

# UNIVERSITÄTSKLINIKUM HAMBURG-EPPENDORF

Institut für Medizinische Biometrie und Epidemiologie

Prof. Dr. Antonia Zapf

## **Health Service Use of Migrants in Germany: Investigating the Influence of Migrant Generations, Country of Birth and Language Proficiency**

### **Dissertation**

zur Erlangung des Doktorgrades Dr. rer. biol. hum.  
an der Medizinischen Fakultät der Universität Hamburg.

vorgelegt von:

Christian Wiessner  
aus Hamburg

Hamburg 2024

**Angenommen von der  
Medizinischen Fakultät der Universität Hamburg am: 05.09.2024**

**Veröffentlicht mit Genehmigung der  
Medizinischen Fakultät der Universität Hamburg.**

**Prüfungsausschuss, der/die Vorsitzende: Prof. Dr. Heiko Becher**

**Prüfungsausschuss, zweite/r Gutachter/in: Prof. Dr. Olaf von dem Knesebeck**

I submitted my cumulative dissertation to the Medical Faculty at the University Medical Center Hamburg-Eppendorf within the Non-Medical PhD Programme.

I was supervised by Prof. Dr. Heiko Becher (University Medical Center Hamburg-Eppendorf), Prof. Dr. Dr. Martin Härter (University Medical Center Hamburg-Eppendorf) and Prof. Dr. Olaf von dem Knesebeck (University Medical Center Hamburg-Eppendorf).

My research was funded by the Bundesministerium für Bildung und Forschung (Förderkennzeichen 01ER1306, PERGOLA).

My dissertation comprises three Thesis Articles which I summarize in the synopsis:

*Thesis Article 1:* Wiessner C, Keil T, Krist L, Zeeb H, Dragano N, Schmidt B, Ahrens W, Berger K, Castell S, Fricke J, Führer A, Gastell S, Greiser H, Guo F, Jaeschke L, Jochem C, Jöckel K-H, Kaaks R, Koch-Gallenkamp L, Krause G, Kuss O, Legath N, Leitzmann M, Lieb W, Meinke-Franze C, Meisinger C, Mikolajczyk R, Obi N, Pischon T, Schipf S, Schmoor C, Schramm S, Schulze MB, Sowarka N, Waniek S, Wigmann C, Willich SN, Becher, H (2020). Personen mit Migrationshintergrund in der NAKO Gesundheitsstudie – soziodemografische Merkmale und Vergleiche mit der autochthonen deutschen Bevölkerung [Persons with migration background in the German National Cohort (NAKO)-sociodemographic characteristics and comparisons with the German autochthonous population]. Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz, 63(3), 279–289. <https://doi.org/10.1007/s00103-020-03097-9>

*Thesis Article 2:* Wiessner C, von dem Knesebeck O, Gerlich MG, Briken P, Becher H (2022). Migration and sexual health services use—Results from the German health and sexuality survey (GeSiD). Sexuality Research and Social Policy, 19(3), 1383-1394. <https://doi.org/10.1007/s13178-022-00691-1>

*Thesis Article 3:* Wiessner C, Licaj S, Klein J, Bohn B, Brand T, Castell S, Führer A, Harth V, Heier M, Heise J-K, Holleczeck B, Jaskulski S, Jochem C, Koch-Gallenkamp L, Krist L, Leitzmann M, Lieb W, Meinke-Franze C, Mikolajczyk R, Moreno Velásquez I, Obi N, Pischon T, Schipf S, Thierry S, Willich SN, Zeeb H, Becher, H (2024). Health Service Use Among Migrants in the German National Cohort – The Role of Birth Region and Language Skills. International Journal of Public Health, 69:1606377. <https://doi.org/10.3389/ijph.2024.1606377>.

In the following synopsis, the personal pronoun ‘we’ refers to the group of researchers with whom I co-published these three Thesis Articles.

## Table of Contents

List of Figures .....	5
List of Tables.....	6
List of Abbreviations.....	7
1 Summary in English and German .....	8
2 Introduction .....	10
3 Methods.....	14
3.1 Study populations.....	14
3.2 Measures of migration background.....	15
3.3 Measures of health service use.....	16
3.3.1 Utilization.....	16
3.3.2 Unmet needs.....	17
3.3.3 Knowledge .....	17
3.3.4 Satisfaction.....	17
3.3.5 Barriers .....	17
3.4 Measures of covariates .....	18
3.4.1 Predisposing characteristics .....	18
3.4.2 Enabling resources .....	18
3.4.3 Need factors.....	18
3.5 Overview of included measures .....	18
3.6 Directed acyclic graph.....	20
3.7 Statistical analysis .....	20
4 Results .....	22
4.1 Description of the study population .....	22
4.2 Main analyses .....	22
4.2.1 Utilization.....	22
4.2.2 Unmet needs.....	25
4.2.3 Knowledge .....	25
4.2.4 Satisfaction.....	26
4.2.5 Barriers .....	26
5 Discussion .....	28
6 Literature .....	33
7 List of Publications.....	40
7.1 Thesis Article 1 .....	40
7.1.1 Online Supplement Material .....	40
7.1.2 Statement of own contributions.....	40
7.2 Thesis Article 2 .....	52

