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ROSTOCKER ZENTRUM – DISKUSSIONSPAPIER
ROSTOCK CENTER – DISCUSSION PAPER

No. 29

**Individual and contextual determinants of health among
Aussiedler and native Germans in the year 2005**

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September 2011

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Accepted by the 'editorial board'*

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Abstract

Ethnic German immigrants, who are called Aussiedler, constitute one of the largest immigrant groups in Germany; however, little is known about their health relative to the health of native Germans. Most of the existing studies on Aussiedler have focused on the general level of health of this group, or on selected individual determinants of the health of migrants, but have failed to consider the effects of the living context. In this study, selected individual and contextual factors are analysed to compare the health of Aussiedler and the health of native Germans. To control for the confounding effects of length of stay, Aussiedler are stratified into four groups by their duration of stay in Germany. The study is based on the German 2005 Microcensus (n = 322,813 native Germans and 10,022 Aussiedler in age 18+) and the INKAR (“Indikatoren und Karten zur Raumentwicklung in Deutschland und Europa”) 2007 regional database. We use a multilevel logistic regression model to estimate the effects on the health of native Germans and Aussiedler of individual characteristics and of three macro factors: regional economic performance, socio-demographic structure and settlement structure. Aussiedler living in Germany for less than 15 years are found to have significantly better health than native Germans and Aussiedler with a longer duration of stay. Individual as well as contextual factors significantly affect the health of Aussiedler and native Germans. High regional centrality depresses health, as does living in a region with low GDP. The proportion of foreigners relative to the native population does not have any consistent effect. The two groups differ with respect to educational gradients in health: there is no educational gradient for Aussiedler, while there is a steep gradient for native Germans. Health disparities between the subpopulations appear to be the result of differences in individual characteristics. Compositional effects, especially in terms of age, SES and lifestyle, seem to be the main drivers of health differences. The differences in the regional distribution of native Germans and Aussiedler and the related macro factors contribute little to the explanation of the health differences between the two groups. The finding that Aussiedler who have lived in Germany for less than 15 years have better health than native Germans supports the “healthy migrant” hypothesis. The deteriorating health status of Aussiedler by duration of stay suggests that migration and socioeconomic deprivation, along with adaptation to the German lifestyle, may have long-term negative effects on the health of Aussiedler.

Keywords: Health disparities, ethnic German immigrants, social gradient, healthy migrant effect, multilevel logistic regression analysis

Introduction

In the years immediately following reunification, the Federal Republic of Germany experienced a high level of net in-migration, largely caused by the inflow of ethnic German immigrants. Ethnic German immigrants (also called resettlers, or Aussiedler) are (descendants of) emigrants who moved from what is now German territory to Eastern Europe¹ before the 20th century. Hoping to improve their living conditions in terms of wealth, job opportunities and social acceptance, many of these descendents decided to re-migrate to Germany. These trends were further promoted by the socio-political and economic collapse in the countries of the former Soviet Union and the passage of legislation affecting Aussiedler in-migration (the pro-return-migration policy of the German government) in the 1990s (Kyobutungi et al., 2006a).

In the 21st century, Aussiedler immigration has almost stopped. However, due to many years of very high levels of in-migration, the Aussiedler population in Germany has grown rapidly. With almost 3.27 million registered persons in 2009, Aussiedler are the largest group of immigrants in present-day Germany (Federal Statistical Office, 2010). Despite their numbers, there is considerable need for more research about Aussiedler, as the number of international studies on this group is still low.

Aussiedler have achieved a high level of social and economic integration in German society (Woellert et al., 2009), in part because integration of these immigrants was intensively promoted by German social policy. Their degree of integration, together with their high levels of education, makes them an attractive population for health research on migrants. The educational composition of Aussiedler differs markedly, for example, from that of Turkish migrants: while 15.5% of male Aussiedler and 17.9% of female Aussiedler have attained a high level of education (*Abitur*), the percentage of highly educated Turkish migrants without German citizenship is only about 7.3% for males and 4.3% for females (Federal Statistical Office, 2010). Considering the well-documented favourable effects of high levels of education on health, the confounding effect of education on health in the Aussiedler population is expected to be smaller than that of other migrant groups.

This study has two aims. First, it will explore whether a “healthy migrant effect” exists among Aussiedler, and whether the health disparity attenuates with the duration of stay in Germany. The “healthy migrant effect” is one of the most discussed explanations for migrants’ health advantages in the years immediately following in-migration (e.g. Kliever, 1992). After these early years, the social deprivation experienced by migrants is expected to result in a trend of deteriorating health by duration of stay in the host country. When looking at the health of Aussiedler, Kyobutungi et al. (2006a) predicted that the healthy migrant effect would fade, as almost the complete population of Aussiedler have moved to Germany in recent decades (Bundeszentrale für politische Bildung, 2000).

Second, we will explore whether contextual factors of the living environment affect the health of migrants beyond their individual characteristics. Not much is known about the effects on the health states of individual Aussiedler of area-level characteristics, which can promote or reduce health disparities between the health of the Aussiedler and the health of the native population. Unlike other groups of migrants, a relatively high number of Aussiedler live in rural and semi-urban regions. Their residential choices have been affected by German policy

¹ Predominately to regions which today belong to Poland, the Czech Republic, Russia, Ukraine and other countries of the former Soviet Union.

restrictions, but also by their own preferences, which were shaped by experiences in their country of birth (Haug and Sauer, 2007).

Theoretical background

Why investigate the health of Aussiedler?

Aussiedler are a distinct group of migrants; different from, for example, Turkish migrants, who constitute the second largest group of migrants in Germany. One of the special characteristics of Aussiedler results from the unique German policy on Aussiedler. They are legally recognized as “Germans by status”, they can directly acquire citizenship and they are entitled to participate in the health and welfare system, with all its rights and responsibilities. Until the 1990s, German immigration policy called for the permanent integration of Aussiedler, but only temporary integration for most of the so-called “guest workers” (labour migrants, like Turkish migrants). Aussiedler have access to the full range of government assistance programmes (financial transfers, government-funded integration programmes and language courses, etc.), which may promote integration and social participation. These benefits may help to reduce some of the negative effects on health due to socioeconomic deprivation, problems of integration and migration stress. By contrast, most of the other groups of immigrants (especially non-EU migrants) do not have that privileged legal status (Kosubek, 1998).

However, German policy on Aussiedler also covers restrictive guidelines, like the assignment of a place of residence to Aussiedler in Germany, which is of interest when analysing spatial aspects of health. Until 2010, Aussiedler who requested social benefits shortly after in-migration were assigned to one of the various regions of Germany based on an official quota system. Although Ronellenfitsch et al. (2006) considered the assignment to be a quasi-random procedure, it can be assumed that systematic trends of trans-regional migration (especially the migration flows from eastern to western Germany) affected the composition of the regional Aussiedler population in terms of socioeconomic characteristics (Haug and Sauer, 2007). In an analysis of the mobility patterns of Aussiedler in West Germany between 1991 and 1994, Mammey (2003) detected only a low level of interregional migration: just 3.4 % of 530 Aussiedler in the survey moved to another state, 5.8 % moved to another region, 14.6 % moved to another municipality within a region and 76% did not move to another municipality. High rates of interregional mobility can be found for younger and older ages, and for persons with high levels of education. At the level of municipalities, Mammey (2003) found that a higher number of migrants moved from rural and suburban regions to urban regions than the other way round. In addition, Aussiedler were not found to be as concentrated in highly urbanised regions as other groups of migrants, like Turkish migrants. While the proportion of Turks in rural regions is very low, Aussiedler also live in peripheral areas. Although a lower level of segregation can be expected for Aussiedler than for Turks, a trend towards increasing segregation has been observed among Aussiedler since the mid-1990s (Dietz, 1999). The segregation of Aussiedler is mainly the result of individual preferences, such as a desire to live close to friends and relatives (trends of so-called chain migration), as well as by restrictions of the communal (social) housing market (Haug and Sauer, 2007).

State of research – the health of Aussiedler

Compared to the number of studies of other groups of international migrants to Germany, studies about the mortality and morbidity of Aussiedler are rare. Relative to native Germans, Aussiedler have lower levels of overall and of cardiovascular mortality (Ronellenfitsch et al., 2006), the same level of all-cancer mortality for male Aussiedler, but higher lung cancer mortality, lower all-cancer mortality (especially lung and breast cancer mortality) for female Aussiedler (Kyobutungi et al., 2006b) and a significantly higher risk of non-natural mortality for male Aussiedler, especially in suicide (Kyobutungi et al., 2006a). The latter seems to be an indicator of significant mental health problems (overview of these studies see Becher et al., 2007).

