390	0,0375	0,0391	0,0398	0,0385	0,0392	0,0349
Direct method death rate, $d_{t,st,M,60+}$ per 1.000													
Germans	0,0524	0,0508	0,0507	0,0487	0,0472	0,0457	0,0452	0,0438	0,0440	0,0448	0,0419	0,0412	0,0401
Migrants	0,0451	0,0434	0,0437	0,0429	0,0421	0,0414	0,0403	0,0385	0,0401	0,0406	0,0384	0,0386	0,0342
Standardized mortality ratio, $SMR_{t,M,60+}$ Reference: Germans													
Germans	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Migrants	0,8671	0,8563	0,8598	0,8793	0,8920	0,9083	0,8928	0,8828	0,9155	0,9097	0,9207	0,9387	0,8511
Life expectancy[1] at age 60, $e_{60,t,M}$, in years													
Germans	17,60	17,89	17,97	18,31	18,64	18,94	19,06	19,36	19,33	19,22	19,68	19,79	20,09
Migrants	18,75	19,04	18,95	19,17	19,38	19,55	19,92	20,25	19,94	19,82	20,23	20,15	21,26

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Women													
Crude death rate, $d_{t,F,60+}$ per 1.000													
Germans	0,0419	0,0399	0,0409	0,0392	0,0384	0,0383	0,0375	0,0367	0,0371	0,0384	0,0360	0,0364	0,0361
Migrants	0,0241	0,0231	0,0239	0,0238	0,0246	0,0242	0,0251	0,0253	0,0261	0,0274	0,0262	0,0270	0,0253
Direct method death rate, $d_{t,st,F,60+}$ per 1.000													
Germans	0,0309	0,0290	0,0292	0,0279	0,0273	0,0270	0,0262	0,0255	0,0258	0,0266	0,0246	0,0242	0,0237
Migrants	0,0233	0,0219	0,0223	0,0221	0,0223	0,0218	0,0221	0,0216	0,0220	0,0227	0,0209	0,0210	0,0194
Standardized mortality ratio, $SMR_{t,F,60+}$ Reference: Germans													
Germans	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Migrants	0,7571	0,7511	0,7555	0,7773	0,8084	0,7975	0,8311	0,8410	0,8473	0,8421	0,8411	0,8513	0,8042
Life expectancy[1] at age 60, $e_{60,t,F}$, in years													
Germans	22,50	22,99	22,96	23,30	23,47	23,59	23,87	24,11	24,05	23,87	24,35	24,47	24,65
Migrants	24,53	24,99	24,87	24,92	24,87	25,07	25,04	25,20	25,08	24,90	25,38	25,36	25,94

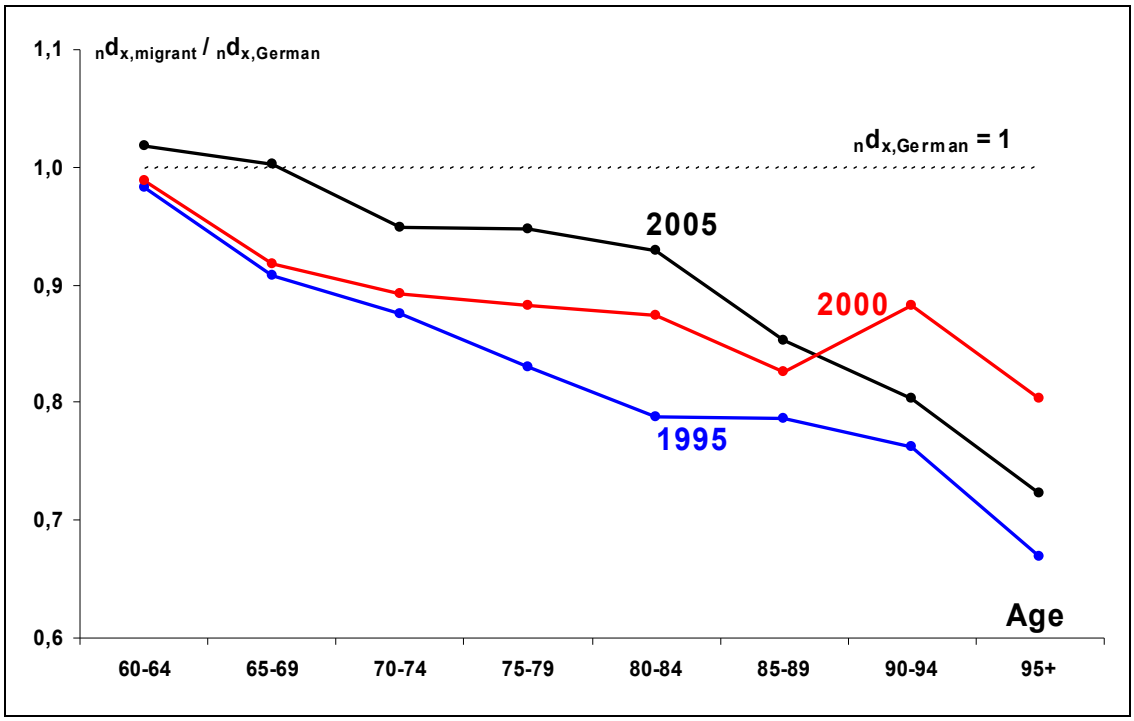
Source: own calculations based on data of the FDZ-RV, SUFRTBN93XVST06 - SUFRTBN05XVST06, SUFRTWF94XVST06 - SUFRTWF06XVST06.

