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ORIGINAL RESEARCH

Infertility and Seeking Medical Help to Have a Child Vary Across Migrant Origin Groups in Germany

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Abstract

This study investigates the extent to which immigrants in Germany are faced with infertility, and it examines their use of reproductive health-care services. Previous research on migrant fertility centered mostly on the higher fertility rates of immigrants and their adaptation processes, but has largely neglected infertility. At the same time, research on infertility in the European low-fertility context has focused almost exclusively on non-migrant populations. Our results indicate higher infertility and lower seeking of medical help among migrants as compared with non-migrants. However, there is substantial heterogeneity between different migrant groups: First-generation migrants show higher risks of infertility and lower use of medical help to get pregnant. The study also shows differences according to (parents') regions of origin: Persons from Russia, Central Asia, and the Middle East (including Turkey) have a higher risk of perceiving infertility or uncertainty about it than other European origin groups. Those from Russia and Central Asia have the lowest use of medical help-seeking. These group differences cannot be explained by socioeconomic factors. Our results suggest that certain immigrant groups—despite having on average a higher number of children—face notable reproductive disadvantages, which deserve further attention in research on migrant fertility and assisted reproduction in general.

Keywords Infertility · Subfecundity · Migration · Medically assisted reproduction (MAR) · Assisted reproductive technology (ART) · Reproductive health · Stratified reproduction · Germany

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Introduction

This study investigates heterogeneity in infertility perceptions and help-seeking behavior by comparing immigrants with the native non-migrant population in Germany. In current demographic research there is growing interest in infertility (Carson & Kallen, 2021; Lazzari et al., 2022; McQuillan et al., 2022), seeking medical help to get pregnant (Domar et al., 2012; Greil et al., 2010; Passet-Wittig & Greil, 2021), and the rapidly growing sector of reproductive medicine (Adamson et al., 2018; Aleixandre-Benavent et al., 2015; Crawford & Ledger, 2019) in the Global North. This is because regions like Europe are characterized by fertility postponement, and older age is one of the most important non-modifiable risk factors for infertility (Dunson et al., 2002; Evers, 2002). However, previous quantitative studies have rarely included immigrant or ethnic minorities in Europe, which is noteworthy, as the proportion of migrants and their birth numbers is significant and increasing across Europe (Bagavos, 2019; Passet-Wittig & Greil, 2021; Sobotka, 2008).

We argue that infertility is an important aspect to consider in research on migrant populations, because it has implications for their life course and family structure, but also for different demographic developments of social groups. In addition, knowledge of how infertility varies across different migrant groups can also provide important insights into the processes of adaptation within migrant populations, for example by looking at migrant generation or groups of origin countries (Wilson, 2019). Previous quantitative studies on migrant fertility in Europe mostly investigated the fertility adaptation processes of immigrants from high(er)-fertility contexts. They generally found that fertility levels of immigrant groups are on average higher than those of natives and that they decline in subsequent generations (Kulu et al., 2019; Milewski, 2010). The perceived "hyper-fertility" of at least some immigrant groups may have contributed to migration researchers neglecting fertility barriers in immigrant groups (Atkin, 2009; Haug & Milewski, 2018; Inhorn & van Balen, 2002). However, the composition of migrant groups in Europe is changing, i.e. migrants are more often coming from countries with low and late fertility in Eastern Europe and Latin America (González-Ferrer et al., 2017), or from countries with rapidly changing fertility patterns, e.g. Turkey (Baykara-Krumme & Milewski, 2017). More recently, migrant groups, such as refugees, have attracted scholarly attention (Saarela & Wilson, 2022). These papers point to declining fertility in particularly vulnerable groups—however, the role of infertility still is an open question. Our study therefore complements research on migrant fertility by looking at infertility and the seeking of medical help to have a child.

A better understanding of infertility among migrant populations also provides important information about the well-being, health status, and access to reproductive health care of these populations. Previous empirical results on various aspects of migrant health produced mixed results, suggesting that selection processes accompanying emigration, i.e. the healthy migrant effect, and selection

associated with remigration, i.e. the salmon bias effect, play a role (Razum et al., 2000). Comparatively few demographic studies have looked into perinatal health or birth outcomes in migrant populations (Juarez et al., 2019; Milewski & Peters, 2014; Väisänen et al., 2022). Only recently, attempts have been made to consider the role of women's health in studies of migrant fertility (Alderotti & Trappolini, 2022), or to include migrant status in analyses of infertility perceptions (Passet-Wittig et al., 2020) and of medical help-seeking for infertility (Köppen et al., 2021). Despite these few exceptions, research on migrant infertility care in Europe is scarce. It comprises qualitative studies, mostly patient samples drawn from clients using reproductive health-care services (Culley et al., 2006)—yet, it is not clear whether the prevalence of infertility and medical help-seeking to have a child is similar to that of the majority population, and how much variation there is between different migrant groups in Europe.

In the US, Colen (1986) coined the term *stratified reproduction* to describe how reproduction is structured across social and cultural boundaries. The implication is that policies and structures empower privileged—White, non-migrant women belonging to the majority group—and disempower less privileged—migrant—women throughout their life courses. The field of medically assisted reproduction (MAR) is stratified, as barriers based on class and race/ethnicity persist (Inhorn, 2018). Recent systematic literature reviews on reproductive endocrinology and infertility have only analyzed studies from the US (Christ et al., 2022; Jackson-Bey et al., 2021; Merkison et al., 2023); they predominantly indicate that ethnic and racial minority groups are disadvantaged in reproductive care and access to infertility treatment. It is unclear whether such findings can be generalized to the European context, given the differences in immigrant and ethnic minority populations and health-care systems (Calhaz-Jorge et al., 2020; Passet-Wittig & Bujard, 2021; Präg & Mills, 2017).

Against this background, we pose the following research questions: First, what are the patterns and determinants of infertility among migrant groups in Germany? Second, what are the patterns and correlates of their use of medically assisted reproduction? For both questions, we compare migrants with the non-migrant majority population and examine differences among various migrant groups. For the latter, we pay particular attention to the role of the migrant generation and the migrants' region of origin.

Our study pools data from 12 waves of the German family panel study pairfam (Huinink et al., 2011) to investigate self-perceived infertility of individuals (if single) or couples. Importantly, we include uncertainty in the response behavior, i.e. the answer category of "I don't know" to account for the sensitivity of the infertility question and cultural differences in response behavior. We go beyond existing research by studying self-perceived infertility and help-seeking behavior in the same sample. Therefore, we can relate the potential need to the usage of MAR. This allows us to draw conclusions about the extent to which differences in medical help-seeking between migrants and non-migrants may be related to different needs and/or to, e.g. institutional barriers (Jackson-Bey et al., 2021).

Background

Country Context

Germany makes an interesting case for this study of infertility and medical help-seeking due to the increasing multi-ethnicity of its population. Germany has been one of the main destinations for migrants in Western Europe for several decades. Therefore, the proportion of immigrants, including their descendants, has been rising steadily and accounted for about 30% of the population in 2023. Among the younger cohorts, the age group of 20 to 45 years, who are of reproductive age and potential users of MAR, about 37% are immigrants, including their descendants (this group is made up of about 15% of persons with German citizenship and about 22% of persons with (exclusively) foreign citizenship) (Destatis, 2024). Since the end of World War II in 1945, immigrants came to Germany for various reasons and from a variety of regions of origin. Immigrant groups include, among others, labor migrants from southern European countries and Turkey since the 1960s, and since the 1990s, increasingly from Eastern and South-eastern European countries. In addition, immigrant groups include ethnic Germans mainly from Eastern Europe (e.g., from former Soviet countries) and refugees from the Balkan countries (following the wars in the former Yugoslavia), Iraq or Syria. In 2023, the countries of origin of migrants and their descendants in Germany were divided into 28% Near and Middle East (including Turkey), about 5% Kazakhstan, about 5% Russia, about 15% Balkan countries, about 29% North, West, Central, South, South-East Europe, and about 17% others. Socioeconomic differences, such as sex ratio, education, and household income, vary widely between these migrant groups, e.g. the share of low education is higher than among natives in Kazakhstan and the Balkan countries and highest in the Near and Middle East (Destatis, 2024).

Another reason why Germany is a good case study is its long-standing low fertility rate and the sharp rise in the mean age of childbearing. Although there has been a slight increase in the total fertility rate (TFR) in recent years until 2021 (Bujard & Andersson, 2024), it still remains well below the population replacement level of 2.1 births per woman. In addition, at over 20%, Germany has a high rate of childlessness, and similar to other countries in the Global North, the causes for this are far from being fully understood. One of the reasons lies in the increasing age at which women and men are having children, which is a crucial risk factor for infertility (Dunson et al., 2002; Evers, 2002). According to the medical definition, people are considered infertile after one year or more of regular unprotected intercourse without getting pregnant (Zegers-Hochschild et al., 2017).

Overall, the prevalence of self-perceived infertility in Germany is currently estimated at around 5–6% for both men and women (Passet-Wittig et al., 2020). Infertility increases with age, reflecting the age-related increase in various biological fertility problems (ESHRE, 2005). In parallel with the ongoing demographic trend of fertility postponement, the use of MAR is increasing in Europe. MAR

is a growing health-care sector in Germany and widely available (DIR, 2021), but treatment rates are relatively low compared to other European countries (De Geyter et al., 2020; Präg & Mills, 2017). One reason for this may be that access to treatment in Germany is rather restrictive and not very inclusive. Currently, public health-care insurance only reimburses married heterosexual couples and typically covers 50% of treatment costs for a maximum of three IVF (in-vitro fertilization) cycles. As a result, the use and timing of MAR is highly dependent on the economic situation of the person or couple (Köppen et al., 2021; Passet-Wittig, 2017).

Migrants, Ethnic Diversity, and Infertility

In Germany, as in other European countries, the heterogeneity of the population has increased as a result of continuing and changing immigration and different demographic behavior of immigrant and majority populations. For some time now, scholars have acknowledged that migrants are highly heterogeneous—what has been termed as "super diversity" (Vertovec, 2007). The notion of within-migrant heterogeneity is receiving increasing attention in research on the demographic behavior of migrants, such as research on fertility (Erman, 2022; Milewski & Adserà, 2023; Wilson, 2019) and research on reproductive health (Väisänen et al., 2022). Acknowledging this heterogeneity helps to move beyond a binary, simplistic distinction between immigrants and non-migrants, or natives. Key characteristics that account for migrant heterogeneity are migrant generation and region of origin. So far, gender differences and dyadic approaches that consider both partners in a couple have received only little attention (Lazzari et al., 2022).

Studies on migrant fertility in Europe look almost exclusively at women and have mainly focused on how migration impacts the subsequent life course of migrants and their descendants, i.e. birth transitions, and how fertility varies among migrants according to their origin and destination contexts (Adserà & Ferrer, 2015; Kulu et al., 2019; Milewski & Adserà, 2023). Empirical studies on the fertility of immigrants in Europe provide support for the hypothesis of migrant selection, e.g. in the case of marriage migrants, which refers to first-generation migrants who move to marry a spouse abroad, and who are often subject to special immigration regulations. At the same time, the influence of socialization in high(er) fertility contexts, which persists long after migration, proves to be significant. Immigrants often have earlier childbearing schedules, overall have higher fertility than their non-migrant counterparts at destination, and childlessness is rather low among immigrants. Migrant fertility levels typically decline with increasing length of stay and in the subsequent migrant generation; while age at childbearing rises—which is usually interpreted as a result of adaptation processes and migrant children's adjustment to the low(er) fertility contexts at destination (overview Kulu et al., 2019; for Germany: Milewski, 2007, 2010; Krapf & Wolf, 2015; Wolf, 2016). At the same time, culturally differing attitudes regarding the relevance of marriage for childbearing (Liu & Kulu, 2023), differences in gender-role attitudes, in particular towards motherhood (Haug & Milewski, 2018), persist over generations between minority and majority

groups. These cultural characteristics, along with socioeconomic factors, are conducive to (relatively) earlier and higher fertility schedules (Milewski, 2010).