The results of studies of the health of Aussiedler have so far been inconsistent. Shortly after in-migration, Aussiedler have worse self-rated health and a higher number of reported complaints, but a lower frequency of visits to practitioners and specialists compared to native Germans (Wittig et al., 2004). The negative health effects of the strain of the migration experience, together with unchanged, traditional health-seeking behaviours, may explain this paradox.

Divergent results have been reported concerning the health of Aussiedler by the duration of stay. While the level of health satisfaction of immigrants from Eastern Europe has been found to be deteriorating (Ronellenfitsch and Razum, 2004), Aussiedler in Augsburg (Bavaria) have reported improvements in self-perceived health by increasing duration of stay (Aparicio et al., 2004). Aussiedler tend to adapt their lifestyles to those of the native population—which includes the adoption of some unhealthy habits—within a few years after migration (Reiss et al., 2010). An adaptation of the smoking patterns of Aussiedler to those native Germans has been reported. This implies that, due to the divergent baseline prevalence of smoking in Eastern Europe, there has been an increase in smoking prevalence among female Aussiedler, and a decrease in the prevalence of smoking among male Aussiedler. According to Reiss et al. (2010), these findings tend to support the theory of a “health transition”.

State of research – effects of regional characteristics on health

In recent years, the number of international studies examining contextual effects on health has grown rapidly. For many contextual small-level characteristics, effects on self-rated health, cardiovascular morbidity, risk factors and mortality have been detected; however these effects have generally been found to be smaller than the effects of individual factors (e.g. reviews by Pickett and Pearl, 2001 or Riva et al., 2007). Poor self-rated health is, for example, strongly associated with bad socioeconomic conditions in a region; negative perceptions of environmental conditions in the area; and lower levels of social capital, political engagement and transport wealth. Due to divergent measurements of health or methodological and conceptual problems, the conclusions we can draw from the literature are limited (Riva et al., 2007).

In the case of Germany, there are relatively few (but a rapidly increasing) number of studies investigating contextual effects on health. The findings on the effects of area-level characteristics on mortality (Queste, 2007, Breckenkamp et al., 2007, Kibele, 2008) and health (Wolf, 2004, Kemptner et al., 2008) have been inconsistent. While no evidence was found for effects of regional deprivation on cardiovascular mortality in the mid-1980s (Breckenkamp et al., 2007), the unemployment rate, the share of employees with university degree (both sexes),

living space (males) and GDP per capita (females) were shown to be associated with the mortality of people aged 65+ in 1998 to 2004 (Kibele, 2008).

In a study of Bavarian regions, socioeconomic disparities² were shown to have a negative effect on self-rated health and health behaviours (e.g., physical inactivity, alcohol consumption, obesity, unhealthy diet) (Kempton et al., 2008). Lifestyle factors like obesity, media consumption, and eating and snacking habits are also known to be closely connected with the social structure and the local infrastructure. Thus, the prevalence of obesity has been shown to be significantly higher for non-German youths (aged 13-15 in the city of Kiel in northern Germany) and for youths living in areas with a high density of fast-food restaurants, kiosks, takeaways and bakeries; as well as a high unemployment rate (Lange et al., 2011). Individuals living in regions with a high unemployment rate, a high degree of rurality, a high proportion of elderly people (aged 65+) and a low proportion of foreigners have been found to have statistically significant higher odds of poor self-rated health (Diehl and Schneider, 2011). Lower levels of infrastructure (Voigtländer et al., 2008) and a higher degree of isolation of the elderly (Cassel, 1976), which may affect their ability to reach their physicians or participate in social events, are explanations for the detrimental effects of rurality. The more vibrant social life and cultural richness in regions with a high degree of ethnic diversity may promote health (Diehl and Schneider, 2011).

Ecological factors also play a role in explaining the association between regional deprivation and health. The adjustments for environmental characteristics of the neighbourhood (perceived air pollution, perceived noise and perceived distance to recreational resources) weaken the effect of economic deprivation on health. However, the relationship between health disadvantages and socioeconomic deprivation at the level of neighbourhoods (as measured by the average purchasing power) and regions (as measured, for example, by unemployment rates) does not completely disappear (Voigtländer et al., 2010).

The number of studies that have focused on the contextual effects on the health of migrants is significantly lower. In Belgium, immigrants from Turkey and Morocco have poorer self-perceived health than native Belgians (Lorant et al., 2008). High unemployment, poor environmental conditions, a lack of public amenities, a poor social environment and a low density of non-natives in a region have been shown to have significantly negative effects on the health of migrants. Controlling for individual socio-economic status and contextual factors were found to reduce the migrants' health disadvantage.³ These results are an indicator of the "double jeopardy" faced by migrants: risks at the individual level and at the contextual level lead to poor health among migrants (Lorant et al., 2008).

Methods

Data

With a sample of nearly 820,000 persons, the German Microcensus is well-suited for analysing living conditions on a sub-national level for ethnic minorities in Germany. The Microcensus is a representative cross-sectional and multi-purpose survey with information about general socio-demographic, economic and behavioural aspects of life (Federal Statistical Office, 2011).

² Measured by indicators like proportion of persons leaving school with a higher education entrance qualification or disposable household income.

³ Or even changed towards a health advantage of Moroccans/Turks.

Wave 2005 of the German Microcensus (hereafter referred to as Microcensus 2005) has been chosen for this analysis because it combines detailed information about migratory background and information on individuals' health status. To meet the requirements of the German data protection law and to ensure an adequate case number per region, the regional level will be defined as "spatial planning regions" (*Raumordnungsregionen*). Due to the very low number of Aussiedler in the East German regions, the analysis is limited to persons living in households in regions in West Germany and Berlin (the eastern and western parts of the city) only.

To collect information about the individuals' residential regions in 2005, the INKAR ("Indikatoren und Karten zur Raumentwicklung in Deutschland und Europa") 2007 database is used. The INKAR 2007 database of the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) covers a wide range of indicators on divergent administrative levels. Many indicators are obtained from the database of the national statistical office, while other factors are directly measured by the Institute staff (BBSR, 2007).

Variables

Migration status

The Microcensus 2005 includes information on country of birth, year of immigration, naturalisation status and previous and present citizenship. By combining these facts, it is possible to approximate the migration status. Native Germans are defined as persons holding German citizenship not acquired by an act of naturalisation, and who were born in Germany in its present boundaries. German citizens who moved to Germany before 1949 are also classified as native Germans. Aussiedler are assumed to be persons with German citizenship (as well as with additional citizenships) not acquired by an act of naturalisation, and who moved to Germany after 1949 (Federal Statistical Office, 2007, p. 325-330). Excluded from this group are persons with additional/former citizenships of countries outside of Eastern or Central Eastern Europe.⁴

In this analysis, nearly 13,100 persons can be identified as Aussiedler; of those, about 11,500 persons are older than age 18. The reference group is made up of nearly 473,000 native Germans, or 376,000 persons aged 18+. By using the information on the year of immigration, the duration of stay in Germany is computed. This information will be used to stratify Aussiedler into four subgroups by length of stay: Aussiedler who have been living in Germany for less than 15 years (in-migration after 1990), for 15 to 30 years (in-migration after 1975) and for more than 30 years (in-migration before 1975). Persons with missing information on the year of immigration are combined in an additional category. The stratification is used to analyse health disparities among different immigration cohorts of Aussiedler.

Health outcomes

The Microcensus 2005 includes a health module in addition to the standard programme with a limited set of indicators. In the following analysis, the general health status is measured by the following question: "Have you been ill or had an accidental injury within the last four weeks

⁴ The Eastern and Central Eastern European countries include Poland, the Czech Republic, Slovakia, Slovenia, Hungary, Romania, Bulgaria, the Russian Federation, Estonia, Latvia, Lithuania and other countries of the former Soviet Union.

[before the interview]?” All persons with positive responses are defined as unhealthy. Because answering this question is optional, the number of cases with missing information is higher than for most of the other variables. In sum, more than 53,000 native Germans and nearly 1,500 Aussiedler had to be excluded from the analysis due to missing health information. In total, about 323,000 native Germans and 10,020 Aussiedler remain in the sample under study (see Table 1).