7.2.1	Statement of own contributions.....	52
7.3	Thesis Article 3 .....	65
7.3.1	Online Supplement Material .....	65
7.3.2	Statement of own contributions.....	65
7.4	List of Talks and Posters related to the Thesis .....	76
7.5	Further scientific publications during the PhD .....	77
8	Acknowledgements .....	80
9	Curriculum Vitae.....	81
10	Eidesstattliche Versicherung .....	83

## List of Figures

<b>Figure 1.</b> Definition of migration background in the NAKO study .....	16
<b>Figure 2.</b> Directed acyclic graph with migration status as the exposure variable and health service use as the outcome .....	20
<b>Figure 3.</b> Barriers towards health service use due to sexual problems (in %) in the GeSiD study .....	27

## List of Tables

**Table 1.** Andersen Model of Health Service Use for the measures used in this thesis .13

**Table 2.** Overview of measures by Thesis Article .....19

**Table 3.** Adjusted Odds Ratio (OR) and Rate Ratio (RR) Estimates along with 95% Confidence Intervals (CI) for utilization, unmet needs, knowledge, and satisfaction with health services by migration group in comparison to no migration background in NAKO and GeSiD .....24

**Table 4.** Count regression model results for outpatient health service use in a period of 12 months with language skills as the exposure variable (NAKO study) .....25

**Table 5.** Multinomial regression results for the latent class outcomes based on the outpatient health service use in a period of 12 months with migration background as the exposure variable (NAKO study) .....25

## List of Abbreviations

<b>AIC</b>	Akaike information criterion
<b>AUDIT-C</b>	Alcohol Use Disorders Identification Test – Consumption
<b>BL</b>	Belarus
<b>CI</b>	Confidence interval
<b>CZ</b>	Czech Republic
<b>D</b>	Germany
<b>DAG</b>	Directed acyclic graph
<b>EU</b>	European Union
<b>GeSiD</b>	Gesundheit und Sexualität in Deutschland
<b>GP</b>	General practitioner
<b>HPV</b>	Human papillomaviruses
<b>HSU</b>	Health service use
<b>ISCED</b>	International Standard Classification of Education
<b>KZ</b>	Kazakhstan
<b>LPA</b>	Latent profile analysis
<b>MSAS</b>	Minimal sufficient adjustment set
<b>NAKO</b>	German National Cohort (NAKO Gesundheitsstudie)
<b>OR</b>	Odds ratio
<b>PHQ-9</b>	Patient Health Questionnaire-9
<b>PL</b>	Poland
<b>PmM</b>	Personen mit Migrationshintergrund
<b>PoM</b>	Personen ohne Migrationshintergrund
<b>RR</b>	Rate ratio
<b>RU</b>	Russia
<b>STI</b>	Sexually transmitted infection
<b>UKR</b>	Ukraine



# 1 Summary in English and German

**Background:** Germany has seen a substantial increase in its migrant population over recent decades, with approximately 27% of its population being migrants as of 2022. These migrants come from diverse backgrounds, with variations in their countries of origin, residence status, reasons for migrating, and language skills. Previous research has often overlooked this heterogeneity, treating migrants as a homogeneous group. This can lead to a lack of understanding of their specific patterns of health service use (HSU) and individual needs.

**Aim:** The aim of this thesis was to investigate different measures of HSU and account for the heterogeneity of migrants based on migrant generations, country of birth, and language proficiency.

**Methods:** This thesis leverages data from the German National Cohort (NAKO) and the German Health and Sexuality Survey (GeSiD), two population-based observational studies. HSU was operationalized by measures of utilization, unmet needs, knowledge about preventive services, satisfaction with utilization, and barriers to utilization, while migration background was defined by the nationality and country of birth of the participants and their parents. Statistical analyses were based on multivariable regression models with a theoretical justification of control variables based on theory and implementation through a directed acyclic graph (DAG).