In addition to selection, adaptation, and socialization, another mechanism linking migration and fertility is disruption. Based on the assumptions that international migration is a stressful process (Sluzki, 1979) and that migrants may experience processes of marginalization, the disruption hypothesis predicts lower fertility among migrants compared to non-migrants. However, there is little evidence to support the disruption hypothesis. On the one hand, this may be related to the fact that most empirical studies to date have examined labor or family migrants (Mussino & Strozza, 2012). Recently, a few studies have looked at groups, which may experience more negative impacts of migration on marriage and partnership. Refugees in Finland (in the 1940s) were found to have lower fertility (Saarela & Wilson, 2022). On the other hand, most empirical studies focus on immigrants in countries with fertility below or close-to-replacement level. If majority populations have lowest-low fertility, it is virtually impossible for migrants to fall below that level.

We noticed that the empirical studies on migrant fertility (including our own ones) interpret declining fertility levels as evidence of adaptation processes in migrant populations. This interpretation is based on the implicit assumption that the differences between the groups or their changes over time are the result of voluntary decisions to have fewer children. However, previous research has not systematically compared the individual fertility intentions of migrants with their fertility outcomes and the causes of any gap, and whether any gap differs from the corresponding gap among non-migrants. This raises the question of the extent to which any fertility decline and any gap between intentions and fertility are due to deliberate choices, to fertility barriers such as infertility, or to a combination of the two.

Infertility is a barrier to reproduction that is also related to health. Recently, poor general and mental health among migrant women and men has been shown to reduce fertility intentions (Alderotti & Trappolini, 2022). However, comparatively few studies have looked at reproductive barriers, including infertility (Johnson et al., 2023) or perinatal health (Väisänen et al., 2022). This is particularly important for migrants, as health is unequally distributed. There is considerable evidence to suggest that international migrants, particularly those moving for work or education, tend to be positively selected for health—this is generally referred to as the healthy migrant effect (HME). Any initial health benefits for first-generation immigrants are assumed to diminish when immigrants stay longer in the host country. Such advantages also decrease over migrant generations. The cause for this process is attributed to increasing similarities between migrants and the respective host population in terms of socioeconomic factors as well as life style and structural conditions (Loi et al., 2021). The initial health benefit of migrants may disappear and their health may deteriorate to a point where it is even worse than that of the native population. Some authors link the levelling off of the HME to the experience of cumulative disadvantages and discrimination in general and the health-care system in particular, which in turn may increase the vulnerability of migrants. Such disadvantages may persist over generations, i.e. when immigrant groups develop into minoritized groups characterized by ethnicity, race, or religion (Bean & Tienda, 1990; Geronimus et al., 2006; Kulu et al., 2019). At the same time, minority-group status and lower socioeconomics are associated with occupational hazards,

environmental risks and poorer housing conditions, experiences of discrimination, lifestyle risk factors, and poorer health outcomes (Bean & Tienda, 1990; Coleman, 1994; Foner & Alba, 2008), and may contribute to a higher risk of infertility among migrant and ethnic minority groups (Jackson-Bey et al., 2021).

Overall, the empirical evidence on reproductive and perinatal health supports the hypothesis of the healthy migrant effect, suggesting advantages for first-generation migrants in particular. At the same time, the evidence on reproductive health highlights the importance of region of origin as a potential marker of differences. For instance, with respect to pre-term birth (PTB)—a risk factor for poor health and development outcomes of the child—the evidence is mixed. Higher PTB risks were found in Finland, but mainly for women who immigrated from low-income countries and not for those from high-income countries (Bastola et al., 2020; Väisänen et al., 2022). In Sweden, results varied between different groups of origin (Juárez et al., 2019; Li et al., 2013) while in the UK, PTB risks were lower among immigrants (Opondo et al., 2020).

In this paper, we will use the terms "fertility advantage" to refer to lower infertility and "fertility disadvantage" to refer to higher infertility. The following main working hypotheses guide our empirical study on perceived infertility. We expect to find variation in perceived infertility across migrant generations, with a migrant fertility advantage mainly in the first generation as compared to non-migrants; the fertility advantage may be smaller in the second generation (H1A on generational differences). Our second hypothesis addresses the variation by migrants' origin-groups: We expect a greater fertility advantage for migrants in origin groups that show greater difference in fertility patterns when compared to German natives. Migrants from countries with lower ages at birth and higher fertility levels, e.g. from the Middle East, may have lower infertility compared to Germans and compared to migrants from countries with ageing fertility patterns, e.g. from other European countries (H1B on origin-group differences).

A third working hypothesis refers to the role of moderators. We consider two main correlates of infertility; i.e. age and general health. The migrant generations and origin groups exhibit differences in patterns of childbearing age and health. On average, as stated above, the lower socioeconomic positions that migrants often occupy in the host country may correlate with a lower age of childbearing, higher average fertility and lower rates of childlessness. An earlier age of childbearing may imply that migrants are less affected by the postponement pattern, which increases the risk of age-related infertility. Infertility is also related to other dimensions of health and lifestyle. In our data set, we can use the information on self-rated health and assume that better health is associated with lower infertility. We expect that controlling for health, age and parenthood may reduce infertility differences between migrants and non-migrants (H1C).

Migrants, Ethnic Diversity, and Seeking Medical Help to Get Pregnant

Medical infertility, or the perception of it, often prompts individuals to seek help from reproductive health-care services. This is the second focus of our study. Systematic literature reviews on reproductive endocrinology and infertility (Christ et al., 2022; Jackson-Bey et al., 2021; Merkison et al., 2023) indicate that ethnic and racial minority groups in the US face disadvantages in both reproductive care

and access to infertility treatment. In the European context, however, there is limited research (Culley et al., 2006). Existing European studies suggest broad similarities between migrant groups in Europe and Black and Latino ethnic groups in the US in their experiences of prejudice and discrimination in obstetric practice (in London (Gürtin-Broadbent, 2009), for Germany and England (Johnson & Borde, 2009), in The Netherlands (van Rooij & Korfker, 2009), for Germany (Vanderlinden, 2011)). Inhorn et al. (2009) also highlighted immigrants from predominantly Muslim Arab countries in the US, whose experiences of discrimination and stigmatized perceptions of high fertility mirror those of Muslim immigrants in Europe, especially after 9/11.

Barriers to accessing reproductive health care and technologies encompass a wide range of factors. These include provider-related issues such as overt discrimination, low cultural competence, and delayed referral to fertility clinics. Financial constraints and language barriers also pose significant problems (Geiger, 2003; Seifer et al., 2022). Certain aspects may be a direct result of the disadvantaged socioeconomic conditions faced by migrant or ethnic minority groups, such as lower income and difficulties in affording treatment. Indirectly, life-style and health factors such as a higher risk of obesity, which may be cited by providers as a reason for refusing care, contribute to lower utilization of medical expertise, lower satisfaction with treatment, and potentially lower success rates (Butts, 2021; Galic et al., 2021; Gürtin-Broadbent, 2009).

Some research suggests that migrants may be more likely than non-migrants to seek medical help to get pregnant if they perceive themselves to be facing infertility. Factors related to the migrant community, such as the intergenerational transmission of culture and fertility knowledge, may influence clients' medical help-seeking behavior (Culley & Hudson, 2009). For many migrant groups, biological parenthood remains of utmost importance, particularly in communities where childlessness is uncommon, and the societal repercussions of infertility are potentially significant (Christ et al., 2022). In Germany, immigrant women were found to have lower fertility awareness than non-migrant women, particularly in terms of knowledge regarding the age-related fertility decline (Milewski & Haug, 2022). However, they also expressed a greater willingness to use MAR when faced with conception difficulties and showed more openness towards methods such as egg donation and surrogacy which are not allowed in Germany. Furthermore, differences between migrant groups have been identified: First-generation migrants showed significantly different attitudes towards MAR use compared to non-migrants, while responses of second-generation migrants were more in line with those of non-migrants, indicating ongoing socioeconomic and cultural assimilation across migrant generations (Haug & Milewski, 2018). Notably, more permissive attitudes and stronger intentions to use MAR were observed, not only among women from countries with Muslim traditions, such as Turkey, but also among women from Eastern European nations such as Poland, as well as those with Christian religiosity (Milewski & Haug, 2020).

Quantitative evidence on the actual behavior of seeking help to conceive among migrant and ethnic minority groups in European countries is both scarce and inconclusive. A non-patient study in Germany focused on immigrant groups, their attitudes towards MAR and their use of treatment. This study revealed no significant

difference in treatment rates between migrants and non-migrants, ranging from around 6 to 8.5% (Milewski & Haug, 2022). Other studies have treated migrant status as a control variable. A recent Danish register-based study provided descriptive evidence indicating that immigrants and their descendants were less likely to use assisted reproductive technologies (ART) in their first treatment (Brautsch et al., 2023).[1] In contrast, a recent study in Germany found no statistically significant differences between migrants and non-migrants (Köppen et al., 2021). It should be noted that the surveys used in these studies only asked respondents whether they had received treatment, not in which country they had received it. Given the wide variation in policies regulating the use of specific ART methods across countries in Europe and elsewhere (Passet-Wittig & Bujard, 2021), it is likely that at least some of the respective respondents received treatment abroad (Präg & Mills, 2017). However, treatment abroad is not reimbursed by national health insurances. This makes it impossible to estimate the role of access to health insurance in Germany, which is granted to residing immigrants as well as to other residents, and economic resources.

Based on the above background, we formulated the following working hypotheses guiding the second part of our analyses on seeking help to conceive. Similar to our hypothesis on perceived infertility, we expect to find variation by migrant generation, with first-generation migrants less likely to have used MAR services than non-migrants; the treatment gap may be smaller in the second generation (H2A on generational differences). Our second hypothesis addresses origin-group variation: We expect a greater gap in migrant groups that show greater difference in fertility patterns between their countries of origin and Germany as compared to those from countries with a smaller difference in fertility patterns between country of origin and Germany (H2B on origin-group differences). Note: Ideally, we would also carry out this part of the analysis by migrant generation and region of origin. However, seeking help to get pregnant is a rather infrequent event, and the sample size does not allow this in a statistically sound and meaningful way. Therefore, we will rely on bivariate tests for our working hypotheses H2A and H2B, and we will carry out a multivariable analysis for combined groups only, thus comparing migrants and non-migrants and testing the role of sociodemographic composition in explaining an overall gap between migrants and non-migrants (H2C). Based on previous research on the marginalization of migrants in reproductive health care, we expect that migrants may have lower use of reproductive health care than non-migrants due to the access barriers discussed above.

[1] ART includes only In-Vitro-Fertilisation (IVF) and treatments based on IVF, while MAR also encompasses assisted inseminations, hormonal treatments and other interventions (Passet-Wittig & Bujard 2021).

Data and Methods

Data

The analysis is based on 12 waves of the German family panel pairfam, release 12.0 (Brüderl et al., 2023; Huinink et al., 2011). Pairfam started in 2008/2009 with a nationwide random sample of 12,402 women and men from three birth cohorts (cohort 1: 1991–1993, cohort 2: 1981–1983: cohort 3: 1971–1973). Data are collected on a yearly basis through computer-assisted personal interviews (CAPI). For this study we pool all available data including data from the DemoDiff study, a complementary panel survey of 1489 East Germans, and from a refreshment sample introduced in wave 11 (5021 respondents). Pooling is necessary to have a sufficient sample size for this study of migrant group differences in perceived infertility and seeking of medical help, both of which are rather infrequent events. The full data set consists of 92,251 observations by 18,912 respondents.

Our study includes women and men aged 21 to 49 years. Participants with inconsistent information on sex across waves were excluded, as were participants under 21 years because the question on self-perceived infertility was not asked below this age. This leaves us with 71,800 observations by 14,327 respondents. As this study uses two dependent variables, self-perceived infertility and help-seeking, and in order to use the maximum amount of information, we work with two analytic samples which are described below.