Table 1: Overview of sample (duration of stay in brackets)

	Males	Females	Total
Native Germans	152,669	170,144	322,813
Aussiedler (<15 years)	316	344	660
Aussiedler (15 to <30 years)	2,848	3,072	5,920
Aussiedler (30+ years)	1,114	1,351	2,465
Aussiedler (no information)	476	501	977
Total	157,423	175,412	332,835

Source: Microcensus 2005, Statistische Ämter des Bundes und der Länder

Control variables on individual level

When analysing contextual effects on individual health outcomes, the effects of personal characteristics will be controlled for. These individual level variables are age (in 10-year age groups), sex, family status (single, married – living together, married – living apart, divorced, widowed), net equivalent income (up to €450, more than €450 to €640, more than €640 to €1040, €1040 to €1600, more than €1600), education (no degree = no degree and not in education, low degree = *Haupt-/Volksschulabschluss*, medium degree = *Realschulabschluss/PTO-Abschluss*, high degree = (*Fach-*)*Hochschulreife*, in education/missing), body mass index (underweight = body mass index of less than 18.5, normal = bmi up to 25, light overweight = bmi up to 30, high overweight = bmi of more than 30) and smoking habits (never smoker, former smoker/ever smoker, smoker, missing). In addition, the quarter of the year of the interview will be included in the models to control for the seasonal effects of health.

Contextual variables

Three contextual factors are included in the models: centrality of regional population distribution, gross domestic product (GDP) per capita and proportion of foreigners in a region.

The centrality of a region is an indicator for settlement structure and population agglomeration, but also of the regional cohesion. Centrality is defined as the percentage of persons in the region who live less than 30 minutes’ journey away from the next regional centre (*Oberzentrum*), and it is measured by the BBSR.

The gross domestic product (GDP) per capita of a region is an indicator for the economic performance/structure and the socioeconomic composition of the regional population. The economic performance itself can be seen as an indicator for the (financial) scope of action of regional policy administration.

The proportion of foreigners in a region is an indicator of the attractiveness of a region as a destination of immigration (e.g. in terms of regional social capital, such as established communities and networks of immigrant groups or the regional social climate/level of acceptance of immigrants).

The macro variables are grouped into three categories: persons who live in the 10% of the western German regions with the lowest level of centrality⁵/lowest GDP per capita⁶/lowest proportion of foreigners⁷, persons in the 10% of the regions with the highest level of centrality/highest GDP per capita/highest proportion of foreigners and persons in the remaining regions.

Statistical methods

Binary logistic multilevel regression models are used to model the effects of individual and contextual variables on an individual's health status (Snijders and Bosker, 1999). Multilevel models are chosen because it is possible to estimate the variance components in addition to the effects of the variables on individual and regional level with this type of model (Kothari and Birch, 2004) Thus, the standard errors for the coefficients of contextual variables will be estimated correctly. In the following analysis, only fixed effect models will be calculated. All estimations are performed using the "xtmelogit" routine in STATA version 10.1 (Rabe-Hesketh and Skrondal, 2005).

Results

The spatial distribution of first-generation Aussiedler differs considerably between East and West Germany, with most Aussiedler being concentrated in the highly urbanised regions of Western Germany (Figure 1). In the West, the proportion of Aussiedler exceeds 1.7% in almost all regions, except in parts of Bavaria, Rhineland-Palatinate and north-western Germany. The percentages are highest (up to 5.1%) in the mostly highly urbanised regions of Hessen, North Rhine-Westphalia, Lower Saxony, Baden-Wurtemberg and Bremen. In East Germany, the proportion is generally below 0.6%, with the notable exception of Berlin (1.3%). The following analyses are based on Aussiedler living in West Germany and Berlin only.

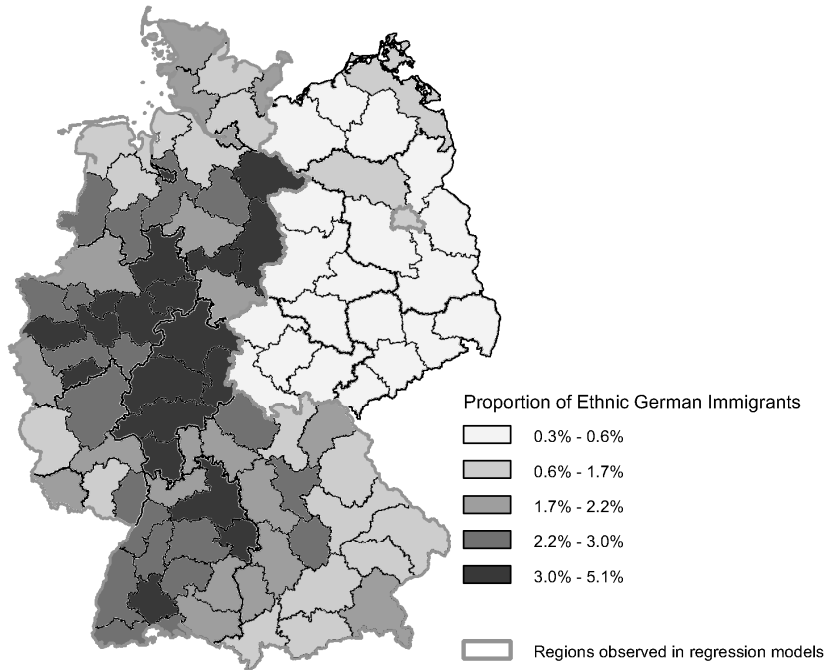
Table 2 compares the characteristics of native Germans with those of Aussiedler, differentiated by the duration of their stay in Germany. Native Germans and Aussiedler differ in terms of their health, family status, education and income. The proportion of unhealthy people is highest among Aussiedler who have been living in Germany for more than 30 years (16%). Those living in Germany for up to 15 years are the healthiest (9% in poor health), and are even healthier than native Germans (12% in poor health). The differences are significant.

⁵ Regions with the lowest centrality: Emsland, Südheide, Schleswig-Holstein Süd-West, Arnsberg, Ostwürttemberg, Oberland, Hamburg-Umland-Süd, Ost-Friesland; regions with the highest centrality: Südlicher Oberrhein, Industrieregion Mittelfranken, Rhein-Main, Bochum/Hagen, Hamburg, Bremen, Berlin, Düsseldorf

⁶ Regions with the lowest GDP: Hamburg-Umland-Süd, Emscher-Lippe, Lüneburg, Bremen-Umland, Westpfalz, Ost-Friesland, Bremerhaven, Hildesheim; regions with the highest GDP: Mittlerer Oberrhein, Düsseldorf, Industrieregion Mittelfranken, Stuttgart, Bremen, Rhein-Main, München, Hamburg.

⁷ Regions with the lowest proportions: Schleswig-Holstein Süd-West, Oberpfalz-Nord, Ost-Friesland, Schleswig-Holstein Nord, Main-Rhön, Oberfranken-West, Hamburg-Umland-Süd, Donau-Wald; regions with the highest proportions: Dortmund, Bremen, Berlin, Unterer Neckar, Hamburg, Rhein-Main, Stuttgart, München.

Figure 1: Proportion of Aussiedler by region in 2005



Source: Microcensus 2005, Statistische Ämter des Bundes und der Länder

Corresponding to the stratification variable (duration of stay), the age structures of the sub-groups differ significantly. Native Germans have a higher mean age (51.6 years) than Aussiedler living in Germany for less than 30 years (41.0 years for <15 years; 44.8 years for 15 to <30 years), the Aussiedler population with long-term residence have the highest average age (61.9 years for >30 years). The differences in mean age are highly significant (see Table 3).

The gender distribution does not differ between the five sub-groups, with women slightly outnumbering men. This is also true for the timing of the interviews, which were mainly performed in the fourth quarter of 2005. The family status differs slightly between the subgroups. Most Aussiedler and native Germans are married and live together with their partners (56% for native Germans to 64 % for 15 to <30 years). The percentage of single persons is smallest among Aussiedler (>30 years) and is highest among native Germans (10% for >30 years to 24% for native Germans). The differences are not statistically significant. While relatively small percentages of Aussiedler who have been in Germany for less than 30 years are divorced or widowed (up to 5% and less than 7%, respectively), the proportions of divorced and widowed people among Aussiedler living in the country for more than 30 years (9% and 17%, respectively) are notably higher than among native Germans (7% and 11%, respectively).