**Results:** We found that first-generation migrants generally had a lower HSU compared to non-migrants, particularly when it comes to preventive services such as the Human papillomaviruses (HPV) vaccination, chlamydia test in the context of a screening program, and colorectal cancer screening. We also found that language proficiency plays a significant role in determining HSU, as those with poor language skills were less likely to utilize health services. Second-generation migrants displayed similar HSU patterns to the non-migrant population, except for a lower uptake of the HPV vaccination. Additionally, migrants reported higher unmet needs for health services in sexual health care. Barriers to access were mainly informal, including language difficulties and shame.

**Conclusion:** The findings underscore the importance of recognizing migrant diversity in health policy and service design. Strategies to improve migrant health access must prioritize overcoming informal barriers and enhancing health literacy, with special attention to the unique needs of first-generation migrants through culturally sensitive and language-inclusive interventions.

## **Zusammenfassung**

**Hintergrund:** Der Anteil an Personen mit Migrationshintergrund (PmM) ist in den vergangenen Jahren stark angestiegen und betrug 27% im Jahr 2022. PmM weisen Unterschiede in Bezug auf Herkunftsländer, Aufenthaltsstatus, Migrationsgründe und Sprachkenntnisse auf. In der bisherigen Forschung wurde diese Heterogenität häufig nicht beachtet, so dass spezifische Muster und Bedürfnisse bei der Inanspruchnahme von Gesundheitsleistungen womöglich nicht erkannt wurden.

**Ziel:** Ziel dieser Arbeit war es, verschiedene Maße für die Inanspruchnahme zu untersuchen und die Heterogenität von PmM auf der Grundlage von Migrantengenerationen, des Geburtslands und Sprachkenntnissen zu berücksichtigen.

**Methoden:** In dieser Arbeit wurden Daten aus der Nationalen Kohorte (NAKO) und der Studie Gesundheit und Sexualität in Deutschland (GeSiD), zwei bevölkerungsbasierten Beobachtungsstudien, verwendet. Die Inanspruchnahme wurde durch die Anzahl an Arztbesuchen, ungedeckte Bedarfe, Wissen über Präventionsangebote, Zufriedenheit mit Konsultationen und Barrieren gemessen. Migrationshintergrund wurde durch die Nationalität und das Geburtsland der Teilnehmer und deren Eltern definiert. Die statistischen Analysen basierten auf multivariablen Regressionsmodellen mit einer theoretischen Begründung der Kontrollvariablen und Umsetzung durch einen gerichteten azyklischen Graphen.

**Ergebnisse:** In unseren Analysen zeigten PmM der ersten Generation im Vergleich zu Personen ohne Migrationshintergrund (PoM) eine niedrigere Inanspruchnahme, insbesondere bei präventiven Leistungen wie der Human papillomavirus (HPV)-Impfung, Chlamydientests innerhalb eines Screeningprogramms und der Darmkrebsvorsorge. Sprachkenntnisse erwiesen sich als ein wichtiger Prädiktor der Inanspruchnahme, wobei schlechte Sprachkenntnisse mit einer niedrigeren Inanspruchnahme verbunden waren. PmM der zweiten Generation wiesen ähnliche Muster der Inanspruchnahme auf wie PoM, mit Ausnahme einer geringeren Nutzung der HPV-Impfung. PmM gaben einen erhöhten ungedeckten Bedarf an Gesundheitsdiensten im Bereich der sexuellen Gesundheit an, und die Barrieren für den Zugang waren hauptsächlich informeller Art, vor allem Sprachschwierigkeiten und Scham spielten eine Rolle.

**Schlussfolgerung:** Die Ergebnisse unterstreichen, wie wichtig es ist, die Vielfalt von PmM bei der Gestaltung von Gesundheitspolitik und -diensten anzuerkennen. Strategien zur Verbesserung des Zugangs von PmM zur Gesundheitsversorgung müssen sich vorrangig auf die Überwindung informeller Barrieren und die Verbesserung der Gesundheitskompetenz konzentrieren, wobei den Bedürfnissen von PmM der ersten Generation durch kultursensible und sprachliche Maßnahmen besondere Aufmerksamkeit gewidmet werden muss.

## 2 Introduction

Over the past several decades, Germany has become an increasingly diverse country of immigration. In 2022, approximately 22 million people (27% of Germany's total population of 83 million inhabitants) were first- or second-generation migrants with foreign roots [1]. This represents a substantial increase from 15 million migrants a decade ago, both in absolute numbers and population share. Several key factors underlie Germany's transformation into a leading destination country for contemporary global migration. Historically, guest worker recruitment programs from the 1950s to the 1970s brought in large numbers of migrant workers from Turkey, Southern Europe, and Mediterranean countries to fill post-war labor shortages [2]. Starting in the 1990s, ethnic German resettlers from the former Soviet Union formed a large migrant subgroup, taking advantage of laws allowing those of German ancestry to claim citizenship and resettle in Germany [3,4]. More recently, continued labor migration from other European Union (EU) countries and forced displacement due to conflicts and crises, particularly in the Middle East, have led to further diversification [5].