[1] Using Chiang-Formula, ${}_nf_x$ from the German Life Table 1986/88, If x<60, ${}_nd_x$ of official statistics is used.

5.3.2. Age-specific mortality of migrants above age 60

In the analysis of the relative mortality differences between migrants and Germans is recognizable that in 1995 and 2000 the age-specific migrant mortality lay under the German ones and the differences have decreased from 1995 to 2000 (fig. 12). Then in 2005 the migrant mortality has risen in the age group of 60 to 69 year-old above the German mortality. In the age groups of 70 to 89 the differences still decreased, however, the migrant mortality remained under the German mortality. This trend that could be also observed for women points to a cohort effect. This comes about if certain cohorts show a clearly lower or higher mortality than the following cohorts (Dinkel 1992). These mortality differences might have been caused by temporarily events or long-term differences of life and working conditions.

Fig. 12: Age-specific mortality differences ($_nd_{x,German}$ = 1) between Germans and migrants in the Federal Republic of Germany (GRV), 1995, 2000, 2005, men



Source: own calculations based on data of the FDZ-RV, SUFRTBN93XVST06 - SUFRTBN05XVST06, SUFRTWF94XVST06 - SUFRTWF06XVST06.

5.3.3. Mortality of certain migrant groups

With the data of the GRV it is also possible to examine the mortality of certain migrant groups. Single nationalities are summarized into nine migrant groups again on account of small case numbers: Neighbouring countries of Germany, Turkey, former Yugoslavia, former guestworker countries, other European states, Africa, America, Asia as well as from other countries of the world (see chapter 5.2.3.).

5.3.3.1. Total mortality

In the statutory pension insurance migrants from the former guestworker countries have the highest proportion of observed deaths in 2005. But it is not surprising, because they represent a large immigrant group in the 1960s and 1970s. Today this migrant group shows an exceptionally "old" age structure. In contrast only 256 deaths (men) as well as 27 deaths (women) from Africa were registered in 2005. Especially in the ages above 90 years only few deaths were registered that complicates a mortality analysis in consideration of significance clearly.

Tab. 5 contains selected mortality measurements for certain migrant groups. Male migrants from the neighbouring country as well as female migrants from Asia showed the highest CDR. After controlling age structure effects by calculating DMDR other migrant groups have the highest mortality. Thus male migrants from former Yugoslavia display the clearly highest DMDR. Migrants from the neighbouring states of Germany and Germans show similar mortality values, while Americans and Asians have much lower ones.

The analysis of the standardized mortality ratio (SMR) that is required especially in case of small case numbers proves a roughly identical ranking of the mortality within the migrant groups. Thus persons from former Yugoslavia show the highest mortality in 2005 (both sexes). Against it American and Asian migrants have the lowest SMR. The results of the life expectancy at age 60 correspond to the DMDR. Male Asians display the highest life expectancy value in 2005 (22.2 years), while the average of all migrants amounts 20.2 years, that are only 0.4 years above the German value. Migrants from former Yugoslavia had a 2.5 years lower life expectancy at age 60 than the Germans. American women showed the highest life expectancy at age 60 (27.3 years), while all migrants average a value of 25.4 years that is 0.9 years higher than for Germans. Women from former Yugoslavia stand out negatively with a life expectancy of 22.4 years that is 3 years under the German value.