Table 2: Characteristics of native Germans and Aussiedler by duration of stay in Germany (in percent)

Proportion in %	Native Germans		Aussiedler (<15 years)		Aussiedler (15 to <30 years)		Aussiedler (30+ years)		Aussiedler (no information)	
Health status										
Healthy	73.6	(73.4 ; 73.7)	77.5	(74.5 ; 80.4)	76.4	(75.4 ; 77.4)	71.5	(69.8 ; 73.1)	77.1	(74.7 ; 79.6)
Unhealthy	12.3	(12.2 ; 12.4)	8.9	(6.9 ; 10.9)	11.0	(10.2 ; 11.7)	16.4	(15.1 ; 17.8)	8.2	(6.6 ; 9.8)
Missing	14.1	(14.0 ; 14.2)	13.6	(11.2 ; 16.0)	12.6	(11.8 ; 13.4)	12.1	(10.9 ; 13.3)	14.7	(12.6 ; 16.7)
Age group										
20 to less than 30 years old	12.3	(12.2 ; 12.4)	33.1	(29.8 ; 36.5)	23.7	(22.7 ; 24.7)	-		23.0	(20.5 ; 25.4)
30 to less than 40 years old	16.3	(16.1 ; 16.4)	21.1	(18.2 ; 24.0)	17.7	(16.7 ; 18.6)	6.5	(5.5 ; 7.4)	26.6	(24.0 ; 29.1)
40 to less than 50 years old	19.6	(19.5 ; 19.7)	16.6	(14.0 ; 19.3)	22.7	(21.7 ; 23.7)	13.8	(12.6 ; 15.1)	32.4	(29.7 ; 35.1)
50 to less than 60 years old	15.9	(15.8 ; 16.0)	14.4	(11.9 ; 16.9)	15.7	(14.8 ; 16.6)	17.9	(16.5 ; 19.4)	17.0	(14.9 ; 19.2)
60 to less than 70 years old	17.4	(17.3 ; 17.5)	7.6	(5.7 ; 9.5)	10.0	(9.3 ; 10.7)	*/*		*/*	0.0
70 to less than 80 years old	11.9	(11.8 ; 12.0)	5.4	(3.8 ; 7.0)	7.5	(6.9 ; 8.2)	*/*		*/*	
80 years and older	6.6	(6.54 ; 6.7)	1.8	(0.88 ; 2.78)	2.7	(2.29 ; 3.06)	7.7	(6.7 ; 8.7)	0.5	(0.2 ; 0.8)
Sex										
Males	47.2	(47.1 ; 47.4)	47.8	(44.2 ; 51.3)	48.1	(46.9 ; 49.3)	45.2	(43.3 ; 47.0)	48.9	(46.0 ; 51.8)
Females	52.8	(52.6 ; 52.9)	52.2	(48.7 ; 55.8)	51.9	(50.7 ; 53.1)	54.8	(53.0 ; 56.7)	51.1	(48.2 ; 54.0)
Quarter of the year of the interview										
1 st quarter	21.3	(21.2 ; 21.4)	17.3	(14.6 ; 20.0)	20.5	(19.6 ; 21.5)	22.8	(21.2 ; 24.3)	23.3	(20.9 ; 25.8)
2 nd quarter	24.8	(24.7 ; 24.9)	25.3	(22.2 ; 28.3)	24.8	(23.8 ; 25.9)	22.9	(21.3 ; 24.5)	27.2	(24.6 ; 29.7)
3 rd quarter	25.6	(25.5 ; 25.8)	22.5	(19.5 ; 25.5)	26.1	(25.1 ; 27.2)	24.7	(23.1 ; 26.3)	22.4	(20.0 ; 24.9)
4 th quarter	28.3	(28.1 ; 28.4)	34.9	(31.6 ; 38.3)	28.5	(27.4 ; 29.6)	29.6	(27.9 ; 31.3)	27.1	(24.5 ; 29.6)
Family status										
Single	23.9	(23.7 ; 24.0)	22.3	(19.3 ; 25.2)	21.6	(20.6 ; 22.6)	10.0	(8.9 ; 11.1)	30.2	(27.6 ; 32.9)
Married - living together	56.4	(56.3 ; 56.6)	63.5	(60.1 ; 66.9)	64.3	(63.1 ; 65.4)	62.4	(60.7 ; 64.2)	59.5	(56.6 ; 62.3)
Married - living apart	1.9	(1.9 ; 2.0)	3.7	(2.3 ; 5.0)	2.4	(2.0 ; 2.7)	1.8	(1.3 ; 2.3)	1.8	(1.1 ; 2.6)
Divorced	7.3	(7.2 ; 7.4)	6.0	(4.3 ; 7.7)	5.1	(4.6 ; 5.6)	8.7	(7.7 ; 9.7)	6.9	(5.4 ; 8.4)
Widowed	10.5	(10.4 ; 10.6)	4.6	(3.1 ; 6.1)	6.7	(6.1 ; 7.3)	17.0	(15.6 ; 18.4)	1.6	(0.9 ; 2.3)
Education										
No degree	1.8	(1.7 ; 1.8)	7.5	(5.6 ; 9.3)	6.7	(6.1 ; 7.2)	6.0	(5.1 ; 6.9)	4.8	(3.6 ; 6.0)
Low degree	48.4	(48.3 ; 48.6)	43.2	(39.7 ; 46.7)	42.4	(41.2 ; 43.6)	56.2	(54.3 ; 58.0)	39.2	(36.4 ; 42.0)
Medium degree	24.4	(24.3 ; 24.5)	28.5	(25.3 ; 31.7)	26.7	(25.6 ; 27.8)	18.0	(16.6 ; 19.4)	27.2	(24.6 ; 29.7)
High degree	24.1	(24.0 ; 24.3)	19.0	(16.2 ; 21.8)	23.1	(22.1 ; 24.1)	19.3	(17.9 ; 20.8)	27.2	(24.7 ; 29.8)
In education / missing information	1.2	(1.2 ; 1.2)	1.8	(0.9 ; 2.8)	1.2	(0.9 ; 1.4)	0.5	(0.3 ; 0.8)	1.6	(0.9 ; 2.3)

*/# data not available (due to a low number of cases)

Source: Microcensus 2005, Statistische Ämter des Bundes und der Länder

Table 2: Characteristics of native Germans and Aussiedler by duration of stay in Germany (in percent)