The first analytic sample is that for the analysis of self-perceived infertility. We use a self-report measure of infertility perception. For this analysis, we do not use information from respondents who ever reported that they or their partner had been sterilized.[2] If a respondent mentioned sterilization of the partner, all observations of the respondent while in a relationship with the sterilized partner were excluded. Information on self-perceived infertility is incomplete for these cases, and if available, difficult to interpret. This leaves us with 65,380 observations from 13,566 respondents. A further 5034 of the remaining 65,380 observations have no information on self-perceived infertility status. Among those with no information on self-perceived infertility were 2276 pregnant respondents or respondents with a pregnant partner who were not asked about their self-perceived infertility. From the resulting sample of 60,346 observations, 2.6% of all observations (n = 1544) had to be excluded due to missing values on the central independent variables concerning migrant status. Two observations had to be dropped due to missing weights. The final analytic sample contains 58,802 observations from 12,777 persons (see Table 4 in Appendix). Immigrants account for about 19.2% of the observations in the unweighted data and 26.4% in the weighted data. Looking at persons rather than

[2] Up to wave 7, sterilization was only asked as a method of contraception if the respondent answered yes to the question on whether they currently used contraception. Since wave 8, information on sterilization has also been asked to those who are currently not using contraception. As we cannot identify the point in time of the sterilization, we decided to exclude all observations of the anchor or all observations while in a relationship with a sterilized partner. This is necessary because our main interest is in the perception of medical problems conceiving a child and not in sterilization.

observations, the share of migrants in the sample is about 23.0% in the unweighted data and 27.4% in the weighted data, which is rather close to the share of migrants in the German population (see "Country Context" Section). The gap between the weighted and the unweighted data at the level of persons and observations indicates that the overall participation of migrants in the panel is lower than that of the majority population. By applying weights, we can achieve a satisfactory representation of migrants in our sample.

The second analytic sample is the one for the analysis of medical help-seeking. In waves 1 to 6 of the pairfam data, respondents were directed to the help-seeking question only if they were expecting a child or if they perceived themselves or their partner to be infertile and said they were trying to have child. This restrictive filtering meant that only few people responded to the help-seeking question in each wave. Starting in wave 7, the filtering was changed so that all women and men who were trying to have a child or who were expecting a child were asked about medical help-seeking. For the purpose of this study, we use data from waves 7 to 12. Our study aims to provide a "broad" picture of those seeking medical help by including all people of reproductive age who responded to the relevant question. We do so because access to medically assisted reproduction is not limited to those in need for treatment based on any definition of infertility, be it perceived or medical (Passet-Wittig & Greil, 2021). Some examples of other users are women in same-sex couples or single women, people who have undergone sterilization, or people who need preimplantation genetic testing. Thus, we can say that the perception of infertility is not a necessary condition for medical help-seeking. Nevertheless, as a robustness check, we analysed help-seeking restricted to those perceiving infertility (see "Robustness and Data Quality" Section). Out of a total of 33,930 records for this period, 2427 observations provided an answer to the help-seeking question. 1.9% of the observations (n = 45) with available data on the help-seeking question had to be dropped because of missing values on the main independent variable *migrant status*. The final data set contains 2345 observations, of which migrants accounted for 19.7% in the unweighted data and 32.8% in the weighted data (see Table 5 in Appendix).

Dependent Variables

The first dependent variable is a self-reported measure of the respondent's and, if in a relationship, the couple's *current infertility perception*. Perceptions of infertility may vary over the life course of an individual (Gemmill & Cowan, 2021; Lazzari et al., 2022; Passet-Wittig et al., 2020), and may or may not overlap with medical infertility. As they reflect a person's experience, perceptions are important in their own right (Benyamini, 2011; Lowry et al., 2020). Our measure of infertility perception is based on the question inquiring whether the respondent perceives that he or she has problems procreating: "Some people are not able to conceive a child or to procreate naturally. As far as you know, is it physically possible for you to conceive a child or to procreate naturally?" Response options were "definitely yes," "probably yes," "probably not," "definitely not," "don't know", and "I don't want to answer that". Respondents with a partner answered an additional question on whether the

respondent perceived that the partner had problems procreating. We constructed an indicator with three categories: (1) "respondent/couple infertile", which applied if the respondent answered "definitely not" or "probably not" for at the least one partner; (2) "respondent/couple fertile", which applied if the respondent answered "definitely yes" or "probably yes" for him/herself and if in a relationship for both partners; (3) "don't know" if respondent/couple (in)fertile" was chosen if the respondent answered "don't know" for at least one partner and the other partner was not infertile. The observation was omitted if there was missing information for at least one person (i.e. "I don't want to answer that") and the other person was not infertile (see Table 6 in Appendix). Both questions were not asked if the respondent mentioned that the couple was expecting a child at the time of the interview, which led us to omit these observations from the main analytic sample.

The second dependent variable is *medical help-seeking*. It is based on the question: "Have you or your partner used any of the following methods to induce a/this pregnancy since the last interview? Please indicate all methods used." The list of methods includes: "medication", "methods to determine ovulation date", "IVF or micro-fertilization (ICSI)", "surgery", "intrauterine insemination", "other treatment", "none of these". Multiple answers were allowed. We identified the highest treatment received. Our help-seeking indicator distinguishes whether the treatment received is typically carried out at a fertility clinic (IVF, ICSI, Intrauterine Insemination, surgery, other treatment) or at the general practitioner/gynecologist (medication, methods to determine ovulation date) in Germany. Respondents who did not mention any treatment or replied with "Don't know" or "I don't want to answer that" are categorized as not help-seeking. The share of those who did not know or did not want to answer the question about help-seeking was too small to be kept as a separate group. Note that the question on help-seeking was asked to women and men who had been trying to have a child[3] or who were expecting a child.

Independent Variables

Our main independent variables are two indicators of *migrant status*: *migrant generation* and *region of origin*. For *migrant generation* we use the pairfam variable *migstatus.* This variable provides information on the country of birth of the respondent and the respondent's mother and father. First-generation migrant status is assigned to all those who have immigrated themselves. Second generation migrants have parents who were born abroad but were themselves born in Germany. *Region of origin* is based on the pairfam variable on the respondents' country of birth (*cob*). Second generation migrants are grouped according to their parents' country of birth (f*cob, mcob*). We distinguish between non-migrants and the following regions of origin: North, West, Central, South, South-East Europe (NWCSSE); Middle East; Balkan countries; Russia; Kazakhstan; and other. The categories reflect the size of the respective groups of migrant origin in Germany (see second chapter) and their participation

[3] The question used to identify those trying is "Have you or your partner tried to have a child since the last interview?" Respondents can reply with "yes" or "no".

in the survey. Turks, e.g., are the largest single-country group in Germany, and they make up a large proportion of our Middle-East category. The categories Russia and Kazakhstan include some ethnic Germans, and some newer groups, whereby Russian migrants have higher education than Kazakh migrants. The NWCSSE category may appear rather broad because it contains a large number of origin countries which contribute few cases. In addition, the grouping reflects socioeconomic and demographic patterns: The NWCSSE category includes countries where fertility occurs at relatively old age and childlessness is quite common—despite some variation within this group. In contrast, the Eastern European countries in the Balkan region and the Russian Federation are characterized by lower childlessness and less fertility postponement, while in the Middle East childlessness is uncommon and fertility often follows a much younger schedule (Keskin & Çavlin, 2023; HFC, 2024). The residual category "other" consists of respondents from other regions of origin for which the group sizes are too small to investigate further. This includes a few cases were both parents of the respondents are from different regions of origin. Cases where it is not clear whether they have a migration background or not were excluded.

We use generated variables provided by pairfam as control variables for our analyses. For the variable *age*, three age groups are distinguished: < 35 years, 35–39 years, 40 + years. Further, we control for whether the respondent *has biological children*, taking into account that infertility may occur at higher parities, not only among childless individuals.[4] For *marital status/partnership*, we distinguish between not having a partner, being in a non-marital relationship, and being married. We also take *education* into account, assuming that higher human capital is associated with lower infertility due to higher fertility knowledge and better use of health care. The measure of education is based on the International Standard Classification of Education (ISCED-97) and has four categories. "Primary/lower secondary education" (1) includes those without a degree or lower secondary education (ISCED 1–3), "higher secondary education" (2) includes those with upper secondary (general and vocational) and postsecondary non-tertiary education (ISCED 4–6), "tertiary education" (ISCED 7–8) includes those with a university degree, and "missing values" indicates incomplete information. If a person is currently enrolled in school, the measure assumes that the person will obtain the corresponding qualification. *Self-perceived health* was measured on a 5-point scale from very good health to very poor health. The categories were merged so that 1 indicates poor or very poor health compared to the other categories (0). An indicator for *survey wave* is included to control for period effects (see Table 4).

For the analysis of help-seeking, we also include a measure of the *households' net income*, because infertility help-seeking may require considerable financial resources. We distinguish five categories: < = 1500 €, 1500–2500 €, 2500–3500 €, 3500 + € and a category indicating missing values ("don't know"/no answer) (see Table 5 in Appendix).

[4] Ten observations had missing values on this variable, because some information to construct this variable was missing. However, it was possible to recode these cases as having children using other available information in the data set.

Plan of Analysis

Our analyses consist of two parts. First, we examine whether the prevalence of self-perceived infertility differs between non-migrants and migrants and between migrant groupings. For this purpose, we use the first analytic sample, for which observations from waves 1 to 12 were pooled. We carry out our analyses jointly for women and men, as our dependent variables include information on the respondents and their partners. We begin by calculating prevalence rates of perceived infertility by migrant generation and by migrants' region of origin. We then carry out a multivariable analysis of perceived infertility using multinomial logit regressions on the pooled data set. Cluster-robust standard errors were estimated to account for serial correlation of errors within persons and heteroskedasticity. Fixed effects panel analysis is not applicable, because our main explanatory variable is constant over time. The random effects panel model also accounts for the panel structure by including a residual term at the level of individuals and allows to include time-constant explanatory variables such as migrant status. Unfortunately, this model relies on very restrictive assumptions which are often not met (Bell & Jones 2015). We follow the recommendation to use the pooled multinomial logit and the pooled logit, each with cluster robust standard errors as a reasonable alternative (Wooldridge, 2010, p. 486ff). Our estimations are presented in a step-wise fashion; Model 1 includes only the combined indicator for migrant generation and country group of origin, Model 2 adds the moderators sex, age, parenthood, and self-perceived health, and Model 3 adds the sociodemographic controls.

Second, we examine medical help-seeking using the pooled data set for waves 7 to 12. We start with a bivariate description for migrant generation and country group of origin. In the following multivariable analyses, we do not differentiate between migrant groupings due to the sample size. After all, seeking help to have a child is an uncommon event. We estimate pooled logit models. Cluster-robust standard errors are estimated.

All analyses are weighted using calibrated design weights as recommended by the pairfam-team to account for the complex survey design and panel attrition (Brüderl et al., 2023). Calibrated design weights in pairfam use information on migration background as a calibration variable. For the presentation of results from multivariable analyses, average marginal effects (AME) are calculated. There is currently a considerable debate in the literature about how to estimate and present results (Kuha & Mills, 2020). We have opted for AME, which represent an average effect of an independent variable on the probability of people perceiving infertility and seeking medical help, based on the observed values of each person on all other variables in the model. They therefore allow for better comparisons between models than logit coefficients and odds ratios (Best & Wolf, 2014; Mood, 2010).

Results

Perception of Infertility

Table 1 shows the proportions of the total sample, and of women and men, who perceived infertility by migrant generation and by country group of origin. Overall, the mean prevalence of perceived infertility is about 7.7%, with little difference between the sexes (8.0% for women and 7.5% for men). A total of 4.8% of respondents say they are unsure. With 5.4%, men are slightly more likely to state "don't know" than women (4.2%).

When we test our working hypothesis 1A, differentiating by migrant generation, we find significant differences: In the total sample and among women and men, the share of those perceiving infertility is higher among first-generation migrants compared to non-migrants and second-generation migrants. In the total sample, perceived infertility is about 5 percentage points higher among first-generation migrants than among the other two groupings. A similar pattern is found for the answer "don't know". 7% of the first-generation migrants answered "don't know", compared to 5.3% of second-generation migrants and 4.3% of non-migrants.