Tab. 5: Selected mortality measures of migrant groups in the Federal Republic of Germany (GRV), 2005, both sexes

Neighbouring countries of Germany	Turkey	Former Yugoslavia	Former guest-worker countries	Other European states	Africa	America	Asia	Other states	Comparison: Germany (Official statistics)
Men									
Crude death rate, $d_{t,M,60+}$ per 1.000									
0,053394	0,025667	0,041332	0,035239	0,043665	0,028208	0,048162	0,050117	0,042705	0,042509
Direct method death rate, $d_{t,st,M,60+}$ per 1.000									
0,041338	0,036919	0,050158	0,037473	0,039004	0,036594	0,034543	0,030891	0,036783	0,041208
Standardized mortality ratio, $SMR_{t,M,60+}$ Reference: Germans									
1,0287	0,9504	1,3214	0,8890	0,9393	0,8676	0,7442	0,7375	0,9161	1,0000
Life expectancy[1] at age 60, $e_{60,t,M}$, in years									
19,6	20,5	17,7	20,4	20,1	21,0	21,1	22,2	20,7	19,8
Women									
Crude death rate, $d_{t,F,60+}$ per 1.000									
0,038540	0,013506	0,023032	0,017414	0,031026	0,038298	0,032340	0,042907	0,025506	0,036433
Direct method death rate, $d_{t,st,F,60+}$ per 1.000									
0,022949	0,024318	0,031047	0,019528	0,021170	0,026655	0,015924	0,018702	0,021045	0,024165
Standardized mortality ratio, $SMR_{t,F,60+}$ Reference: Germans									
0,9452	1,0256	1,3612	0,8162	0,8727	1,0690	0,6570	0,7575	0,8713	1,0000
Life expectancy[1] at age 60, $e_{60,t,F}$, in years									
24,7	24,3	22,4	25,8	25,5	24,1	27,3	26,1	25,6	24,5

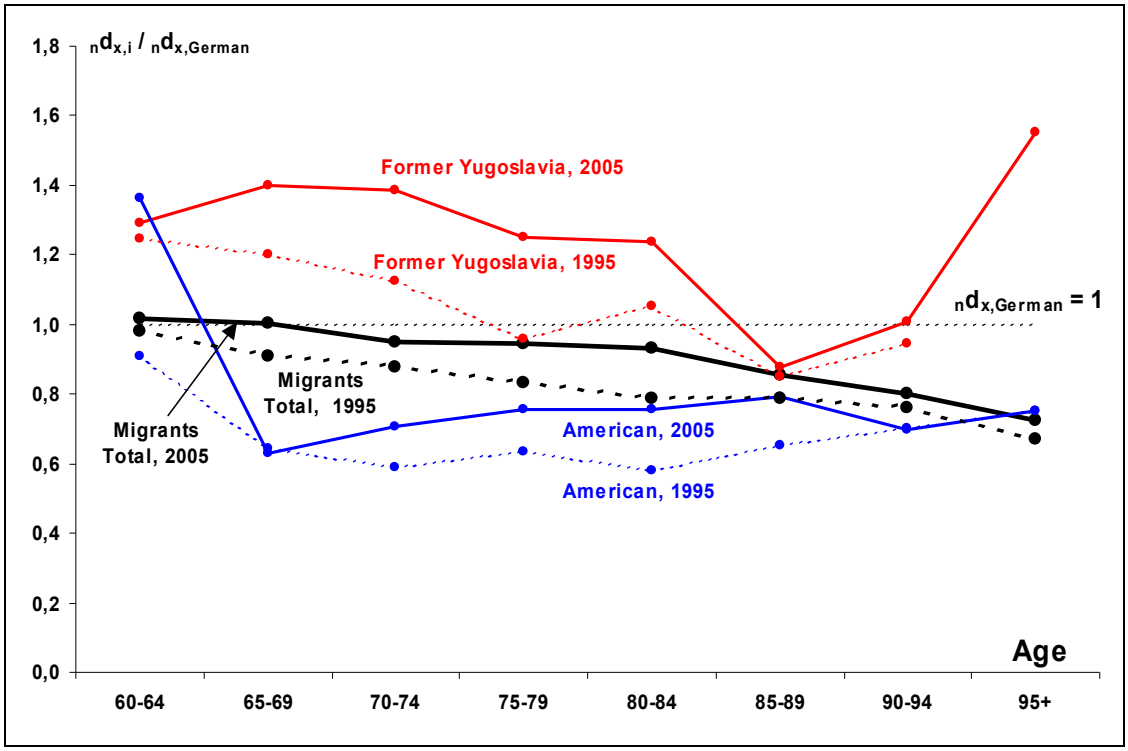
Source: own calculations based on data of the FDZ-RV, SUFRTBN93XVST06 - SUFRTBN05XVST06, SUFRTWF94XVST06 - SUFRTWF06XVST06.