Proportion in %	Native Germans		Aussiedler (<15 years)		Aussiedler (15 to <30 years)		Aussiedler (30+ years)		Aussiedler (no information)	
Net equivalence income										
Up to €480	2.1	(2.0 ; 2.1)	10.2	(8.1 ; 12.4)	3.0	(2.5 ; 3.4)	1.9	(1.4 ; 2.4)	5.1	(3.8 ; 6.3)
More than €480 to €640	3.7	(3.6 ; 3.8)	20.4	(17.6 ; 23.3)	6.9	(6.3 ; 7.5)	3.4	(2.7 ; 4.1)	4.1	(3.0 ; 5.3)
More than €640 to €1,040	18.8	(18.7 ; 18.9)	41.6	(38.1 ; 45.1)	32.6	(31.5 ; 33.7)	21.0	(19.5 ; 22.6)	25.6	(23.1 ; 28.1)
More than €1,040 to €1,600	32.1	(32.0 ; 32.3)	16.5	(13.9 ; 19.1)	34.7	(33.5 ; 35.8)	35.5	(33.7 ; 37.3)	29.3	(26.6 ; 31.9)
More than €1,600	34.5	(34.3 ; 34.6)	6.3	(4.6 ; 8.0)	17.5	(16.6 ; 18.4)	31.8	(30.1 ; 33.5)	26.4	(23.8 ; 28.9)
Missing information	8.8	(8.7 ; 8.9)	5.0	(3.4 ; 6.5)	5.4	(4.8 ; 5.9)	6.4	(5.5 ; 7.3)	9.6	(7.9 ; 11.3)
Body mass index										
Underweight	1.7	(1.7 ; 1.8)	2.5	(1.4 ; 3.6)	1.5	(1.3 ; 1.8)	1.4	(1.0 ; 1.8)	2.1	(1.3 ; 2.9)
Normal weight	37.5	(37.3 ; 37.6)	34.0	(30.7 ; 37.4)	35.3	(34.2 ; 36.5)	32.2	(30.4 ; 33.9)	41.7	(38.8 ; 44.5)
Light overweight	27.4	(27.3 ; 27.6)	27.2	(24.1 ; 30.4)	28.8	(27.7 ; 29.9)	33.8	(32.0 ; 35.5)	23.2	(20.8 ; 25.7)
High overweight	9.8	(9.7 ; 9.9)	14.0	(11.5 ; 16.5)	13.2	(12.4 ; 14.0)	13.3	(12.0 ; 14.6)	9.5	(7.8 ; 11.2)
Missing information	23.6	(23.5 ; 23.7)	22.3	(19.3 ; 25.2)	21.2	(20.2 ; 22.1)	19.4	(17.9 ; 20.8)	23.5	(21.0 ; 26.0)
Smoking habits										
Never smoker	43.6	(43.4 ; 43.7)	50.7	(47.1 ; 54.2)	48.6	(47.4 ; 49.8)	47.2	(45.4 ; 49.1)	39.5	(36.6 ; 42.3)
Former smoker	18.1	(18.0 ; 18.3)	8.9	(6.9 ; 10.9)	13.9	(13.1 ; 14.8)	22.1	(20.5 ; 23.6)	15.2	(13.1 ; 17.3)
Smoker	21.9	(21.8 ; 22.0)	25.3	(22.2 ; 28.3)	23.0	(22.0 ; 24.0)	17.0	(15.6 ; 18.4)	27.9	(25.3 ; 30.5)
Missing information	16.4	(16.3 ; 16.5)	15.2	(12.6 ; 17.7)	14.4	(13.6 ; 15.3)	13.7	(12.4 ; 15.0)	17.4	(15.2 ; 19.6)
Centrality of population distribution										
Regions with low centrality	5.1	(5.0 ; 5.1)	4.3	(2.9 ; 5.8)	4.1	(3.6 ; 4.6)	3.2	(2.6 ; 3.9)	6.9	(5.4 ; 8.4)
Regions with average centrality	74.7	(74.6 ; 74.9)	74.1	(71.0 ; 77.2)	71.9	(70.8 ; 72.9)	70.0	(68.3 ; 71.7)	72.4	(69.8 ; 75.0)
Regions with high centrality	20.2	(20.1 ; 20.4)	21.6	(18.7 ; 24.5)	24.1	(23.0 ; 25.1)	26.7	(25.1 ; 28.4)	20.7	(18.4 ; 23.0)
Gross domestic product										
Regions with low GDP	6.1	(6.0 ; 6.2)	6.2	(4.4 ; 7.9)	4.5	(4.0 ; 5.0)	4.4	(3.7 ; 5.2)	6.8	(5.4 ; 8.3)
Regions with average GDP	73.5	(73.4 ; 73.7)	72.6	(69.5 ; 75.8)	71.6	(70.5 ; 72.7)	66.2	(64.4 ; 67.9)	70.4	(67.7 ; 73.0)
Regions with high GDP	20.4	(20.2 ; 20.5)	21.2	(18.3 ; 24.1)	23.9	(22.9 ; 24.9)	29.4	(27.7 ; 31.1)	22.8	(20.4 ; 25.2)
Proportion of foreigners										
Regions with low proportion	6.6	(6.5 ; 6.7)	5.8	(4.1 ; 7.4)	2.7	(2.3 ; 3.1)	2.9	(2.3 ; 3.5)	5.7	(4.3 ; 7.0)
Regions with average proportion	72.1	(72.0 ; 72.3)	72.8	(69.6 ; 75.9)	78.6	(77.7 ; 79.6)	70.9	(69.2 ; 72.6)	76.9	(74.5 ; 79.4)
Regions with high proportion	21.2	(21.1 ; 21.4)	21.5	(18.6 ; 24.4)	18.7	(17.8 ; 19.6)	26.2	(24.5 ; 27.8)	17.4	(15.2 ; 19.6)

Source: Microcensus 2005, Statistische Ämter des Bundes und der Länder

The majority of Aussiedler have low levels of education (about 43% for <15 years to about 56% for >30 years, versus 48% for native Germans). The percentage of persons with no education is slightly (but significantly) higher for Aussiedler (about 6% to 8%) than for native Germans (about 2%). The proportion of persons with medium and high degrees does not differ among Aussiedler and native Germans: about 18% to 25% of native Germans and Aussiedler have a medium degree, and about 19% to 24% have a high degree. Most of the native Germans and Aussiedler have a net equivalence income of between €640 and €1600, but there are statistically significant differences between the subgroups.

Table 3: Mean age, mean net equivalence income and mean body mass index for native Germans and Aussiedler, 95% confidence intervals

	Native Germans	Aussiedler (<15 years)	Aussiedler (15 to <30 years)	Aussiedler (30+ years)	Aussiedler (no information)
Mean age	51.62 <i>51.57 , 51.67</i>	40.97 <i>39.85 , 42.09</i>	44.76 <i>44.36 , 45.16</i>	61.87 <i>61.39 , 62.34</i>	38.96 <i>38.35 , 39.56</i>
Mean net equivalence income	1576.04 <i>1573.13 , 1578.95</i>	897.89 <i>850.45 , 945.33</i>	1246.63 <i>1229.38 , 1263.88</i>	1558.25 <i>1523.21 , 1593.29</i>	1432.04 <i>1379.49 , 1484.59</i>
Mean body mass index	25.55 <i>25.54 , 25.57</i>	26.13 <i>25.73 , 26.54</i>	25.94 <i>25.82 , 26.06</i>	26.34 <i>26.17 , 26.51</i>	25.10 <i>24.81 , 25.40</i>

Source: Microcensus 2005, Statistische Ämter des Bundes und der Länder

The mean income of Aussiedler rises with an increasing duration of stay (€898 for <15 years to €1558 for >30 years, €1576 for native Germans). The proportion of persons with an income of less than €640 is highest for Aussiedler (<15 years; about 31%) and is smallest for Aussiedler (>30 years) and native Germans (about 6%). The differences in income between native Germans and Aussiedler are mostly significant.

The body mass index of Aussiedler does not differ from that of native Germans, as in all subgroups, about 32% to 38% of the people are of normal weight. Among Aussiedler, however, there is a trend towards light and high overweight with increasing duration of stay (light/high overweight: about 41% for <15 years and about 47% for >30 years). Aussiedler have a slightly, but significantly higher mean body mass index than native Germans (25.6 kg/m² for native Germans; about 26.0 kg/m² for Aussiedler). Aussiedler and native Germans differ only slightly in their smoking habits. Most persons have never smoked, but Aussiedler (about 47% to 51%) have a higher proportion of never smokers than native Germans (about 44%). While Aussiedler (<30 years) are less likely to be former smokers (about 9% for <15 years to 14% for 15 to <30 years), Aussiedler (>30 years; about 22%) are more likely to be former smokers than native Germans (about 18%). Smoking prevalence (about 22%) does not significantly differ between the subgroups (except Aussiedler >30 years: 17%).

In all of the subgroups, the vast majority live in regions of average centrality, with an average GDP per capita and with an average proportion of foreigners. However, with an increasing duration of stay, Aussiedler are concentrated in regions with the highest centrality (22% for <15 years, 27% for >30 years), the highest GDP per capita (21% for <15 years, 29% for >30 years) or the highest proportion of foreigners (22% for <15 years, 26% for >30 years).

Our multivariate analysis consists of three nested models. In the first model, which we call the baseline model, we estimate the risk of poor health for the five subgroups without controlling for any individual characteristic. The extended model controls for age and sex, while the final model includes both individual characteristics (education and net equivalence income, the quarter of the year of the interview, family status, smoking habits and body mass index) and macro factors (centrality of population distribution, GDP per capita and proportion

of foreigners). All analyses are performed for the total population (Table 3, first column), as well as separately for males (second column) and for females (third column).

The first part of Table 4 shows that, in the baseline model, Aussiedler with a duration of stay of less than 30 years have better health than native Germans, while Aussiedler who have been living in Germany for more than 30 years have worse health. This is true for both sexes. All disparities are highly significant. In the extended model, adjusting for age and sex (in "Total") reduces the health disparity by duration of stay, which then becomes insignificant.