Testing our working hypothesis H1B, differentiating by migrants' region of origin also reveals significant differences between migrant groupings. In total, individuals from the Balkan countries are—at around 6%—by far the least likely to perceive infertility. The Balkan country grouping also remains the least likely to perceive

Table 1 Perceived infertility by sex, migrant generation and region of origin (%)

	Total sample			Women			Men		
	Fertile	Infertile	Dk	Fertile	Infertile	Dk	Fertile	Infertile	Dk
Migrant generation*									
Non-migrant	88.8	6.9	4.3	89.2	7.1	3.7	88.5	6.6	4.9
Gen. 1 migrant	80.7	12.3	7.0	82.3	11.8	5.9	78.8	12.8	8.4
Gen. 2 migrant	87.1	7.7	5.3	87.4	7.8	4.8	86.7	7.5	5.8
Region of origin*									
Non-migrant	88.8	6.9	4.3	89.2	7.1	3.7	88.5	6.6	4.9
NWCSSE Europe	84.7	10.0	5.4	84.8	10.6	4.6	84.5	9.1	6.4
Balkan	89.1	6.0	4.9	89.9	4.4	5.7	88.1	8.1	3.8
Russia	77.9	13.7	8.4	77.1	16.0	6.9	79.2	10.1	10.7
Kazakhstan	81.9	10.6	7.6	83.8	10.0	6.2	79.9	11.2	9.0
Middle East	83.4	9.9	6.7	85.7	7.5	6.8	81.5	11.9	6.6
Other	84.0	9.9	6.1	87.3	8.8	3.9	80.5	11.1	8.4
Overall share	87.5	7.7	4.8	87.9	8.0	4.2	87.1	7.5	5.4
n	52,581	3779	2442	27,540	2131	1107	25,041	1648	1335

Calculations based on pairfam waves 1–12 (weighted data). $N_{total} = 12{,}777$ persons with n = 58,802 observations

Dk Don't know, *NWCSSE* North, West, Central, South, South-East Europe

*indicates significant variation between the migrant status group variables regarding perceived infertility on 5% level, based on Pearson chi-squared tests, test statistics calculated for full sample only

infertility when differentiating by sex. In contrast, individuals from Russia are—at around 14%—the most likely to perceive infertility in the whole sample, but there are some differences between the sexes. Women from Russia have—at around 16%—the highest prevalence of perceived infertility. Among men, those from Kazakhstan and from the Middle East have the highest proportions of perceived infertility (11 to 12%), and their proportions are significantly higher than those of women from the same region. Among men from Russia, the share of those perceiving infertility is also quite high (about 10%), but much lower than that of women.

Additionally, we used the combined indicator of migrant generation and region of origin for the whole sample (not shown). This indicator sheds light on the regions of origin that contribute most to the increased risk of perceived infertility among first-generation migrants. All regions of origin except the Balkans have higher perceived infertility than non-migrants, with migrants from Russia having by far the highest share at almost 15%. Overall, second-generation migrants from most regions of origin have rates of perceived infertility that are not so different from those of non-migrants (range: 3 to 9%). Migrants from Europe have the highest proportion of perceived infertility (9%).

For the multivariable analyses, we proceed in two steps to test our working hypotheses, first using migrant generation as the main independent variable, and second using the combined indicator of migrant generation and region of origin. Figure 1 shows the results of the multivariable analysis for migrant generation using AME (the full table of results can be found in Table 7 in the Appendix). The first row in each category shows results from the baseline model (Models M1). Moderators and control variables were added in two steps (Models M2 to M3). The analyses show that first-generation migrants are 5.4 percentage points more likely to perceive infertility than non-migrants in the baseline model. First-generation migrants are also 2.7 percentage points more likely to report being unsure than non-migrants. In contrast, second-generation migrants do not differ from non-migrants in their probability of perceiving infertility.

The migrant disadvantage for first-generation migrants persists when sex, parenthood, health, and age are introduced to the model (Model M2). Their introduction rather results in a slight increase in the probability of perceived infertility and a larger increase in the probability of "don't know"-answers. Additionally, the inclusion of marital status/partnership and education in Model M3 does not change the association between migrant generation and perceived infertility. Figure 2 complements the picture by highlighting differences in region of origin within migrant generations (the full table of results table can be found in Table 8 in the Appendix). In the baseline model, first-generation migrants from Russia are 8 percentage points more likely to perceive infertility than non-migrants. Migrants from the Balkan countries are the group with the smallest increase in the probability of perceived infertility compared to non-migrants. Overall, these results remain stable when moderators and controls are added to the model—thus, not supporting our working hypothesis H1C on the role of the groupings' sociodemographics. By and large, the moderators and controls showed the effects known from the literature: Persons, who were older, childless and rated their health as poor were more likely to perceive infertility (Tables 7 and 8 in the Appendix).

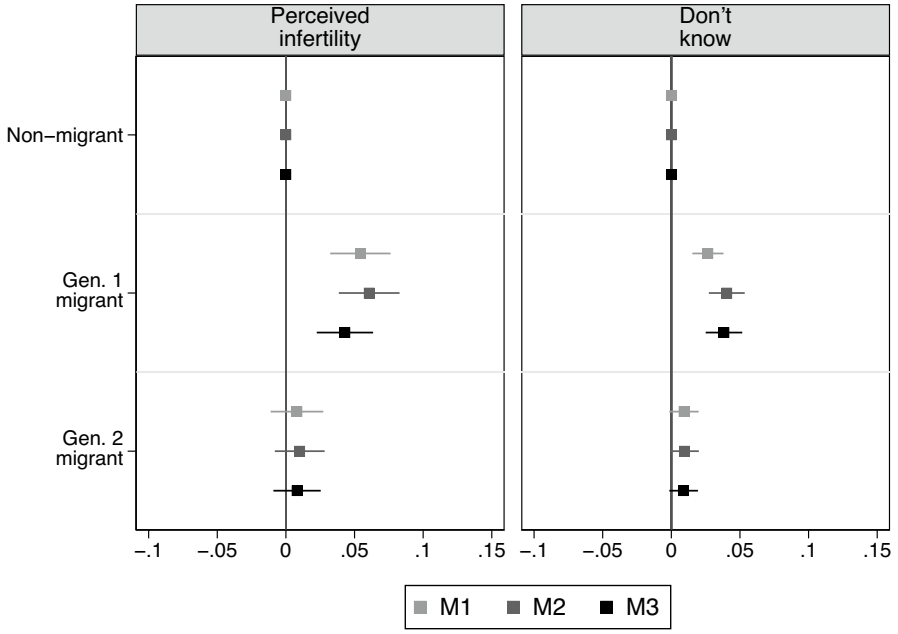

Fig. 1 Perceived infertility, by sex and migrant generation (AME). Calculations based on pairfam waves 1–12 (weighted data), $N_{total} = 12{,}777$ persons with n = 58,802 observations. *AME* average marginal effects, *NWCSSE* North, West, Central, South, South-East Europe. Multinomial logit model; full models are available in Table 7 (Appendix). Model M2 controls for sex, age, parenthood, and health. Model M3 additionally controls for marital status/partnership, education, and wave

Hence, the results do not support our working hypothesis 1A; contrary to our assumption, first-generation migrants have a fertility disadvantage compared to non-migrants. However, no such disadvantages were found for the second migrant generation. Our results also contradict our working hypothesis 1B by showing that migrants from countries where fertility patterns are characterized by a rather young fertility schedule have not lower, but higher rates of infertility and uncertainty—and thus a fertility disadvantage—compared to non-migrants.

Seeking Medical Help to Have a Child

In our second analysis, we look at seeking help to have a child in the sample of those who said that they were trying to have a child. Table 2 shows the proportion of persons who indicated any medical help-seeking. Testing our working hypothesis H2A, i.e. comparing migrant generations, we found the lowest proportion of help-seekers among second-generation migrants and the highest among non-migrants, while first-generation migrants were in-between. This pattern does not align with hypothesis H2A where we assumed that second-generation migrants would be closer to non-migrants than first-generation migrants.

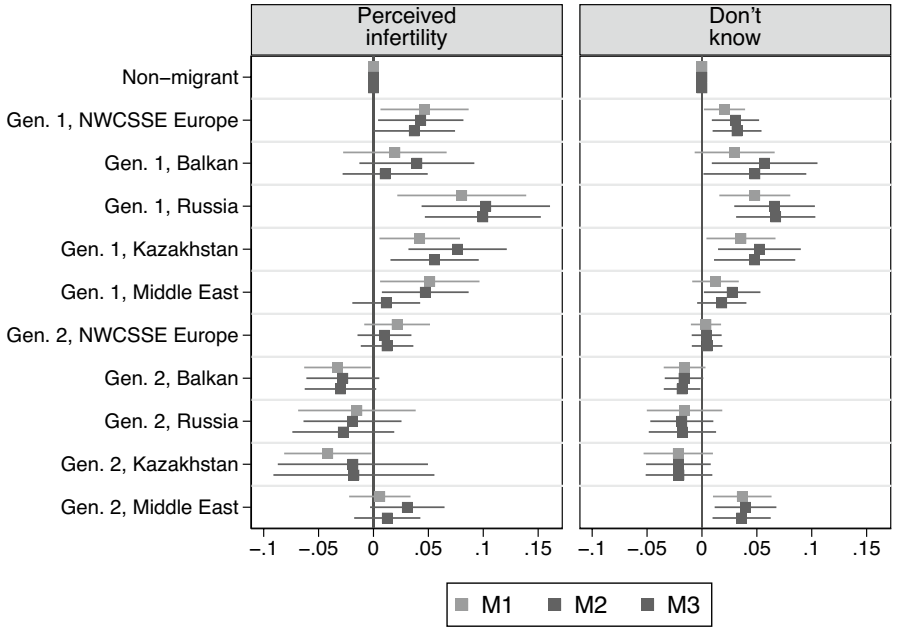

Fig. 2 Perceived infertility, by migrant generation and migrants' region of origin (AME). Calculations based on pairfam waves 1–12 (weighted data), $N_{total} = 12{,}777$ persons with n = 58,802 observations. *AME* average marginal effects, *NWCSSE* North, West, Central, South, South-East Europe. Multinomial logit model; full models are available in Table 8 (Appendix). Model M2 controls for sex, age, parenthood, and health. Model M3 additionally controls for marital status/partnership, education, and wave. Residual categories "Gen. 1, other" and "Gen. 2, other" not shown in figure

By region of origin—testing our hypothesis H2B—variation among migrants was less pronounced, except for the very heterogeneous group of "other" regions. The lowest shares of help-seeking were found among respondents from the Middle East, Russia, and Kazakhstan. These patterns are not entirely consistent with what would be expected from our findings on perceived infertility, where non-migrants would have lower needs than first-generation migrants, and people from the Middle East, Russia and Kazakhstan would have a higher need as opposed to other groupings. In fact, we found the opposite pattern of use: the groupings with the highest infertility—i.e. potential need—have lower treatment rates than those with lower need. Thus, our results do not support our working hypotheses H2A and H2B, but rather indicate a more heterogeneous pattern.

Due to the relatively small sample size, we focus on the comparison between migrants and non-migrants in the following analyses, testing the role of moderators and controls (working hypothesis 2C). For the same reason, a simple indicator of seeking medical help vs. not seeking medical help is applied in most descriptive and multivariable analyses.

Table 3 relates the need for treatment—to the extent that this need can be expressed in terms of perceived infertility—to medical help-seeking. We compare

Table 2 Any medical help-seeking, by migrant generation and region of origin (%)

	Any medical help-seeking	
	No	Yes
Migrant generation*		
Non-migrant	67.0	33.0
Gen. 1 migrant	72.3	27.7
Gen. 2 migrant	79.5	20.5
Region of origin*		
Non-migrant	67.0	33.0
Europe + Balkan	77.0	23.0
Russia/Kazakhstan	82.4	17.6
Middle East	82.8	17.2
Other	58.4	41.6
Overall share	69.8	30.3
n	1642	703

Calculations based on pairfam waves 7–12 (weighted data). $N_{total} = 1500$ persons with n = 2,345 observations

NWCSSE North, West, Central, South, South-East Europe

*indicates significant variation between the migrant status group variables regarding medical help-seeking on 5% level, based on Pearson's chi-squared test

help-seeking rates between migrants and non-migrants by perceived infertility status. Generally, those who perceive infertility are about twice as likely to have sought medical help as those who do not perceive infertility. However, the help-seeking rate among the latter is still significant, suggesting that self-perceived infertility does not capture all the reasons for seeking medical help. Help-seeking rates are higher among non-migrants, whether they perceive infertility or not. However, the difference is much more pronounced when no fertility problems are perceived.