Germany's migrant population embodies great **diversity** across many dimensions, including reasons for migration, countries of origin, residence status, duration of residence, language proficiency, cultural identities, and varying degrees of acculturation/assimilation [6–8]. However, this diversity of migrants has often been overlooked in migrant health research, with studies treating migrants as a seemingly homogeneous group, leading several authors to argue that migrant diversity needs to be addressed [9–13].

The two largest migrant subgroups in Germany are those of Turkish descent, reflecting the legacy of Turkish guest worker programs, and ethnic German resettlers. Other major migrant populations include labor migrants from EU countries such as Poland and Romania; recently arrived refugees and asylum seekers from Syria, Afghanistan, Iraq, and other conflict zones; and migrants from Asian countries [14]. Another important source of diversity is **generational status**. First-generation migrants are individuals who were born outside of Germany, while second-generation migrants are individuals who were born in Germany to immigrant parents.

Both the classification of migrants based on their country of birth [11,15] and the generational approach [16–19] have been applied in recent studies on the relationship between migration background and health service use (HSU) in Germany. Further studies included the following characteristics: one-/two-sided migration background [20,21]; the acculturation of migrants [8]; citizenship [22,23]; mother tongue of the parents [24]; focus on specific subgroups such as

resettlers [25] or Turkish migrants [26]; and residence status [27]. However, a recent systematic review found that the majority of studies classified migration background on a binary scale, thereby disregarding the **heterogeneity of migrants** in Germany [28]. In general, persons with a migration background and a personal experience of migration tend to differ from non-migrants in their HSU, whereas second-generation migrants are more similar to the non-migrant population in Germany [18,19,28]. In addition, persons with a two-sided migration background, as well as children and women, tend to show a particularly low HSU [28].

The **HSU of migrants** depends not only on the specific subgroups compared with the non-migrant population, but also on the specific services that are investigated. A recent systematic review on HSU in Europe found a generally higher use of emergency services and higher rates of hospitalizations among migrants than among non-migrants [29]. In contrast, migrants had a lower use of specialist services and screening tests and were less likely to be vaccinated, which may be due to a lower uptake of vaccines in the country of origin and less access to vaccination in the host country [30,31]. Regarding mental and dental health services, Lebano et al. identified unmet needs for migrants in Europe [32]. Services by general practitioners (GPs) were used more frequently by migrants than non-migrants in some studies, while a comparable, and a lower use was observed as well [29]. When only German studies were considered, similar results were observed. A recent systematic review found a generally lower use of services by medical specialists, rehabilitation, and preventive services and a slightly higher use of GPs, while vaccination proportions were considerably lower among first-generation migrants [28]. However, due to the heterogeneity of migrant populations and study designs, recent systematic reviews were unable to conduct a meta-analysis for the effect of migration status on HSU [28,29,32–36].

As HSU differs between migrants and non-migrants, the question of **access** and **barriers** to HSU arises, as equitable access to health services is considered an important dimension in the performance of health systems [10]. Barriers can arise from a variety of factors and can be classified as formal or informal. Formal barriers are those that restrict access to services directly because of the cost of services, lack of health insurance, lack of referral between services, and legal entitlements that prevent access [10,33]. Informal barriers consist of a lack of cultural competence among health care providers and a failure of health systems to address diversity. Among migrants, they may be related to language barriers, lack of health literacy, lack of knowledge about the availability of services, lack of knowledge about the benefits of services,

and shame and embarrassment about certain medical conditions [29,37]. Importantly, a deeper understanding of the most relevant barriers for migrants is necessary, as they may vary depending on the migrant group and country of residence [29]. After identifying the most relevant barriers, a reduction of those is needed, as the consequences of unmet health care needs may pose a substantial burden for both the individual and the community [38].

Ideally, needs should be the primary determinant of HSU. However, there are other factors associated with health care utilization that are conceptualized in the **Andersen model of HSU** [39,40]. It distinguishes between **need factors**, **enabling resources**, and **predisposing characteristics**. While needs refer to medical conditions that directly influence HSU, enabling resources refer to the timely and financial resources that enable people to use health care services. Examples of enabling resources include having health insurance and the time to use services despite professional and personal obligations. Lastly, predisposing characteristics refer to the fact that HSU is indirectly related to HSU through certain personal characteristics [41]. These include sociodemographic variables such as sex, age, education, and migration background, as well as health beliefs. In addition, need factors, enabling resources, and predisposing characteristics can all be measured at the **individual** and **aggregate levels**, which Andersen refers to as contextual determinants [39]. Examples of contextual determinants include the medical needs of a community measured by morbidity (need factor), the availability of health services in proximity to the living place (enabling resource), and the age structure of a community (predisposing characteristic) [18,39]. Possible outcomes in the Andersen model are as follows:

- **Utilization** of different medical services, such as primary care, specialist care, hospitalizations, emergency care, rehabilitation, screening services, vaccinations, general health check-ups, dental health care, and mental health care [28,32,33,35].
- **Unmet needs** of HSU [18,42]
- **Knowledge** about and **attitudes** towards preventive services [18,43]
- **Satisfaction** with HSU [18,44]
- **Barriers** to HSU [45,46]

This thesis aims to investigate the association between migration background (exposure) and different measures of HSU (outcomes). The heterogeneity of migrants has been considered by the generational approach, by a classification based on the country of birth of first-generation

migrants, and by language proficiency of non-native migrants. The following outcomes were used as measures of HSU:

- **Utilization:** Utilization of general practitioners, medical specialists, mental health care, sexual health care, preventive services
- **Unmet needs:** Unmet needs of sexual health care
- **Knowledge:** Knowledge about prevention and testing in sexual health care
- **Satisfaction:** Satisfaction with sexual health care
- **Barriers:** Barriers to sexual health care

The theoretical basis of HSU in this thesis is presented in Table 1. Despite migration background, additional predisposing characteristics, enabling resources, and need factors were included as predictors of HSU.

**Table 1.** Andersen Model of Health Service Use for the measures used in this thesis

<b>Predictors of Health Service Use</b>				
<i>Predisposing characteristics</i>	<i>Enabling resources</i>	<i>Need factors</i>		
Migration background (Migrant generation, Birth country, Language proficiency) Sex Age Education Relationship status Alcohol consumption	Place of residence (urban/rural or study center)	Current general health status Lifetime diagnosis of diseases Depression		
<b>Outcomes of Health Service Use</b>				
<i>Utilization</i>	<i>Unmet needs</i>	<i>Knowledge</i>	<i>Satisfaction</i>	<i>Barriers</i>
General practitioners Medical specialists Mental health care Colorectal cancer screening Sexual health care HPV vaccination Chlamydia test	Unmet needs of sexual health care	Knowledge about prevention and testing in sexual health care	Satisfaction with sexual health care	Barriers of sexual health care

The relevance of these predictors depends on the research question. For the investigation of mental health care, depression was a relevant predictor, whereas for sexual health care, relationship status was included in the model. This thesis summarizes the work of three

underlying articles. *Thesis Article 1* focused on the definition of migration background and the possibilities to consider the heterogeneity of migrants, while *Thesis Article 2* investigated the utilization, satisfaction, knowledge about services, barriers, and unmet needs of first- and second-generation migrants in relation to sexual health care. *Thesis Article 3* classified migrants based on their country of birth and examined their use of GPs, medical specialists, and mental health services.

## 3 Methods

### 3.1 Study populations

Investigation of the research questions relied on data from population-based studies. These were (i) the German National Cohort (NAKO), a population-based cohort study [47], and (ii) the German Health and Sexuality Survey (GeSiD), a nationwide population-based cross-sectional survey [48].

The **NAKO** randomly selected participants from population registers at 18 study centers in urban and rural areas in Germany. Baseline data were collected between 2014 and 2019, and we used questionnaire data from computer-assisted face-to-face interviews and self-administered questions. In total, 205,415 participants were recruited for the baseline examination. The age range was 19 to 74 years, and the only inclusion criterion was a sufficient knowledge of the German language [47]. For *Thesis Article 1*, data from the first half of the participants (101,816 individuals) could be used [11], while for *Thesis Article 3*, data from all participants were available [49]. High data quality was targeted by a pretest before data collection and extensive data quality checks with subsequent data cleaning [50]. The response proportion was 17% and varied between 9% and 32% for the different study centers [47].

The **GeSiD** study was conducted in 2018 and 2019, and participants were recruited from 200 sample points across Germany. Sampling was designed as a two-stage process, in which these sample points were selected and spread across 178 municipalities. The population registers were then asked to draw a random sample of participants. A total of 4,955 individuals between 18 and 75 years of age were recruited, with an oversampling of adults aged 18 to 35 years. The overall response proportion was 30%. As an incentive, respondents received 30€ for participating in the study. The interviews were conducted in the participants' homes and lasted approximately 50 minutes on average. Due to sensitive topics regarding sexuality, the interviews were mainly conducted as computer-assisted self-interviews. Questions that were

not considered sensitive were posed using computer-assisted personal interviews [48]. *Thesis Article 2* was based on GeSiD data [18].