Table 4: Odds of being ill in the last 4 weeks for native Germans and Aussiedler: odds ratio and 95% CI from multilevel regression

	Total		Males		Females	
	OR	95% CI	OR	95% CI	OR	95% CI
Baseline model						
Native Germans	1		1		1	
Aussiedler (<15 years)	0.67	(0.52 , 0.86)	0.66	(0.46 , 0.97)	0.67	(0.48 , 0.95)
Aussiedler (15 to <30 years)	0.85	(0.78 , 0.91)	0.86	(0.76 , 0.96)	0.84	(0.76 , 0.93)
Aussiedler (30+ years)	1.37	(1.24 , 1.51)	1.35	(1.15 , 1.58)	1.38	(1.21 , 1.58)
Aussiedler (no information)	0.64	(0.52 , 0.79)	0.79	(0.59 , 1.06)	0.52	(0.38 , 0.72)
Extended baseline model, controlled for age and sex (in "Total")						
Native Germans	1		1		1	
Aussiedler (<15 years)	0.86	(0.67 , 1.11)	0.86	(0.59 , 1.26)	0.86	(0.61 , 1.21)
Aussiedler (15 to <30 years)	1.01	(0.93 , 1.09)	1.01	(0.90 , 1.14)	1.01	(0.90 , 1.12)
Aussiedler (30+ years)	1.11	(1.00 , 1.23)	1.07	(0.91 , 1.25)	1.15	(1.00 , 1.32)
Aussiedler (no information)	0.93	(0.75 , 1.15)	1.11	(0.83 , 1.48)	0.77	(0.56 , 1.06)
Final model, controlled for all individual* and macro factors**						
Native Germans	1		1		1	
Aussiedler (<15 years)	0.74	(0.58 , 0.96)	0.70	(0.48 , 1.02)	0.77	(0.54 , 1.09)
Aussiedler (15 to <30 years)	0.96	(0.88 , 1.04)	0.93	(0.83 , 1.05)	0.97	(0.87 , 1.08)
Aussiedler (30+ years)	1.06	(0.95 , 1.18)	1.01	(0.87 , 1.19)	1.10	(0.96 , 1.26)
Aussiedler (no information)	0.90	(0.72 , 1.11)	1.04	(0.78 , 1.39)	0.77	(0.56 , 1.05)

* controlled for age, (sex in Model "Total",) quarter of the year of the interview, family status, education, income, body mass index, and smoking habits
 ** controlled for centrality of population distribution, GDP per capita, and proportion of foreigners

Source: Microcensus 2005, Statistische Ämter des Bundes und der Länder

After controlling for the additional covariates quarter of year of interview, family status, education and net equivalence income, smoking habits and body mass index, and the three selected macro factors in the final models (see Table 4, lower row); Aussiedler who have been in Germany for less than 15 years are seen to have a health advantage (females: OR=0.77, p=0.139; males: OR=0.70, p=0.066), For both sexes combined, the differences relative to native Germans are statistically significant (OR=0.74, p=0.024).

We use the final model to explore the effects of the individual characteristics and of the macro factors on the health of the total population, native Germans and Aussiedler. Again, we estimate separate models for males (Table 5) and females (Table 6).

In general, the effects of the individual factors are the same for Aussiedler and native Germans. However, two interesting findings emerge.

Table 5: Odds of being ill in the last 4 weeks among male native Germans and male Aussiedler: odds ratio and 95% CI from multilevel regression

Covariates	(Total) Males		Male Native Germans		Male Aussiedler	
	OR	95% CI	OR	95% CI	OR	95% CI
Group						
Native Germans	1					
Aussiedler (<15 years)	0.70	(0.48 , 1.02)			1	
Aussiedler (15 to <30 years)	0.93	(0.83 , 1.05)			1.32	(0.88 , 1.99)
Aussiedler (30+ years)	1.01	(0.87 , 1.19)			1.41	(0.90 , 2.21)
Aussiedler (no information)	1.04	(0.78 , 1.39)			1.56	(0.95 , 2.57)
Age group						
20 to less than 30 years old	0.79	(0.74 , 0.85)	0.80	(0.74 , 0.85)	0.78	(0.54 , 1.13)
30 to less than 40 years old	1.01	(0.95 , 1.06)	1.01	(0.96 , 1.07)	0.77	(0.55 , 1.08)
40 to less than 50 years old	1		1		1	
50 to less than 60 years old	1.43	(1.36 , 1.51)	1.43	(1.36 , 1.51)	1.53	(1.15 , 2.04)
60 to less than 70 years old	1.65	(1.57 , 1.74)	1.66	(1.57 , 1.75)	1.60	(1.16 , 2.21)
70 to less than 80 years old	2.66	(2.52 , 2.81)	2.67	(2.52 , 2.82)	2.86	(2.05 , 4.00)
80 years and older	3.73	(3.47 , 4.01)	3.77	(3.50 , 4.06)	2.53	(1.46 , 4.39)
Quarter of the year of the interview						
1 st quarter	1		1		1	
2 nd quarter	0.80	(0.77 , 0.84)	0.80	(0.77 , 0.84)	0.71	(0.55 , 0.91)
3 rd quarter	0.76	(0.73 , 0.79)	0.76	(0.73 , 0.80)	0.61	(0.47 , 0.79)
4 th quarter	0.90	(0.87 , 0.94)	0.90	(0.87 , 0.94)	0.83	(0.66 , 1.05)
Family status						
Single	1.21	(1.15 , 1.26)	1.21	(1.15 , 1.27)	0.99	(0.73 , 1.34)
Married - living together	1		1		1	
Married - living apart	1.40	(1.26 , 1.55)	1.40	(1.26 , 1.55)	1.34	(0.77 , 2.34)
Divorced	1.38	(1.30 , 1.46)	1.38	(1.30 , 1.47)	1.15	(0.78 , 1.69)
Widowed	1.16	(1.09 , 1.24)	1.16	(1.08 , 1.24)	1.26	(0.83 , 1.93)
Education						
No degree	1.44	(1.30 , 1.60)	1.49	(1.34 , 1.65)	1.07	(0.75 , 1.53)
Low degree	1		1			
Medium degree	0.89	(0.85 , 0.93)	0.89	(0.85 , 0.92)	0.96	(0.76 , 1.22)
High degree	0.83	(0.80 , 0.87)	0.83	(0.79 , 0.86)	1.12	(0.88 , 1.44)
In education/missing information	1.28	(1.06 , 1.55)	1.33	(1.10 , 1.62)	0.22	(0.03 , 1.63)
Net equivalence income						
Up to €480	1.08	(0.97 , 1.20)	1.08	(0.97 , 1.21)	0.90	(0.53 , 1.54)
More than €480 to €640	1.22	(1.12 , 1.32)	1.21	(1.12 , 1.32)	1.28	(0.89 , 1.84)
More than €640 to €1,040	1		1		1	
More than €1,040 to €1,600	0.85	(0.81 , 0.89)	0.86	(0.82 , 0.89)	0.72	(0.58 , 0.89)
More than €1,600	0.73	(0.70 , 0.76)	0.74	(0.70 , 0.77)	0.61	(0.46 , 0.80)
Missing information	0.84	(0.79 , 0.90)	0.85	(0.80 , 0.91)	0.50	(0.31 , 0.82)
Body mass index						
Underweight	2.08	(1.79 , 2.41)	2.11	(1.82 , 2.45)	0.73	(0.21 , 2.53)
Normal weight	1		1		1	
Light overweight	0.96	(0.93 , 1.00)	0.96	(0.93 , 1.00)	0.95	(0.77 , 1.17)
High overweight	1.28	(1.22 , 1.34)	1.28	(1.23 , 1.35)	1.09	(0.83 , 1.42)
Missing information	0.83	(0.78 , 0.89)	0.84	(0.78 , 0.90)	0.77	(0.50 , 1.18)
Smoking habits						
Never smoker	1		1		1	
Former smoker	1.45	(1.40 , 1.50)	1.45	(1.39 , 1.50)	1.59	(1.28 , 1.98)
Smoker	1.26	(1.22 , 1.31)	1.26	(1.22 , 1.32)	1.24	(0.99 , 1.55)
Missing information	0.81	(0.73 , 0.91)	0.82	(0.73 , 0.92)	0.53	(0.23 , 1.23)
Centrality of population distribution						
Low centrality	1		1		1	
Average centrality	1.15	(1.01 , 1.31)	1.15	(1.01 , 1.31)	1.45	(0.86 , 2.45)
High centrality	1.22	(1.00 , 1.49)	1.21	(0.99 , 1.48)	1.66	(0.93 , 2.96)
Gross domestic product per capita						
Low GDP per capita	1		1		1	
Average GDP per capita	0.95	(0.84 , 1.08)	0.95	(0.84 , 1.07)	1.04	(0.67 , 1.62)
High GDP per capita	0.81	(0.65 , 1.00)	0.80	(0.65 , 1.00)	0.87	(0.51 , 1.49)
Proportion of foreigners						
Low proportion of foreigners	1		1		1	
Average proportion of foreigners	0.94	(0.83 , 1.07)	0.94	(0.83 , 1.06)	1.38	(0.82 , 2.34)
High proportion of foreigners	0.98	(0.81 , 1.19)	0.98	(0.80 , 1.19)	1.33	(0.74 , 2.42)