In a next step, we compare the share of help-seekers for two different types of treatment between migrants and non-migrants. As Table 2 shows, 33% of non-migrants sought help to have a child, compared to about 28% among first-generation migrants and 21% among second-generation migrants. When assessing the type of treatment (not shown), migrants are less likely than non-migrants to mention the family doctor/gynecologist as the highest level of treatment (about 14% vs. about 23%), but migrants and non-migrants are similarly likely to say that they received treatment typically provided in fertility clinics (9.7% vs. 9.6%). Importantly, if we look only at those who sought medical help to get pregnant, migrants are more likely to have received treatment at a fertility clinic (migrants: about 40%; non-migrants: about 29%).

Figure 3 shows the results of the multivariable analysis, which are consistent with the descriptive findings (see Tables 2 and 3). There is a stable disadvantage for migrants in seeking medical help to have a child: Their probability of seeking help is about 8 percentage points lower than that of non-migrants. The negative association

Table 3 Help-seeking rates, by migrant status and perceived infertility (%)

	Perceived infertility			Ratio of help seekers perceiving infertility/help seekers not perceiving infertility
	Yes	No	Don't know	
Non-migrant	64.4	29.4	25.2	2.2
Migrant	43.0	23.0	16.7	1.9
Total %	57.8	27.4	20.9	2.1
n	137	552	58	

Calculations based on pairfam waves 7–12 (weighted data). $N_{total} = 1500$ persons with n = 2345 observations

between migrant status and help-seeking remains relatively stable in magnitude and significance when moderators and control variables are added—thus not supporting our working hypothesis H2C on the role of the sociodemographic composition. Of the covariates, parenthood and perception of infertility are the strongest predictors—each reducing the probability of help-seeking by about 20 percentage points. As parenthood is an important predictor and migrants are more likely to have children, also in our sample, we also tested whether having children moderates the association between migrant status with medical help-seeking, but found no such effect (not shown).

Overall, the effects of the explanatory variables are in the directions as known from the literature. Respondents in our sample are more likely to have sought medical help to get pregnant if they are older, childless, married, have higher education, have a household income of 3500€ or more, and perceive their health status as poor.

Robustness and Data Quality

Our estimated prevalence of perceived infertility of 8.0% among women and 7.5% among men is within the range of other European studies of self-reported 12-month infertility, but at the lower end of this range (Cox et al., 2022). They also compare well with another pairfam study using the same indicator, which estimated slightly lower mean prevalence of 5.6% for women and 4.9% for men (Passet-Wittig et al., 2020). The higher average prevalence in the current study could be due to the ageing of the sample, as the other study only used waves 1 to 7. In our sample, 30% of all women and men have sought medical help to have a child. This also compares well with a study on non-migrants and migrants in Germany (Milewski & Haug, 2022), which is based on a different data source.

Importantly, our estimates proved rather robust to modifications to the sample. For the main analyses on perceived infertility, observations from respondents who reported a pregnancy for themselves or—where applicable—their partner were excluded because they were not asked about perceived infertility. As a sensitivity analysis (results available on request), we treated these respondents/couples as

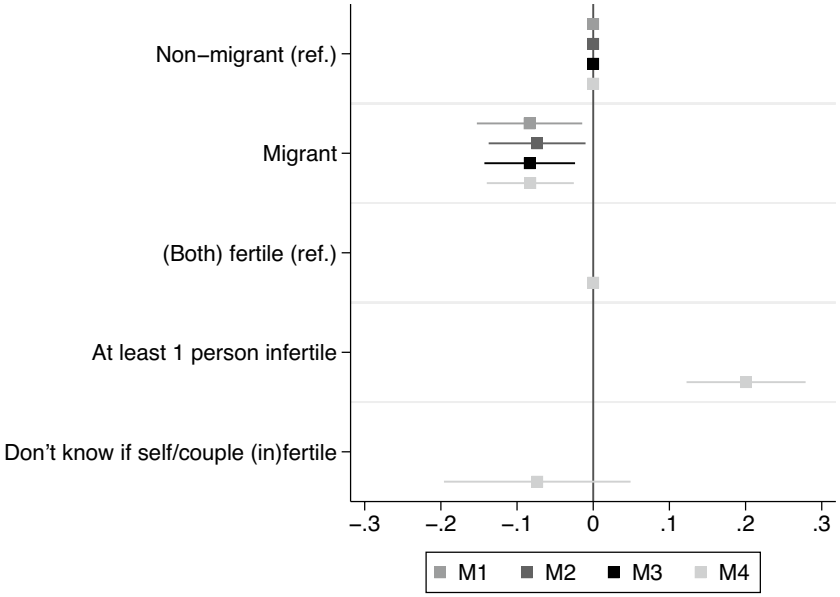

Fig. 3 Help-seeking by migrant status and perceived infertility (AME). Calculations based on pairfam waves 7–12 (weighted data). $N_{total} = 1500$ persons with n = 2345 observations. *AME* average marginal effects. Logistic model; full models are available in Table 9 (Appendix). Model M2 controls for sex, age, parenthood, and health. Model M3 additionally controls for marital status/partnership, education, and household income. Perceived infertility is added in Model M4

fertile, based on the assumption that most couples who achieve a pregnancy have conceived naturally, and re-ran the analyses. No substantial differences were found when comparing the effect estimates in this analysis with the findings in Tables 7 and 8 in Appendix, indicating that the assumption about natural conception was reasonable. However, this may change with increasing use of medically assisted reproduction. It would therefore be preferable to have information on how each pregnancy was conceived.

As is sometimes the case in panel surveys, the routing of respondents to the perceived infertility question was subject to change. In waves 2 and 3, preload information on infertility status was used in the filter. Respondents who considered themselves or their partners as definitively infertile were not re-asked the same question, implicitly assuming their sterility. From wave 4 onwards, the question was posed without referencing the preload information. To test whether the conditional filtering in waves 2 and 3 affected the results, we conducted analyses excluding these waves, but found no substantial differences (results available on request).

This study looked at medical help-seeking in the whole population of women and men of reproductive age, which gives a broad picture of those seeking help to have child. These analyses showed that migrants were less likely to have sought medical help. However, we would expect to find a similar negative association in a sample of

only people perceiving infertility, as migrants are over-represented in this sample. To test this, we re-ran the analyses in a sample of 240 people perceiving infertility (in waves 7 to 10) and also found a negative association. However, we are careful about interpreting this finding because the cell sizes become very small when we differentiate between migrants and non-migrants. More data would be needed to investigate this further.

We also wanted to include more life style and health variables—i.e. BMI, smoking, alcohol—in addition to subjective health. Here, we faced some limitations. BMI is updated every year, but only for the main sample and not for the Demodiff sample, thus it contains a lot of missing values. Smoking was only included for the full sample in waves 5, 7, 9, and only for the refreshment sample in wave 11. Alcohol consumption was only included in waves 5, 7, 9, and 11. Including them would have resulted in a large proportion of missing values for these variables. Alternatively, using only selected waves would have been problematic, given that self-perceived infertility among migrants is a rather uncommon event.

Finally, we considered random effects panel models as an alternative estimation method (see "Plan of Analysis" Section) as an additional robustness check. We estimated random effects multinomial logit models for the infertility analysis and random effects logit models for the medical help-seeking analysis. We conclude that the findings are robust to the estimation method and that main conclusions of the analyses remain valid (results available upon request).

Conclusion

This study examines differences in perceived infertility and seeking medical help to get pregnant among migrants compared to non-migrants in Germany, providing insights into a group often overlooked in infertility research, particularly in Europe. Studying migrants and their reproductive health needs is particularly important in countries like Germany and many other European countries, where the migrant population exceeds one quarter of the population. Using representative data from the general population over 12 waves, we compared the perceived infertility of women and men and/or their partners and their use of medical help to conceive with that of non-migrants. Our analysis included first- and second-generation migrants from various regions of origin.

Contrary to our expectations of a fertility advantage in the first generation and among migrants from countries at an earlier stage of the second demographic transition, the results did not consistently support these assumptions. Instead, we observed significant variation among migrant groups. In particular, a fertility disadvantage for first-generation migrants emerged, challenging the notion of a healthy-migrant effect on fertility. First-generation migrants faced a higher risk of perceived infertility and were more likely to express uncertainty about their fertility status. To put these effects into context, the prevalence of perceived infertility in our sample was approximately 8%, indicating that it is a relatively uncommon occurrence in the general

population. Consequently, differences between social groups were modest, with an increase of around 5 percentage points among first-generation migrants compared to non-migrants and the second generation (controlling for other factors). However, given the low baseline risk, this increase of 5 percentage points means that more than twice as many first-generation migrants experience infertility compared to non-migrants—a remarkable scale effect. However, infertility is only one facet of reproductive trajectories and barriers.

Another relevant question is whether migrants and non-migrants differ in their medical help-seeking behavior. Our descriptive findings indicated that first-generation migrants not only face higher infertility rates, but also show lower utilization of infertility care. Additionally, we expected that differences between migrants and non-migrants would be less pronounced in the second generation than in the first. However, we found no differences in the risk of self-perceived infertility for second-generation migrants compared to non-migrants, but observed even lower treatment rates compared to the first generation. Taken together, these findings point to a pattern of "stratified reproduction" with migrant groups being double-disadvantaged compared to non-migrants.

We observed differences in the risk of perceived infertility according to migrants' regions of origin. We expected lower perceived infertility among migrants from countries where fertility patterns are characterized by young birth ages and low childlessness compared to Germany, which is characterized by late fertility and high childlessness. Instead, we discovered higher rates of infertility and uncertainty—and thus a fertility disadvantage—among groups from Russia, Kazakhstan, and the Middle East, including Turkey. Strikingly, our descriptive analysis suggested that these groups have the lowest use of infertility treatment in our—admittedly—small sample. These findings imply that processes of fertility disruption may be affecting the first generation and certain migrant origin groups in particular. On the one hand, Germany's general, universal health-care system may, on average, facilitate the integration of migrant health across generations. On the other hand, ethnic marginalization processes may be evident in certain cases. Future research should look more closely at the underlying causes of these differences. Finally, in the realm of migrant fertility research, it is essential not to automatically interpret higher fertility levels among migrants compared to non-migrants as evidence against fertility disruption, or declining fertility levels among subsequent generations as proof of adaptation processes. Instead, future studies should systematically compare fertility ideals and intentions with actual fertility outcomes, and consider reproductive barriers as an explanation for deviations. Such studies can complement existing research and shed light on the extent to which seemingly adaptive processes are due to deliberate choices versus involuntary reproductive barriers. This would ultimately allow direct assessment of the hypothesis of fertility disruption in migrant populations.

Furthermore, we examined various stages of help-seeking. Our analysis revealed significant differences among migrants and non-migrants in Germany. Migrants are significantly less likely to receive treatments which are typically provided by a

general practitioner or gynecologist (only). Interestingly, there is virtually no difference in the use of treatments typically administered at fertility clinics, such as insemination or IVF. When focusing solely on those seeking any form of medical help, migrants show an even higher tendency to undergo treatment in fertility clinics. This implies that migrants who have decided to seek medical help in conceiving are more likely to seek more advanced and invasive treatments. This finding is consistent with a study showing that first-generation migrants in Germany display greater openness to medically assisted reproduction (MAR) and stronger intentions to use MAR compared with non-migrants (Haug & Milewski, 2018). Taken together, these findings underline, on the one hand, that help-seekers represent a distinct group, demonstrating the importance of using general population samples for a comprehensive understanding of the process of seeking medical help at various stages of treatment. On the other hand, the reasons for this increased openness towards MAR among migrants warrant attention. Previous research suggests that stronger norms regarding having biological children and the significance of motherhood play a crucial role in migrant groups from countries with more familistic social structures. Consequently, infertility is a concern for childless individuals or couples as well as for families wishing to expand beyond one child. As this study shows, this appears to be important to consider in studies of migrants, but should also be considered for non-migrants.