### 3.2 Measures of migration background

The classification of migration background was based on the definition of the German Federal Statistical Office [51]. A person is considered to have a migration background if the person itself or at least one parent did not have German **nationality at birth**. This definition includes five different groups of persons:

- (1) Immigrant and non-immigrant foreigners
- (2) Immigrant and non-immigrant naturalized persons
- (3) Resettlers
- (4) Persons who have acquired German citizenship through adoption by a German parent
- (5) Children of the four aforementioned groups

In the NAKO, groups 1-3 and 5 were classified using questions about the nationality of the participant and the country of birth of the participant and his or her parents [11] (Figure 1). Adoption was not part of the NAKO questionnaire, therefore group 4 could not be identified in the NAKO. Non-migrants were identified as participants with a German nationality, and Germany as the country of birth of the participant and both parents. In addition, expellees and descendants of expellees were identified, as well as non-migrants who were born as Germans in a foreign country. A further distinction of subgroups of migrants was based on generational status, country of birth, and language proficiency. Categorization by country of birth was based on the UN definition of different regions of origin [52]. Participants who were non-native German speakers were asked about their German language skills, which ranged from very good to very bad.

In GeSiD, questions about nationality at birth and the country of birth of the participant and both parents were used to assign the migration status [18]. If the participant or at least one parent did not have German citizenship at birth, they were classified as migrants. Subgroups were created based on generational status.



**Figure 1.** Definition of migration background in the NAKO study

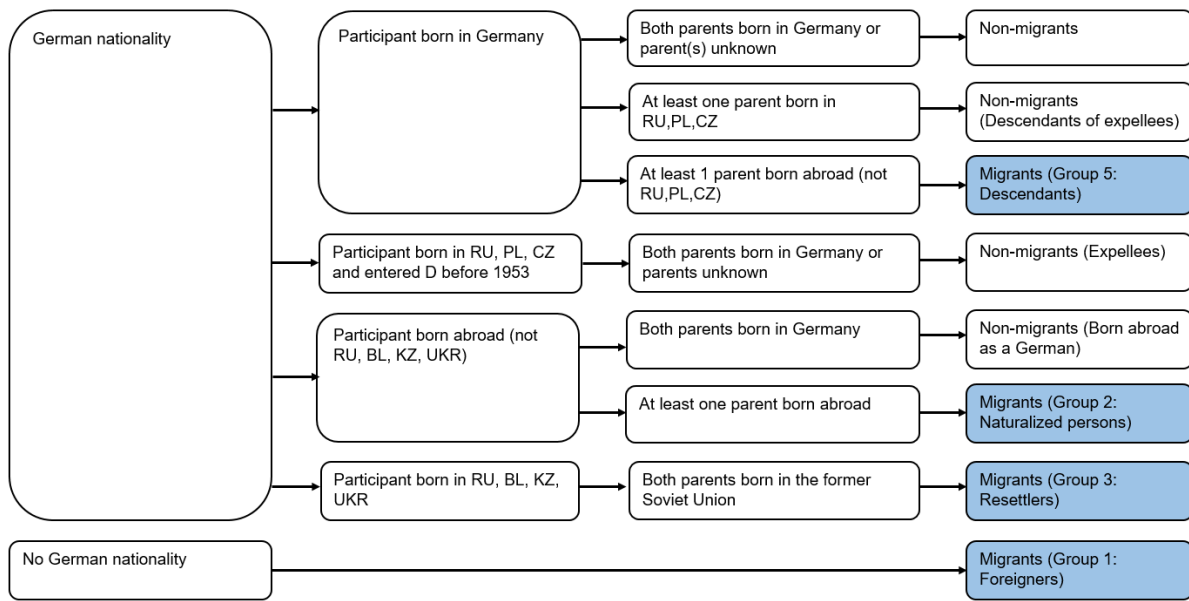


Illustration based on [53]. BL=Belarus, CZ=Czech Republic, D=Germany, KZ=Kazakhstan, PL=Poland, RU=Russia, UKR= Ukraine

### 3.3 Measures of health service use

Different measures of HSU were used as the outcome variables. They were divided into the five categories utilization, unmet needs, knowledge about services, satisfaction with services, and barriers to HSU.

#### 3.3.1 Utilization

Utilization of services from different health professionals was measured as reported by the study participants. The self-reported number of visits to GPs, medical specialists, and psychologists/psychiatrists in the past 12 months was recorded. The number of visits to medical specialists was calculated as the sum of visits to internists, radiologists, neurologists, dermatologists, urologists, orthopedists, otolaryngologists, and ophthalmologists [49].