Source: Microcensus 2005, INKAR 2007, Statistische Ämter des Bundes und der Länder

Table 6: Odds of being ill in the last 4 weeks among female native Germans and female Aussiedler: odds ratio and 95% CI from multilevel regression

Covariates	(Total) Females		Female Native Germans		Female Aussiedler	
	OR	95% CI	OR	95% CI	OR	95% CI
Group						
Native Germans	1					
Aussiedler (<15 years)	0.77	(0.54 , 1.09)			1	
Aussiedler (15 to <30 years)	0.97	(0.87 , 1.08)			1.26	(0.87 , 1.84)
Aussiedler (30+ years)	1.10	(0.96 , 1.26)			1.39	(0.93 , 2.08)
Aussiedler (no information)	0.77	(0.56 , 1.05)			1.07	(0.66 , 1.73)
Age group						
20 to less than 30 years old	0.88	(0.82 , 0.94)	0.87	(0.82 , 0.94)	0.96	(0.67 , 1.38)
30 to less than 40 years old	0.99	(0.93 , 1.04)	0.99	(0.94 , 1.05)	0.85	(0.60 , 1.22)
40 to less than 50 years old	1		1		1	
50 to less than 60 years old	1.32	(1.25 , 1.39)	1.30	(1.23 , 1.37)	1.92	(1.42 , 2.58)
60 to less than 70 years old	1.68	(1.59 , 1.76)	1.66	(1.58 , 1.74)	2.47	(1.81 , 3.37)
70 to less than 80 years old	2.66	(2.52 , 2.80)	2.66	(2.52 , 2.81)	2.71	(1.93 , 3.80)
80 years and older	3.65	(3.44 , 3.88)	3.64	(3.42 , 3.87)	4.59	(3.08 , 6.84)
Quarter of the year of the interview						
1 st quarter	1		1		1	
2 nd quarter	0.83	(0.80 , 0.86)	0.83	(0.80 , 0.87)	0.78	(0.62 , 0.99)
3 rd quarter	0.78	(0.75 , 0.81)	0.77	(0.74 , 0.81)	0.83	(0.66 , 1.05)
4 th quarter	0.94	(0.90 , 0.97)	0.94	(0.90 , 0.97)	0.90	(0.72 , 1.12)
Family status						
Single	1.35	(1.29 , 1.41)	1.34	(1.28 , 1.41)	1.52	(1.15 , 2.01)
Married - living together	1		1		1	
Married - living apart	1.52	(1.39 , 1.67)	1.52	(1.38 , 1.68)	1.53	(0.93 , 2.53)
Divorced	1.64	(1.56 , 1.72)	1.65	(1.57 , 1.73)	1.35	(0.99 , 1.83)
Widowed	1.34	(1.28 , 1.39)	1.34	(1.28 , 1.39)	1.27	(1.00 , 1.62)
Education						
No degree	1.28	(1.17 , 1.40)	1.29	(1.18 , 1.42)	1.21	(0.92 , 1.59)
Low degree	1		1		1	
Medium degree	0.89	(0.86 , 0.93)	0.89	(0.86 , 0.92)	1.01	(0.81 , 1.26)
High degree	0.91	(0.87 , 0.95)	0.91	(0.87 , 0.95)	0.97	(0.76 , 1.25)
In education/missing information	1.69	(1.46 , 1.97)	1.69	(1.45 , 1.97)	1.46	(0.55 , 3.88)
Net equivalence income						
Up to €480	1.10	(1.01 , 1.21)	1.10	(1.00 , 1.20)	1.29	(0.82 , 2.01)
More than €480 to €640	1.19	(1.12 , 1.27)	1.19	(1.11 , 1.27)	1.19	(0.87 , 1.61)
More than €640 to €1,040	1		1		1	
More than €1,040 to €1,600	0.94	(0.91 , 0.97)	0.94	(0.91 , 0.98)	0.91	(0.75 , 1.12)
More than €1,600	0.89	(0.85 , 0.93)	0.89	(0.86 , 0.93)	0.77	(0.59 , 1.00)
Missing information	1.06	(1.01 , 1.13)	1.07	(1.01 , 1.13)	0.97	(0.65 , 1.43)
Body mass index						
Underweight	1.35	(1.25 , 1.45)	1.36	(1.26 , 1.47)	0.95	(0.55 , 1.64)
Normal weight	1		1		1	
Light overweight	1.14	(1.10 , 1.18)	1.14	(1.10 , 1.18)	1.18	(0.96 , 1.46)
High overweight	1.58	(1.51 , 1.65)	1.57	(1.50 , 1.64)	1.77	(1.40 , 2.23)
Missing information	1.00	(0.95 , 1.05)	1.00	(0.95 , 1.05)	0.83	(0.59 , 1.16)
Smoking habits						
Never smoker	1		1		1	
Former smoker	1.41	(1.36 , 1.46)	1.42	(1.36 , 1.47)	1.24	(0.96 , 1.60)
Smoker	1.28	(1.23 , 1.33)	1.28	(1.24 , 1.33)	1.19	(0.94 , 1.51)
Missing information	0.75	(0.69 , 0.82)	0.76	(0.69 , 0.83)	0.31	(0.12 , 0.80)
Centrality of population distribution						
Low centrality	1		1		1	
Average centrality	1.22	(1.06 , 1.41)	1.23	(1.07 , 1.42)	0.96	(0.63 , 1.48)
High centrality	1.30	(1.05 , 1.63)	1.31	(1.05 , 1.64)	1.03	(0.64 , 1.67)
Gross domestic product per capita						
Low GDP per capita	1		1		1	
Average GDP per capita	0.91	(0.80 , 1.04)	0.91	(0.79 , 1.04)	0.77	(0.53 , 1.10)
High GDP per capita	0.75	(0.59 , 0.95)	0.75	(0.59 , 0.95)	0.70	(0.44 , 1.10)
Proportion of foreigners						
Low proportion of foreigners	1		1		1	
Average proportion of foreigners	0.90	(0.78 , 1.03)	0.89	(0.78 , 1.03)	1.03	(0.61 , 1.73)
High proportion of foreigners	0.96	(0.77 , 1.20)	0.96	(0.77 , 1.19)	1.34	(0.75 , 2.40)

Source: Microcensus 2005, INKAR 2007, Statistische Ämter des Bundes und der Länder

First, native Germans and Aussiedler differ in the effects of education on health. While native Germans with no degree or a low degree have the greatest health disadvantage, there is no consistent, statistically significant educational gradient on the health of Aussiedler. A significant social gradient does, however, exist for the effect of income on health. For both native Germans and Aussiedler, the health of individuals with low income is worse than the health of individuals with high income. This effect is stronger for males than females, and it is more pronounced for Aussiedler than for native Germans.

Second, the effect of the body mass index differs. In general, individuals with high overweight have worse health than those with normal weight. The negative effect of being overweight is stronger for females than for males. Underweight native Germans have worse health, while underweight Aussiedler have no health disadvantage.

Table 7: Improvements in models' goodness of fit (measured by likelihood ratio tests)

	Male native Germans	Female native Germans	Male Aussiedler	Female Aussiedler
Extended baseline model, controlled for age only and duration of stay for Aussiedler				
Log Likelihood	-58,627.52	-69,396.16	-1,768.19	-2,036.12
Extended model, controlled for all individual factors*				
Log Likelihood	-57,625.83	-68,256.03	-1,726.42	-1,991.98
Additional degrees of freedom	23	23	23	23
Significance (likelihood ratio test)	0.000	0.000	0.000	0.000
Final model, controlled for all individual* and macro factors**				
Log Likelihood	-57,621.72	-68,249.55	-1,722.99	-1,988.59
Additional degrees of freedom	6	6	6	6
Significance (likelihood ratio test)	0.222	0.044	0.333	0.342

* controlled for age, quarter of the year of the interview, family status, education, income, body mass index, and smoking habits

** controlled for centrality of population distribution, GDP per capita, and proportion of foreigners

Source: Microcensus 2005, INKAR 2007, Statistische Ämter des Bundes und der Länder

Turning to macro factors, we find significant effects on health, although their explanatory power is small as measured by the likelihood ratio test (Table 7). For female native Germans only, the inclusion of the macro factors leads to statistically significant improvements in the goodness of fit ($p=0.044$).