Like all empirical research, this study has data-related limitations and offers suggestions for future data collection. We used a social science survey in Germany, which for the first time included questions on the sensitive topic of infertility and help-seeking. Although the pairfam survey covers the general population and includes a representative sample of immigrants, it does not over-represent any particular migrant group. Due to the relatively infrequent, though not rare, occurrence of infertility and help-seeking, the immigrant case numbers were small, limiting the ability to differentiate between migrant groupings as desired. We conducted multivariable analyses for infertility based on migrant generation and region of origin, but were only able to make fairly broad groupings by country of origin. We did not estimate perceived infertility separately for women and men because our research suggests that infertility is a shared experience within a couple, as is potential treatment. However, many causes of infertility may be sex-specific and thus may indicate specific prevention measures and health-care needs for women and men. Therefore, future analyses should also look at patterns of infertility by sex (Trappolini & Giudici, 2021). While the pairfam data provided a solid foundation for studying population heterogeneity in perceived infertility, it was less comprehensive for examining medical help-seeking to get pregnant. Multivariable models controlling for migrant generation or region of origin, let alone for both variables simultaneously, were not feasible. Consequently, the findings indicate a migrant disadvantage, but the variation we found between migrant groupings based on merely descriptive analyses rests on less solid ground. Nevertheless, both variables—migrant generation and (parents') region of origin—are crucial markers for probing within-migrant diversity

and understanding marginalization processes that seem to impact specific migrant groups.

Our results underline that a simplistic distinction between migrants and non-migrants falls short of capturing this diversity. A more nuanced approach is needed. Notably, our findings suggest that first-generation migrants, in particular, may face reproductive risks, aligning with existing literature on migrant assimilation, fertility, and health. The disruptive nature of migration on the life course, often accompanied by spatial separation of family members, language barriers, and acculturation processes, is linked to stress and cumulative disadvantages as seen in ethnic minority groups (Bean & Tienda, 1990). Therefore, the duration of stay in a destination country should be considered in future studies.

To better understand the causes of infertility and treatment experiences, it is crucial to complement demographic and socioeconomic data with additional health and lifestyle variables (Homan et al., 2007). Factors such as smoking, alcohol, and substance use, and adverse BMI have been shown to correlate with ethnicity, religious affiliation, and religiosity, for both women and men, and they also explain health differences between European countries. Certain groups, such as religious Muslims, may have reduced risks associated with alcohol use, yet face increased risks of overweight and childhood diabetes compared with non-migrants in Europe. This suggests the need for a more nuanced examination of group differences—not only between migrant minorities in Europe and non-migrants, but also within different migrant or ethnic groups. Such an approach would also provide insights into the societal context and the health-care system. It is worth noting that these lifestyle factors are modifiable risk factors, and hence amenable to prevention and intervention.

In conclusion, our study provides a detailed picture of the two interrelated events—perceived infertility and help-seeking—for the migrant population, differentiated by migrant generation and region of origin. It shows a double migrant fertility disadvantage, ie. higher infertility and lower help-seeking, in particular in the first generation and for certain groups of origin. These findings are relevant for research on migrant assimilation, as they reveal a rarely analyzed dimension of social inequality and differential demographic behavior in contemporary multi-ethnic Europe.

Appendix

See Tables (4, 5, 6, 7, 8, 9)

Table 4 Description of the sample for perceived infertility analyses by migrant status (in %)

	Non-migrant	Migrant	Total
Migrant generation*			
Non-migrant	100.0	na	0.7
Gen. 1 migrant	na	53.5	14.1
Gen. 2 migrant	na	46.5	12.3
Region of origin*			
NWCSSE Europe	na	40.7	10.8
Balkan	na	6.5	1.7
Russia	na	10.8	2.8
Kazakhstan	na	7.1	1.9
Middle East	na	21.9	5.8
Other	na	12.9	3.4
Sex*			
Men	53.7	46.7	51.8
Women	46.3	53.3	48.2
Age in years			
< 35	51.9	52.2	52.0
35–39	25.7	26.5	25.9
40 +	22.4	21.4	22.1
Parenthood*			
No	59.3	50.0	56.8
Yes	40.7	50.0	43.2
Self-perceived health*			
Good	87.0	86.1	86.7
Bad	13.1	13.9	13.3
Marital status/partnership*			
No partner	29.3	27.1	28.7
Unmarried	35.8	25.0	33.0
Married	35.0	47.9	38.4
Education*			
Primary/lower secondary	6.5	16.6	9.2
Higher secondary	56.5	47.4	54.1
Tertiary	36.9	35.4	36.5
Missing value	0.1	0.5	0.2
N	9837	2940	12,777
n	47,539	11,263	58,802

Calculations based on pairfam waves 1–12 (weighted data)

NWCSSE North, West, Central, South, South-East Europe; *na* not applicable

*indicates that the migrant group varies significantly from the non-migrant group in the respective sociodemographic/economic trait on 5% level, based on Pearson's chi-squared test

Table 5 Description of the sample for help-seeking analyses, by migrant status (in %)

	Non-migrant	Migrant	Total
Help-seeking*			
No	67.0	75.4	69.8
Yes	33.0	24.6	30.3
Sex*			
Men	50.7	44.0	48.5
Women	49.3	56.1	51.5
Age in years			
< 35	52.5	57.3	54.1
35–39	29.9	30.5	30.1
40 +	17.6	12.3	15.9
Parenthood			
No	59.2	54.7	57.7
Yes	40.8	45.4	42.3
Marital status/partnership*			
No partner	4.3	3.4	4.0
Unmarried	34.8	23.9	31.3
Married	60.9	72.7	64.8
Education			
Primary/lower secondary	56.9	60.4	58.0
Higher secondary/tertiary	43.2	39.6	42.0
Household income in € *			
< = 1500	8.1	9.9	8.7
1500–250	14.5	19.2	16.1
2500–350	24.7	28.5	25.9
3500 +	48.0	36.0	44.0
Missing value	4.8	6.4	5.3
Subjective health			
Good	87.3	85.4	86.7
Bad	12.7	14.6	13.4
Perceived infertility			
(Both) fertile	87.4	85.9	86.9
At least 1 person infertile	10.4	9.6	10.2
I don't know	2.1	4.5	2.9
Overall share	67.2	32.8	100.0
n	1884	461	2345

Calculations based on pairfam waves 7–12 (weighted data). $N_{total} = 1500$ persons with n = 2345 observations

*indicates that the migrant group varies significantly from the non-migrant group in the respective sociodemographic/ economic trait on 5% level, based on Pearson's chi-squared test

Table 6 Frequency distribution of responses to the questions on perceived infertility of respondent and—if applicable—of partner

		Partner								
		−4	−3	−2	−1	1	2	3	4	Total
Resp.	−4 Filter error	0	0	0	0	0	0	0	0	0
	−3 Does not apply	0	0	0	3	0	0	3	6	12
	−2 I don't want to answer that	0	0	0	38	0	0	5	11	54
	−1 Don't know	2	937	45	792	240	155	19	29	2,219
	1 Definitely yes	3	8025	0	123	26,668	1514	254	350	36,937
	2 Probably yes	2	5938	0	107	1347	9084	304	110	16,892
	3 Probably not	1	328	4	26	312	323	282	36	1312
	4 Definitely not	2	303	27	29	459	132	52	372	1376
	n	10	15,531	76	1118	29,026	11,208	919	914	58,802

Calculations based on pairfam waves 1–12

−3 for partner means that the respondent did not have a partner at the time of the interview. -3 for respondent applies only in waves 2 & 3 because in these waves respondents who chose "4 definitely not" in the year before were not asked about their perceived infertility again

Table 7 Results of the multinomial logit analysis on the probability of perceived infertility, by migrant generation (AME)

	Model 1			Model 2			Model 3		
	Fertile	Infertile	Dk	Fertile	Infertile	Dk	Fertile	Infertile	Dk
Migrant generation (ref. non-migrant)									
Gen. 1 migrant	−0.081**	0.054**	0.027**	−0.101**	0.061**	0.040**	−0.081**	0.043**	0.038**
Gen. 2 migrant	−0.017	0.008	0.009	−0.020	0.010	0.010	−0.017	0.008	0.009
Women (ref. men)				0.000	0.007	−0.007*	−0.001	0.005	−0.005
Age in years (ref. < 35)									
35 − 39				−0.075**	0.069**	0.006	−0.071**	0.065**	0.006
40 +				−0.134**	0.123**	0.011*	−0.127**	0.113**	0.014*
Parenthood (ref. no)				0.089**	−0.040**	−0.049**	0.116**	−0.071**	−0.045**
Bad health (ref. good health)				−0.031**	0.028**	0.004	−0.028**	0.027**	0.001
Marital status/partnership (ref. married)									
No partner							0.051**	−0.067**	0.016**
Unmarried							0.027**	−0.039**	0.012**
Education (ref. primary/lower secondary)									
Higher secondary							−0.114**	0.076**	0.038**
Tertiary							−0.043**	0.031**	0.011**
Missing value							−0.182*	0.189**	−0.007

Calculations based on pairfam waves 1–12 (weighted data). $N_{total} = 12{,}777$ persons with n = 58,802 observations

AME average marginal effect, *Dk* Don't know

*$p < 0.05$, **$p < 0.01$

Model 3 includes wave as a control (not shown, available on request)

Table 8 Results of the multinomial logit analysis on the probability of perceived infertility, by migrant generation and region of origin (AME)

	Model 1			Model 2			Model 3		
	Fertile	Infertile	Dk	Fertile	Infertile	Dk	Fertile	Infertile	Dk
Migrant generation/region of origin (ref. non-migrant)									
Gen. 1, NWCSSE Europe	−0.067**	0.047*	0.021*	−0.074**	0.043*	0.031**	−0.069**	0.037*	0.032**
Gen. 1, Balkan	−0.049	0.020	0.030	−0.097**	0.040	0.057*	−0.059	0.011	0.048*
Gen. 1, Russia	−0.129**	0.080**	0.048**	−0.168**	0.102**	0.066**	−0.167**	0.100**	0.067**
Gen. 1, Kazakhstan	−0.078**	0.042*	0.036*	−0.129**	0.077**	0.052**	−0.104**	0.056**	0.048*
Gen. 1, Middle East	−0.064**	0.051*	0.012	−0.075**	0.047*	0.028*	−0.030	0.012	0.018
Gen. 1, other	−0.093**	0.068*	0.025	−0.100**	0.070*	0.032*	−0.086**	0.052*	0.033*
Gen. 2, NWCSSE Europe	−0.025	0.022	0.004	−0.014	0.010	0.004	−0.017	0.012	0.005
Gen. 2, Balkan	0.049**	−0.033*	−0.016	0.044*	−0.028	−0.016	0.048**	−0.030	−0.018*
Gen. 2, Russia	0.031	−0.015	−0.016	0.037	−0.019	−0.018	0.045	−0.028	−0.018
Gen. 2, Kazakhstan	0.063*	−0.042*	−0.022	0.040	−0.019	−0.021	0.039	−0.018	−0.021
Gen. 2, Middle East	−0.043*	0.006	0.037	−0.071**	0.031	0.040**	−0.049*	0.013	0.036**
Gen. 2, other	0.005	−0.013	0.008	−0.017	0.010	0.007	−0.018	0.011	0.007
Women (ref. men)				−0.001	0.007	−0.007	0.000	0.005	−0.005

Table 8 (continued)

	Model 1			Model 2			Model 3		
	Fertile	Infertile	Dk	Fertile	Infertile	Dk	Fertile	Infertile	Dk
Age in years (ref. < 35)									
35 – 39				−0.077**	0.070**	0.007	−0.072**	0.065**	0.007
40+				−0.138**	0.125**	0.013*	−0.130**	0.114**	0.016*
Parenthood (ref. no)				0.091**	−0.041**	−0.050**	0.117**	−0.071**	−0.046**
Bad health (ref. good health)				−0.032**	0.028**	0.004	−0.029**	0.028**	0.001
Marital status/partnership (ref. married)									
No partner							0.052**	−0.068**	0.015**
Unmarried							0.028**	−0.040**	0.012**
Education (ref. primary/lower secondary)									
Higher secondary							−0.121**	0.083**	0.039**
Tertiary							−0.043**	0.032**	0.011**
Missing value							−0.200**	0.205**	−0.005

Calculations based on pairfam waves 1–12 (weighted data). $N_{total} = 12{,}777$ persons with n = 58,802 observations

AME average marginal effect, *Dk* Don't know, *NWCSSE* North, West, Central, South, South-East Europe

*$p < 0.05$, **$p < 0.01$

Model 3 includes wave as a control (not shown, available on request)

Table 9 Results of the multivariable logistic analysis on the probability of medical help-seeking to have a child, all respondents (AME)

	Model 1	Model 2	Model 3	Model 4
Migrant (ref. non-migrant)	−0.084*	−0.074*	−0.083**	−0.083**
Women (ref. men)		0.093**	0.099**	0.092**
Age in years (ref. < 35)				
35 – 39		0.085**	0.062*	0.049
40 +		0.178**	0.157**	0.114**
Parenthood (ref. no)		−0.208**	−0.225**	−0.212**
Bad health (ref. good health)		0.081*	0.097**	0.083*
Marital status/partnership (ref. married)				
No partner			−0.168**	−0.164**
Unmarried			−0.129**	−0.122**
Lower education (ref. higher education)			−0.043	−0.051
Household income in € (ref. < 1500)				
1500–2500			0.091	0.093
2500–3500			0.054	0.047
3500 +			0.114*	0.105*
Missing value			0.028	0.034
Perceived infertility (ref. (both) fertile)				
At least 1 person infertile				0.201**
Don't know if self/couple (in) fertile				−0.073

Calculations based on pairfam waves 7–12 (weighted data). $N_{total} = 1500$ persons with n = 2345 observations

AME average marginal effect

*$p < 0.05$, **$p < 0.01$

Model 4 includes wave as a control (not shown, available on request)

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References

Adamson, G. D., de Mouzon, J., Chambers, G. M., Zegers-Hochschild, F., Mansour, R., Ishihara, O., Banker, M., & Dyer, S. (2018). International committee for monitoring assisted reproductive technology: World report on assisted reproductive technology, 2011. *Fertility and Sterility, 110*(6), 1067–1080. https://doi.org/10.1016/j.fertnstert.2018.06.039

Adserà, A., & Ferrer, A. (2015). Immigrants and demography: Marriage, divorce, and fertility. In B. R. Chiswick & P. W. Miller (Eds.), *Handbook of the economics of international migration* (pp. 315–374). Elservier.