Regarding sexual health care, self-reported visits due to sexual problems in the past 5 years were recorded. Sexual problems encompassed reduced sexual desire, problems in reaching an orgasm, reduced reactions to sexual stimuli (women only), pain during sex (women only), premature ejaculation (men only), and problems in getting an erection (men only) [54]. In addition, participants were asked whether they had ever used services from health professionals for sexual problems in the relationship, HIV or other sexually transmitted infections (STIs), and contraceptives with the three categories ‘use’, ‘no use, but an unmet need’, ‘both no use and no need’ [18].

As preventive services, the use of colorectal cancer screening (hemocult test) in the past 5 years, a vaccination against human papillomaviruses (HPV), and the use of a chlamydia test in the context of a screening program for young women were considered [11,18]. The analysis for the use of colorectal cancer screening was restricted to participants aged 50 years and older, because this screening method is recommended and covered by health insurance from this age onwards [11]. For the HPV vaccination and the chlamydia test, women aged 18 to 35 years were asked about their use, as these services have only been recommended since 2007 (HPV vaccination, [55]) and 2008 (Chlamydia screening program, [56]), respectively.

### **3.3.2 Unmet needs**

In the aforementioned questions about sexual problems in the relationship, HIV or other STIs, and contraceptives, participants indicated an unmet need by reporting that they never used these services but would have liked to. These individuals were compared with those who had never used these services and had no need.

### **3.3.3 Knowledge**

Awareness about the two sexual prevention measures, HPV vaccination between the ages of 9 and 14 years and a yearly free-of-charge chlamydia test in the context of a screening program, was investigated in women aged 18 to 35 years.

### **3.3.4 Satisfaction**

For HSU due to sexual problems, participants who sought help from a health professional were asked about their satisfaction with the consultation. Satisfaction was rated on a 5-point scale ranging from very satisfied to very dissatisfied. This scale was dichotomized into a high level of satisfaction (very satisfied, quite satisfied) vs. a low level of satisfaction (neither satisfied nor dissatisfied, quite dissatisfied, very dissatisfied).

### **3.3.5 Barriers**

Participants who reported an unmet need for HSU due to sexual problems, but who did not seek medical help, were asked about the reasons that influenced their decision not to seek help. Eleven options were given that were e.g. related to language problems ('I couldn't talk about my problem'), shame ('I found it embarrassing'), partner preferences ('My partner didn't approve'), negative experiences ('I had previously had negative experiences or been disappointed the last time I sought help'), and the services in the community ('There were no such services offered where I live').

### **3.4 Measures of covariates**

Variables that are related to HSU were classified into predisposing characteristics, enabling resources, and need factors based on the Andersen model of HSU [39,40].

#### **3.4.1 Predisposing characteristics**

Age and sex were recorded in both NAKO and GeSiD based on information from population registers. In the NAKO, education was categorized into low (International Standard Classification of Education (ISCED) level 1/2), medium (ISCED level 3/4), high (ISCED level 5/6), and still in education based on the ISCED-97 classification. A similar categorization was used in GeSiD, with the exception that still in education was classified as low education. Further predisposing characteristics for HSU were relationship status as a dichotomous indicator of the presence/absence of a relationship [18], and alcohol consumption as measured by the Alcohol Use Disorders Identification Test – Consumption (AUDIT-C), which indicates the presence or absence of risky alcohol consumption. Values above 4 (men) and 3 (women) were considered a risky alcohol consumption [58].

#### **3.4.2 Enabling resources**

Enabling resources were measured at the aggregate level. In GeSiD, the residence of participants was recorded and categorized into rural (living in a settlement of up to 5,000 inhabitants) and urban (living in a settlement of more than 5,000 inhabitants). In the NAKO, the study center was used as a proxy for place of residence.

#### **3.4.3 Need factors**

Need factors for the utilization of services by different physicians were assessed using the self-reported lifetime prevalence of a medically diagnosed disease. In total, 46 diseases were evaluated and the total number of lifetime diseases was calculated [49]. In addition, the current self-reported general health status was recorded (categories excellent, very good, good, not good, bad). For the utilization of services by psychologists/psychiatrists, the Patient Health Questionnaire (PHQ)-9 sum score was used as a measure of depression [59].

### **3.5 Overview of included measures**

Table 2 provides an overview of the measures included in the different Thesis Articles.