[1] Using Chiang-Formula, ${}_nf_x$ from the German Life Table 1986/88, If x< 60, ${}_nd_x$ of official statistics is used.

5.3.3.2. Age-specific mortality

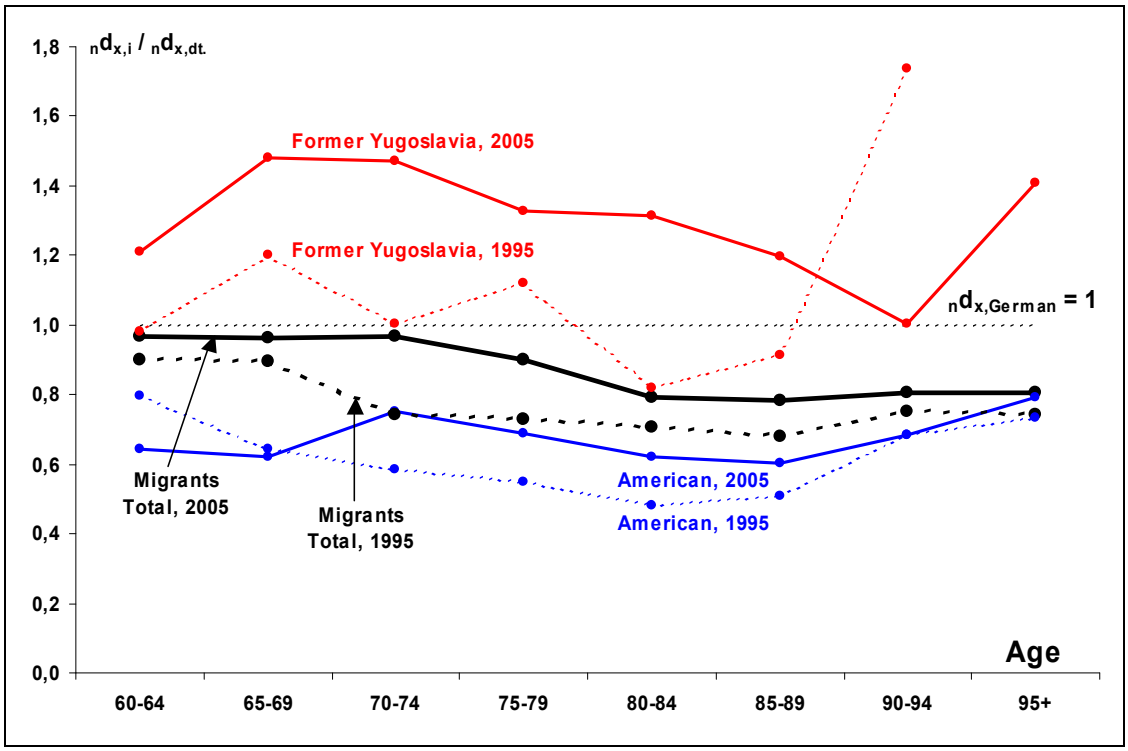
Finally an age-specific mortality analysis of several migrant groups is presented. In 2005 migrants from former Yugoslavia displayed the highest age-specific death rate in the age groups of 60 to 84 year-old (both sexes). The relation Yugoslavian to German mortality has clearly risen compared to 1995. American migrants have the lowest age-specific death rates (both sexes). But also migrants from American states have lost in the period from 1995 to 2005 their mortality advantage compared to the German population. This trend is also to be observed in all other migrant groups. Thus mortality differences in the age groups from 60 to 84 between male German and male migrants marginal exist in 2005 (fig. 13). Only in higher age groups above 85 significant mortality differences are still recognizable. However differences in female mortality between Germans and migrants are much higher, but are also clearly diminished since 1995 (fig. 14).