Alderotti, G., & Trappolini, E. (2022). Health status and fertility intentions among migrants. *International Migration, 60*(4), 164–177. https://doi.org/10.1111/imig.12921

Aleixandre-Benavent, R., Simon, C., & Fauser, B. C. J. M. (2015). Trends in clinical reproductive medicine research: 10 years of growth. *Fertility and Sterility, 104*(1), 131–137. https://doi.org/10.1016/j.fertnstert.2015.03.025

Atkin, K. (2009). Making sense of ethnic diversity, difference and disadvantage within the context of multicultural societies. In L. Culley, N. Hudson, & F. van Rooij (Eds.), *Marginalized reproduction: Ethnicity, infertility and reproductive technologies* (pp. 49–63). Routledge.

Bagavos, C. (2019). On the multifaceted impact of migration on the fertility of receiving countries: Methodological insights and contemporary evidence for Europe, the United States, and Australia. *Demographic Research, 41*, 1–36. https://doi.org/10.4054/DemRes.2019.41.1

Bastola, K., Koponen, P., Gissler, M., & Kinnunen, T. I. (2020). Differences in caesarean delivery and neonatal outcomes among women of migrant origin in Finland: A population-based study. *Paediatric and Perinatal Epidemiology, 34*(1), 12–20. https://doi.org/10.1111/ppe.12611

Baykara-Krumme, H., & Milewski, N. (2017). Fertility patterns among Turkish women in Turkey and abroad: The effects of international mobility, migrant generation, and family background. *European Journal of Population, 33*(3), 409–436. https://doi.org/10.1007/s10680-017-9413-9

Bean, F. D., & Tienda, M. (1990). *The Hispanic population of the United States*. Russell Sage Foundation.

Bell, A., & Jones, K. (2015). Explaining fixed effects: Random effects modelling of time-series cross-sectional and panel data. *Political Science Research and Methods, 3*(01), 133–153. https://doi.org/10.1017/psrm.2014.7

Benyamini, Y. (2011). Health and illness perceptions. In H. S. Friedman (Ed.), *The Oxford handbook of health psychology* (pp. 281–314). Oxford University Press.

Best, H., & Wolf, C. (2014). Logistic regression. In H. Best & C. Wolf (Eds.), *The SAGE handbook of regression analysis and causal inference* (pp. 153–172). Sage.

Brautsch, L. A. S., Voss, I., Schmidt, L., & Vassard, D. (2023). Social disparities in the use of ART treatment: A national register-based cross-sectional study among women in Denmark. *Human Reproduction, 38*(3), 503–510. https://doi.org/10.1093/humrep/deac247

Brüderl, J., Hank, K., Huinink, J., Nauck, B., Neyer, F.J., Walper, S., Alt, P., Borschel, E., Buhr, P., Castiglioni, L., Fiedrich, S., Finn, C., Garrett, M., Herzig, M., Hajek, K., Huyer-May, B., Lenke, R., Müller, B., Peter, T., Schmiedeberg, C., Schütze, P., Schumann, N., Thönnissen, C., Wetzel, M., & Wilhelm, B. (2023). The German Family Panel (pairfam). *GESIS Data Archive*, *ZA5678 Data file Version 12.0.0*. https://doi.org/10.4232/pairfam.5678.12.0.0

Bujard, M., & Andersson, G. (2024). Fertility declines near the end of the COVID-19 pandemic: Evidence of the 2022 birth declines in Germany and Sweden. *European Journal of Population, 40*, 4. https://doi.org/10.1007/s10680-023-09689-w

Butts, S. F. (2021). Health disparities of African Americans in reproductive medicine. *Fertility and Sterility, 116*(2), 287–291. https://doi.org/10.1016/j.fertnstert.2021.06.041

Calhaz-Jorge, C., De Geyter, C. H., Kupka, M. S., Wyns, C., Mocanu, E., Motrenko, T., Scaravelli, G., Smeenk, J., Vidakovic, S., & Goossens, V. (2020). Survey on ART and IUI: Legislation, regulation, funding and registries in European countries: The European IVF-monitoring Consortium (EIM) for the European Society of Human Reproduction and Embryology (ESHRE). *Human Reproduction Open*. https://doi.org/10.1093/hropen/hoz044

Carson, S. A., & Kallen, A. N. (2021). Diagnosis and management of infertility: A review. *JAMA, 326*(1), 65–79. https://doi.org/10.1001/jama.2021.4788

Christ, J. P., Vu, M., Mehr, H., Jackson-Bey, T., & Herndon, C. N. (2022). See one, do one, teach one: Reimagining reproductive endocrinology and infertility training programs to expand access to care. *F&S Reports, 3*(Suppl. 2), 114–121. https://doi.org/10.1016/j.xfre.2021.10.001

Coleman, D. A. (1994). Trends in fertility and intermarriage among immigrant populations in Western Europe as measures of integration. *Journal of Biosocial Science, 26*(1), 107–136. https://doi.org/10.1017/S0021932000021106

Colen, S. (1986). With respect and feelings: Voices of West Indian child care and domestic workers in New York City. In J. B. Cole (Ed.), *All American women: Lines that divide, ties that bind* (pp. 46–70). Free Press.

Cox, C. M., Thoma, M. E., Tchangalova, N., Mburu, G., Bornstein, M. J., Johnson, C. L., & Kiarie, J. (2022). Infertility prevalence and the methods of estimation from 1990 to 2021: A systematic review and meta-analysis. *Human Reproduction Open, 2022*(4), hoac051. https://doi.org/10.1093/hropen/hoac051

Crawford, G., & Ledger, W. (2019). In vitro fertilisation/intracytoplasmic sperm injection beyond 2020. *BJOG: an International Journal of Obstetrics & Gynaecology, 126*(2), 237–243. https://doi.org/10.1111/1471-0528.15526

Culley, L., & Hudson, N. (2009). Constructing relatedness: Ethnicity, gender and third party assisted conception in the UK. *Current Sociology, 57*(2), 249–267. https://doi.org/10.1177/0011392108099165

Culley, L. A., Hudson, N., Rapport, F. L., Katbamna, S., & Johnson, M. R. D. (2006). British South Asian communities and infertility services. *Human Fertility, 9*(1), 37–45. https://doi.org/10.1080/14647270500282644

De Geyter, C., Calhaz-Jorge, C., Kupka, M. S., Wyns, C., Mocanu, E., Motrenko, T., Scaravelli, G., Smeenk, J., Vidakovic, S., Goossens, V., The European IVF-monitoring Consortium (EIM) for the European Society of Human Reproduction and Embryology (ESHRE). (2020). ART in Europe, 2015: Results generated from European registries by ESHRE. *Human Reproduction Open, 2020*(1), hoz038. https://doi.org/10.1093/hropen/hoz038

Destatis (2024). Mikrozensus - Bevölkerung nach Migrationshintergrund. Erstergebnisse 2023. Retrieved August 11, 2024, from www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publikationen/_publikationen-innen-migrationshintergrund.html

DIR. (2021). Jahrbuch 2020. German IVF register. *Journal of Reproductive Medicine and Endocrinology, 3*, 1–60.

Domar, A., Gordon, K., Garcia-Velasco, J., La Marca, A., Barriere, P., & Beligotti, F. (2012). Understanding the perceptions of and emotional barriers to infertility treatment: A survey in four European countries. *Human Reproduction, 27*(4), 1073–1079. https://doi.org/10.1093/humrep/des016

Dunson, D. B., Colombo, B., & Baird, D. D. (2002). Changes with age in the level and duration of fertility in the menstrual cycle. *Human Reproduction, 17*(5), 1399–1403. https://doi.org/10.1093/humrep/17.5.1399

Erman, J. (2022). Cohort, policy, and process: The implications for migrant fertility in West Germany. *Demography, 59*(1), 221–246. https://doi.org/10.1215/00703370-9629146

ESHRE Capri Workshop Group. (2005). Fertility and ageing. *Human Reproduction Update, 11*(3), 261–276. https://doi.org/10.1093/humupd/dmi006

Evers, J. L. (2002). Female subfertility. *The Lancet, 360*(9327), 151–159. https://doi.org/10.1016/S0140-6736(02)09417-5

Foner, N., & Alba, R. (2008). Immigrant religion in the U.S. and Western Europe: Bridge or barrier to inclusion? *International Migration Review, 42*(2), 360–392. https://doi.org/10.1111/j.1747-7379.2008.00128.x

Galic, I., Negris, O., Warren, C., Brown, D., Bozen, A., & Jain, T. (2021). Disparities in access to fertility care: Who's in and who's out. *F&S Reports, 2*(1), 109–117. https://doi.org/10.1016/j.xfre.2020.11.001

Geiger, H. J. (2003). Racial and ethnic disparities in diagnosis and treatment: A review of the evidence and a consideration of causes. In B. D. Smedley, A. Y. Stith, & A. R. Nelson (Eds.), *Unequal treatment: Confronting racial and ethnic disparities in health care* (pp. 417–454). National Academies Press.

Gemmill, A., & Cowan, S. K. (2021). Low perceived susceptibility to pregnancy as a reason for contraceptive nonuse among women with unintended births. *Demographic Research, 44*, 759–774. https://doi.org/10.4054/DemRes.2021.44.31

Geronimus, A. T., Hicken, M., Keene, D., & Bound, J. (2006). "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. *American Journal of Public Health, 96*(5), 826–833. https://doi.org/10.2105/AJPH.2004.060749

González-Ferrer, A., Castro Martín, T., Kraus, E., & Eremenko, T. (2017). Childbearing patterns among immigrant women and their daughters in Spain: Over-adaptation or structural constraints. *Demographic Research, 37*, 599–634. https://doi.org/10.4054/DemRes.2017.37.19

Greil, A. L., Slauson-Blevins, K., & McQuillan, J. (2010). The experience of infertility: A review of recent literature. *Sociology of Health & Illness, 32*(1), 140–162. https://doi.org/10.1111/j.1467-9566.2009.01213.x

Gürtin-Broadbent, Z. (2009). "Anything to become a mother": Migrant Turkish women's experiences of involuntary childlessness and assisted reproductive technologies in London. In L. Culley, N. Hudson, & F. van Rooij (Eds.), *Marginalized reproduction: Ethnicity, infertility and reproductive technologies* (pp. 117–133). Routledge.