Native Germans living in highly urbanised regions have the highest risk of poor health (males $OR=1.21$, $p=0.063$; females $OR=1.31$, $p=0.016$), with females being more disadvantaged than males. High centrality also has a negative effect on the health of male Aussiedler (males $OR=1.66$, $p=0.084$), but none on female Aussiedler (females $OR=1.03$, $p=0.900$).

Native Germans living in regions with a high GDP per capita have the lowest risk of poor health, while those living in economically disadvantaged regions have the highest. The effects of the GDP are stronger for female native Germans ($OR=0.75$, $p=0.018$) than for male native Germans ($OR=0.80$, $p=0.047$). In the Aussiedler population, the effects of regional economic performance on health are inconsistent. Female Aussiedler ($OR=0.70$, $p=0.120$) living in economically prosperous regions have better health than female Aussiedler living in regions with low GDP. However, there is no significant health disparity for male Aussiedler ($OR=0.87$, $p=0.612$).

The proportion of foreigners in a region has no statistically significant effect on the individual's health status, either for native Germans or for Aussiedler.

Discussion

This is the first study that investigates individual and contextual effects on the health of Aussiedler and their potential to explain health disparities between Aussiedler and native Germans. We find evidence for a healthy migrant effect among those living in Germany less than 15 years. A model correcting for a rich set of individual characteristics and contextual factors shows that Aussiedler have a slight health advantage relative to the German native population. We also find evidence for the adaptation of health behaviours among Aussiedler, which supports the health transition theory. The health disadvantage of Aussiedler with a long duration of stay in Germany is primarily the result of their individual characteristics. Once these characteristics are controlled for, the differences between the Aussiedler population and native Germans are attenuated. We identified significant contextual effects of GDP and centrality on the health of native Germans and Aussiedler, which are similar for both groups. However, these macro variables explain little of the difference between the two groups. This result is in line with a series of studies that report comparatively small effects of macro factors relative to individual characteristics. Individual characteristics affect the health of the Aussiedler in a manner similar to the health of native Germans, with the exception of education, where no significant health gradient exists for Aussiedler. In contrast to this finding, income differentials in health appear to be larger among the Aussiedler population than among native Germans.

Interpretation

The negative association between duration of stay and the health of Aussiedler is one of the key findings of this study. The possible explanations for this relationship, in addition to the adaptation hypothesis, are the effects of socioeconomic deprivation, such as a high risk of unemployment, increased stress and a climate of discrimination. Furthermore, deprivation may have an effect on the choice of an (unhealthy) living area. Our results are contrary to the findings of Aparicio et al. (2004), who reported better health with increasing duration of stay. This may be explained by their study group, since Aparicio et al. (2004) investigated Aussiedler living in a relatively wealthy urban region (Augsburg/Bavaria) and the surrounding areas only. In such a setting, a high cost of living may encourage the out-migration of badly integrated, economically unsuccessful (or unhealthy) persons, while the remaining persons might be a very selective group.

The changing composition of Aussiedler by country of origin may be another explanation. Until the 1990s, most Aussiedler immigrated from Poland to Germany. After the crisis in the Eastern European countries, Aussiedler from countries of the former Soviet Union to Germany dominated. Differences in help-seeking behaviours or health perceptions in Poland and in the countries of the former Soviet Union, or divergent selection effects of out-migration and remigration, may explain the results. Because of a lack of studies, and because of the fact that most Aussiedler do not give any information about country of birth/origin in the Microcensus, it is not possible to verify these explanations.

We find significant and strong effects for two of our macro factors: namely, regional economic performance and centrality. The finding that high regional GDP is correlated with better health among both Aussiedler and native Germans, independent of the socioeconomic status of the individuals, is in line with reports from other studies (e.g. Pickett & Pearl 2001, Riva et al. 2006). The detrimental effects of urbanity on health reported in this study are in

agreement with the conclusions of Watt et al. (1993), who attribute the disadvantage to higher levels of stress or unfavourable environmental conditions in urban regions (such as higher levels of air pollution and noise). Other studies have come to contradictory conclusions. For example, Diehl & Schneider (2011) detected higher odds of poor health for persons living in areas with a higher degree of rurality. Confounding effects of hazards at the small area level may cause this divergent conclusion. Based on the findings of Voigtländer et al. (2010), health disparities between persons in urban and rural regions might be reduced if the effects are additionally adjusted for the environmental characteristics of the neighbourhood.

In this analysis, the effects of regional ethnic concentration on the health of native Germans and Aussiedler are inconsistent. Thus, our study does not confirm the findings of Lorant et al. (2008) or of Diehl and Schneider (2011). Due to a lack of studies in this field, further research will be needed to explain our findings.

Turning to individual-level characteristics, the most notable point is the absence of an educational gradient on the health of Aussiedler. A weak association between education and socioeconomic status may explain this finding, and suggests the presence of problems in the integration of Aussiedler into the labour market. Aussiedler with high levels of education tend to work in lower positions than they would in their countries of birth/origin (Greif et al., 2003). Another important finding is that the health gradient by income is steeper among Aussiedler than among native Germans. The differences may be the result of a more distinct selection effect in the job market among Aussiedler than among native Germans. Aussiedler who achieve higher job positions may differ greatly from Aussiedler in lower or moderate occupational positions (e.g. in terms of job qualifications, willingness to retrain, flexibility, mobility, motivation or health).

Strengths and limitations

The major strength of this study is the use of the German Microcensus, which covers a wide range of variables on the individual level, has a sufficient number of cases at the level of regions, and allows us to identify migrants by their place of birth/origin, as well as by their current nationality. This is important when studying Aussiedler, since they acquire German nationality right after migration.

This study has several limitations. The first and most important of these is the operationalisation of health in the Microcensus. In the questionnaire, no definition of “being ill” is given, and respondents are not asked about the severity of the reported illness. The relatively high item non-response in the health variable is an additional problem, since it can be assumed that non-respondents are predominantly in poor health (Goldberg et al., 2001). A limitation that applies to all studies about migrants’ health is the cross-cultural validity of the health indicator. Even if the interviewers were advised to define “being ill” (which they were not), the individual awareness of morbidity could differ significantly between native Germans and Aussiedler. Additionally, the health assessment may vary between the particular immigration cohorts, e.g. due to changes in health-seeking behaviour by increasing duration of stay or different countries of origin.

Second, there are problems with the identification of Aussiedler in the data. Due to the fact that Aussiedler have to be identified by combining various facts (country of birth, year of immigration, current nationality, citizenship by naturalisation?) under specific assumptions (Federal Statistical Office, 2007), a misclassification bias cannot be fully excluded. Nevertheless, the misclassification bias is expected to be low.

Third, we know the duration of the stay in Germany, but do not have information about the duration of the stay in a particular region and the duration of the exposure to the contextual factors. Because of the cross-sectional design of the Microcensus, the analysis is not suitable for detecting causality. Thus, it is not possible to exclude the effect of selective in-migration and clustering of unhealthy persons in specific regions (e.g. urban regions with a good medical infrastructure). These effects lead to worse health situations in the corresponding regions, independent of regional distinctions (Norman et al., 2005). Systematic trends of return migration to the country of origin, or of onward migration to other countries, may lead to an additional selection bias, which may in turn affect the validity of the analysis.

Fourth, a general limitation lies in the validity of the chosen regional indicators themselves. For most of the contextual factors, the theoretical causal association with the health outcome on the level of individuals is unclear. Thus, the indicators are more proxies of confounding variables (like environment and ecological conditions) than causes of good or poor health themselves.⁸ The choice of regional units is an additional problem in the interpretation of indicators. The larger the spatial unit, the larger the overlaid heterogeneity of living conditions within a region. Most environmental factors, for example, lose explanatory power if very large spatial units are chosen for analysis. Although the choice of regional level in the Microcensus is restricted to ensure privacy, spatial planning regions are expected to be a suitable choice in our analysis.

This study sheds new light on the determinants of the health of Aussiedler relative to the health of their native German counterparts. Germany is facing the ageing of its migrant population, and with more migrants reaching old age, health issues will become more important. Gaining knowledge about the determinants of the health of ethnic minorities at the individual and regional levels can be useful in developing policy strategies to reduce inequalities in health, and to enable migrants to reach old age in good health.

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⁸ For an overview of confounding effects in epidemiological multilevel studies, see Chaix et al., 2010.

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