Fig. 13: Age-specific mortality differences ($_nd_{x,German}$ = 1) between selected migrant groups and Germans in the Federal Republic of Germany (GRV), 1995 and 2005, men



Source: own calculations based on data of the FDZ-RV, SUFRTBN93XVST06 - SUFRTBN05XVST06, SUFRTWF94XVST06 - SUFRTWF06XVST06.

Fig. 14: Age-specific mortality differences ($_nd_{x,German}$ = 1) between selected migrant groups and Germans in the Federal Republic of Germany (GRV), 1995 and 2005, women



Source: own calculations based on data of the FDZ-RV, SUFRTBN93XVST06 - SUFRTBN05XVST06, SUFRTWF94XVST06 - SUFRTWF06XVST06.

6. Conclusion

The mortality of migrants and non-migrants in Germany shows systematically different pattern. Dimensions as well as determinants have not been exhausted. The present study has a share in examining dimensions as well as determinants of the mortality differences between migrant and German population in Germany accurately.

It could be evidenced that the migrant mortality is much lower than the German mortality own calculated with the official statistics due to the insufficient data concerning migrant population stock and migrant deaths. As a result of the underestimated deaths and the overestimated migrant population stock the measured migrant mortality is considerably lower than the mortality of the German population. Thus male migrants show a life expectancy of 83.0 years that is 6.0 years higher than the male Germans in 2005/2006. The female differences are less, however the life expectancy of female migrants (86.0) is 4.0 years higher than the German ones. Indeed, large age-specific differences exist. Thus the infant and child migrant mortality is generally higher than the German mortality that is to be led back to the raised accident mortality. In higher ages the mortality of the German population is extremely high that points to the fact that especially the migrant population stock in higher ages is clearly overestimated. The migrant mortality measures based on official statistics show absolutely peaks of the migrant mortality. Actual values of migrant mortality must be much lower on account of data lacks in official statistics. However, realistic estimations cannot be expected before 2013 when detailed results of the census in 2011 are available. Then especially the migrant population stocks will be much lower than nowadays.

Other databases are used in this study on account of the implausible results based on official statistics. First, the central alien register (AZR) was used because this database provides reliable data of the migrant population in Germany. Thus male migrants show a life expectancy of approx. 81.0 years that is 2 years under the value in official statistics. Female migrants also display the increased life expectancy. Furthermore mortality analyses of single migrant groups are possible in AZR. Hence is to be found out that Asian and African migrants have the maximum life expectancy. That points to the fact that these migrants could benefit most from the healthy-migrant-effect. However, only low mortality differences exist between single migrant groups in the AZR.

Beside the AZR data of the statutory pension insurance (GRV) were used in this study. This database shows especially above age 60 valide informations because the registration status of a person is coupled directly to a pension payment. It could be found out that the mortality differences between migrants and Germans have strongly decreased since 1994. Indeed, thus the life expectancy at age 60 increased by migrants and Germans, however, the difference fell to 0.4 years (men) and 0.9 years (women) in 2005.

The detailed single migrant mortality analyses evidenced an especially high mortality to migrants from former Yugoslavia. Thus these migrants showed a life expectancy approx. 3 years under the average of of all migrants. It point out to the fact that these persons could not benefit from the healthy-migrant-effect. On the other hand stress factors might be influenced the mortality lead back to violence and cruelty experiences in the Balkan conflicts from 1991 to 1995. The lowest mortality showed the migrants from Asia and America again which could benefit most from the healthy-migrant-effect.

It can be concluded that also with alternative databases migrants have a lower mortality than the German population. However, the differences are substantially lower than would to be expected in analyses based on official statistics. It is evident in long-term analyses that the mortality differences between migrants and Germans decrease. Assuming that a part of the existing mortality differences is still based on data errors it can be already spoken of a roughly identical total mortality between migrants and Germans. The determinants of the migrant mortality trends could not be cleared in the present study sufficiently. Referring to this study and Razum/Rohrmann (2002) it can be absolutely the case that the migrant mortality advantages disappear with longer length of stay. Then the migrant mortality is mainly influenced by the social status of the migrant group. The decline of the mortality differences in the last years is at least a clue for it.

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