Haug, S., & Milewski, N. (2018). Women's attitudes toward assisted reproductive technologies—A pilot study among migrant minorities and non-migrants in Germany. *Comparative Population Studies, 43*, 343–370. https://doi.org/10.12765/CPoS-2019-06en

HFC - Human Fertility Collection. (2024). Max Planck Institute for Demographic Research (Germany) and Vienna Institute of Demography (Austria). www.fertilitydata.org

Homan, G. F., Davies, M., & Norman, R. (2007). The impact of lifestyle factors on reproductive performance in the general population and those undergoing infertility treatment: A review. *Human Reproduction Update, 13*(3), 209–223. https://doi.org/10.1093/humupd/dml056

Huinink, J., Brüderl, J., Nauck, B., Walper, S., Castiglioni, L., & Feldhaus, M. (2011). Panel analysis of intimate relationships and family dynamics (pairfam): Conceptual framework and design. *Journal of Family Research, 23*(1), 77–101.

Inhorn, M. C. (2018). *America's Arab refugees: Vulnerability and health on the margins*. Stanford University Press.

Inhorn, M. C., Ceballo, R., & Nachtigall, R. (2009). Marginalized, invisible, and unwanted: American minority struggles with infertility and assisted conception. In L. Culley, N. Hudson, & F. van Rooij (Eds.), *Marginalized reproduction: Ethnicity, infertility and reproductive technologies* (pp. 181–197). Routledge.

Inhorn, M., & Van Balen, F. (Eds.). (2002). *Infertility around the globe new thinking on childlessness, gender, and reproductive technologies*. University of California Press.

Jackson-Bey, T., Morris, J., Jasper, E., Velez Edwards, D. R., Thornton, K., Richard-Davis, G., & Plowden, T. C. (2021). Systematic review of racial and ethnic disparities in reproductive endocrinology and infertility: Where do we stand today? *F&S Reviews, 2*(3), 169–188. https://doi.org/10.1016/j.xfnr.2021.05.001

Johnson, K. M., Shreffler, K. M., Greil, A. L., & McQuillan, J. (2023). Bearing the reproductive load? Unequal reproductive careers among U.S. Women. *Population Research and Policy Review, 42*(1), 14. https://doi.org/10.1007/s11113-023-09770-6

Johnson, M., & Borde, T. (2009). Representation of ethnic minorities in research: Necessity, opportunity and adverse effects. In L. Culley, N. Hudson, & F. van Rooij (Eds.), *Marginalized reproduction: Ethnicity, infertility and reproductive technologies* (pp. 64–79). Routledge.

Juárez, S., Mussino, E., & Hjern, A. (2019). Being a refugee or having a refugee status? Birthweight and gestational age outcomes among offspring of immigrant mothers in Sweden. *Scandinavian Journal of Public Health, 47*(7), 730–734. https://doi.org/10.1177/1403494818777432

Keskin, F., & Çavlin, A. (2023). Cohort fertility heterogeneity during the fertility decline period in Turkey. *Journal of Biosocial Science, 55*(4), 779–794. https://doi.org/10.1017/S0021932022000268

Köppen, K., Trappe, H., & Schmitt, C. (2021). Who can take advantage of medically assisted reproduction in Germany? *Reproductive Biomedicine & Society Online, 13*, 51–61. https://doi.org/10.1016/j.rbms.2021.05.002

Krapf, S., & Wolf, K. (2015). Persisting differences or adaptation to German fertility patterns? First and second birth behavior of the 1.5 and second generation Turkish migrants in Germany. *Kölner Zeitschrift Für Soziologie und Sozialpsychologie, 67*(Suppl. 1), 137–164. https://doi.org/10.1007/s11577-015-0331-8

Kuha, J., & Mills, C. (2020). On group comparisons with logistic regression models. *Sociological Methods & Research, 49*(2), 498–525. https://doi.org/10.1177/0049124117747306

Kulu, H., Milewski, N., Hannemann, T., & Mikolai, J. (2019). A decade of life-course research on fertility of immigrants and their descendants in Europe. *Demographic Research, 40*, 1345–1374. https://doi.org/10.4054/DemRes.2019.40.46

Lazzari, E., Gray, E., & Baffour, B. (2022). A dyadic approach to the study of perceived infertility and contraceptive use. *Demographic Research, 47*, 1–36. https://doi.org/10.4054/DemRes.2022.47.1

Li, X., Sundquist, J., & Sundquist, K. (2013). Immigrants and preterm births: A nationwide epidemiological study in Sweden. *Maternal and Child Health Journal, 17*(6), 1052–1058. https://doi.org/10.1007/s10995-012-1087-7

Liu, C., & Kulu, H. (2023). Competing family pathways for immigrants and their descendants in Germany. *International Migration Review (online First)*. https://doi.org/10.1177/01979183231161600

Loi, S., Pitkänen, J., Moustgaard, H., Myrskylä, M., & Martikainen, P. (2021). Health of immigrant children: The role of immigrant generation, exogamous family setting, and family material and social resources. *Demography, 58*(5), 1655–1685. https://doi.org/10.1215/00703370-9411326

Lowry, M. H., Greil, A. L., McQuillan, J., Burch, A., & Shreffler, K. M. (2020). Medically defined infertility versus self-perceived fertility problem: Implications of survey wording for assessing associations with depressive symptoms. *Women's Health Reports, 1*(1), 232–240. https://doi.org/10.1089/whr.2020.0032

McQuillan, J., Passet-Wittig, J., Greil, A. L., & Bujard, M. (2022). Is perceived inability to procreate associated with life satisfaction? Evidence from a German panel study. *Reproductive Biomedicine & Society Online, 14*, 87–100. https://doi.org/10.1016/j.rbms.2021.09.004

Merkison, J. M., Chada, A. R., Marsidi, A. M., & Spencer, J. B. (2023). Racial and ethnic disparities in assisted reproductive technology: A systematic review. *Fertility and Sterility, 119*(3), 341–347. https://doi.org/10.1016/j.fertnstert.2023.01.023

Milewski, N. (2007). First child of immigrant workers and their descendants in West Germany: Interrelation of events, disruption, or adaptation? *Demographic Research, 17*, 859–896. https://doi.org/10.4054/DemRes.2007.17.29

Milewski, N. (2010). *Fertility of immigrants. A two-generational approach in Germany*. Springer.

Milewski, N., & Adserà, A. (2023). Introduction: Fertility and social inequalities in migrant populations: A look at the roles of selection, context of reception, and employment. *Journal of International Migration and Integration, 24*(Suppl. 1), 1–21. https://doi.org/10.1007/s12134-022-01003-7

Milewski, N., & Haug, S. (2020). Religious diversity and women's attitudes toward using assisted reproductive technologies—Insights from a pilot study in Germany. *Journal of Religion and Demography, 7*(1), 150–168.

Milewski, N., & Haug, S. (2022). At risk of reproductive disadvantage? Exploring fertility awareness among migrant women in Germany. *Reproductive Biomedicine & Society Online, 14*, 226–238. https://doi.org/10.1016/j.rbms.2021.11.007

Milewski, N., & Peters, F. (2014). Too low or too high? On birthweight differentials of immigrants in Germany. *Comparative Population Studies, 39*(1), 3–22. https://doi.org/10.12765/CPoS-2014-02

Mood, C. (2010). Logistic regression: Why we cannot do what we think we can do, and what we can do about it. *European Sociological Review, 26*(1), 67–82.

Mussino, E., & Strozza, S. (2012). The fertility of immigrants after arrival: The Italian case. *Demographic Research, 26*, 99–130. https://doi.org/10.4054/DemRes.2012.26.4

Opondo, C., Jayaweera, H., Hollowell, J., Li, Y., Kurinczuk, J. J., & Quigley, M. A. (2020). Variations in neonatal mortality, infant mortality, preterm birth and birth weight in England and Wales according to ethnicity and maternal country or region of birth: An analysis of linked national data from 2006 to 2012. *Journal of Epidemiology and Community Health, 74*(4), 336–345. https://doi.org/10.1136/jech-2019-213093

Passet-Wittig, J. (2017). *Unerfüllte Kinderwünsche und Reproduktionsmedizin. Eine sozialwissenschaftliche Analyse von Paaren in Kinderwunschbehandlung*. Barbara Budrich.

Passet-Wittig, J., & Bujard, M. (2021). Medically assisted reproduction in developed countries: Overview and societal challenges. In N. Schneider & M. Kreyenfeld (Eds.), *Research handbook on the sociology of the family* (pp. 417–438). Edward Elgar Publishing.

Passet-Wittig, J., Bujard, M., McQuillan, J., & Greil, A. L. (2020). Is perception of inability to procreate a temporal phenomenon?: A longitudinal exploration of changes and determinants among women and men of reproductive age in Germany. *Advances in Life Course Research, 45*, 100339. https://doi.org/10.1016/j.alcr.2020.100339

Passet-Wittig, J., & Greil, A. L. (2021). Factors associated with medical help-seeking for infertility in developed countries: A narrative review of recent literature. *Social Science & Medicine, 227*, 113782. https://doi.org/10.1016/j.socscimed.2021.113782

Präg, P., & Mills, M. C. (2017). Cultural determinants influence assisted reproduction usage in Europe more than economic and demographic factors. *Human Reproduction, 32*(11), 2305–2314. https://doi.org/10.1093/humrep/dex298

Razum, O., Zeeb, H., & Rohrmann, S. (2000). The "healthy migrant effect" - not merely a fallacy of inaccurate denominator figures. *International Journal of Epidemiology, 29*(1), 191–192. https://doi.org/10.1093/ije/29.1.191

Saarela, J., & Wilson, B. (2022). Forced migration and the childbearing of women and men: A disruption of the tempo and quantum of fertility? *Demography, 59*(2), 707–729. https://doi.org/10.1215/00703370-9828869

Seifer, D. B., Sharara, F. I., & Jain, T. (2022). The disparities in ART (DART) hypothesis of racial and ethnic disparities in access and outcomes of IVF treatment in the USA. *Reproductive Sciences, 29*(7), 2084–2088. https://doi.org/10.1007/s43032-022-00888-0

Sluzki, C. E. (1979). Migration and family conflict. *Family Process, 18*(4), 379–390. https://doi.org/10.1111/j.1545-5300.1979.00379.x

Sobotka, T. (2008). Overview Chapter 7: The rising importance of migrants for childbearing in Europe. *Demographic Research*, 19, 225–248. www.jstor.org/stable/26349250

Trappolini, E., & Giudici, C. (2021). Gendering health differences between nonmigrants and migrants by duration of stay in Italy. *Demographic Research, 45*, 221–258. https://doi.org/10.4054/DemRes.2021.45.7

Väisänen, H., Remes, H., & Martikainen, P. (2022). Perinatal health among migrant women: A longitudinal register study in Finland 2000-17. *SSM - Population Health, 20*, 101298. https://doi.org/10.1016/j.ssmph.2022.101298

van Rooij, F., & Korfker, D. (2009). Infertile Turkish and Moroccan minority groups in the Netherlands: Patients' views on problems within infertility care. In L. Culley, N. Hudson, & F. van Rooij (Eds.), *Marginalized reproduction. Ethnicity, infertility and reproductive technologies* (pp. 134–150). Routledge.

Vanderlinden, L. K. (2011). Treating ethnic others: Cultural sensitivity and minority stereotypes at a German fertility clinic. *Human Organization, 70*(3), 253–264.

Vertovec, S. (2007). Super-diversity and its implications. *Ethnic and Racial Studies, 30*(6), 1024–1054. https://doi.org/10.1080/01419870701599465

Wilson, B. (2019). The intergenerational assimilation of completed fertility: Comparing the convergence of different origin groups. *International Migration Review, 53*(2), 429–457. https://doi.org/10.1177/0197918318769047

Wolf, K. (2016). Marriage migration versus family reunification: How does the marriage and migration history affect the timing of first and second childbirth among Turkish immigrants in Germany? *European Journal of Population, 32*(5), 731–759. https://doi.org/10.1007/s10680-016-9402-4

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). MIT Press.

Zegers-Hochschild, F., Adamson, G. D., Dyer, S., Racowsky, C., De Mouzon, J., Sokol, R., Rienzi, L., Sunde, A., Schmidt, L., Cooke, I. D., Simpson, J. L., & Van Der Poel, S. (2017). The international glossary

on infertility and fertility care, 2017. *Human Reproduction, 32*(9), 1786–1801. https://doi.org/10.1093/humrep/dex234