**Table 2.** Overview of measures by Thesis Article

	Thesis Article 1	Thesis Article 2	Thesis Article 3
Data source	NAKO	GeSiD	NAKO
<b>Migration background</b>			
Generational status	Yes	Yes	Yes
Birth country	Yes	Only descriptively	Yes
Language skills	No	No	Yes
<b>Health service use</b>			
Utilization	Colorectal cancer screening	Sexual health care, Vaccination against HPV, Chlamydia test	General practitioners, Medical specialists, Psychologists/psychiatrists
Unmet needs	No	Unmet needs regarding sexual health care	No
Knowledge	No	Knowledge about vaccination against HPV and chlamydia test	No
Satisfaction	No	Satisfaction with use of services due to sexual problems	No
Barriers	No	Barriers of health service use due to sexual problems	No
<b>Covariates</b>			
Predisposing characteristics	Age, Sex, Education	Age, Sex, Education, Relationship status	Age, Sex, Education, Alcohol Consumption
Enabling resources	Study center	Urban/rural residence	Study center
Need factors	No	General health status	General health status, Number of lifetime diseases, PHQ-9 sum score

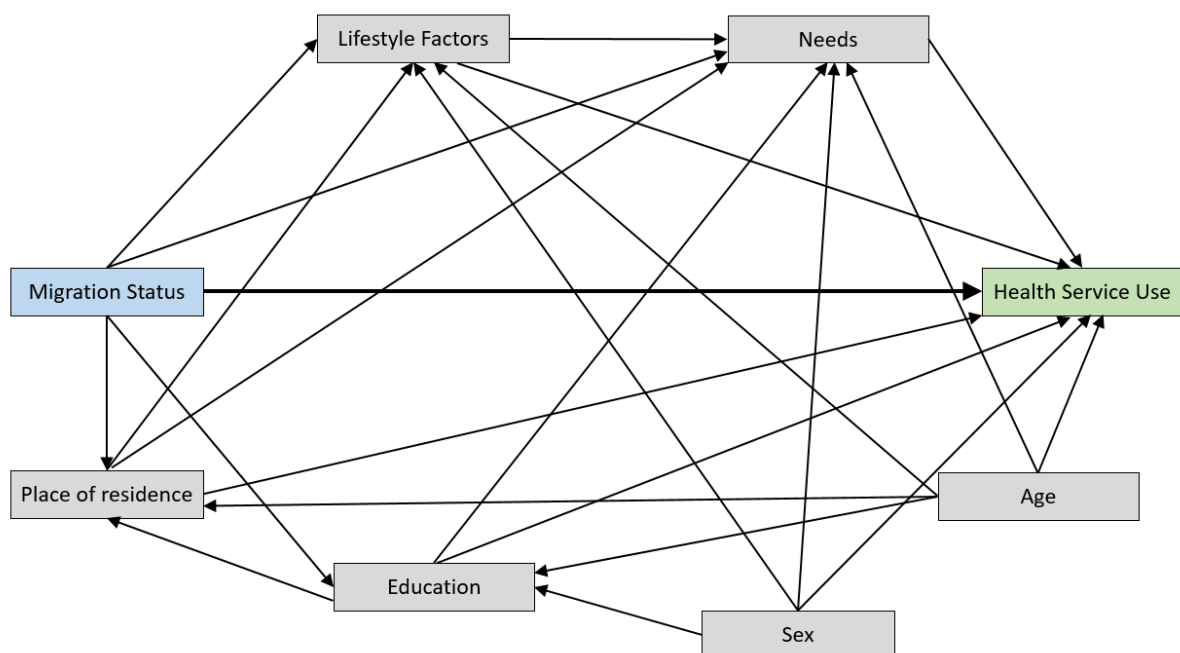
HPV= Human papillomaviruses

PHQ-9= Patient Health Questionnaire-9

### 3.6 Directed acyclic graph

A directed acyclic graph (DAG) was created to represent the hypothesized relationships between migration status (the exposure variable), HSU (the outcome variables), and relevant covariates (Figure 2). The DAG was created by combining two existing DAGs from the *www.causaldiagrams.org* database that had similar exposure and outcome variables [60,61]. Additional assumptions about the data-generating mechanism were then incorporated based on subject matter knowledge. The web application dagitty [62] was used to draw and edit the final DAG, which aimed to accurately reflect the hypothesized causal structure linking migration status, health care utilization, and related covariates. In this thesis, it is not possible to justify every arrow between any pair of variables. However, the stronger assumption is that there is no effect between two variables. Therefore, the assumptions in the DAG are mainly encoded in the missing arrows [63].

**Figure 2.** Directed acyclic graph with migration status as the exposure variable and health service use as the outcome



### 3.7 Statistical analysis

In the NAKO, extensive data quality checks were performed according to the principles of good epidemiological practice [64]. Descriptive analyses of migrants in the NAKO were conducted based on age, sex, education, time since arrival, country of origin, and generational status [11,49]. Multivariable regression models were fitted. For count outcomes, these were count regression models (number of visits to GPs, medical specialists, and

psychologists/psychiatrists) and a logistic regression model for a binary outcome (use of the hemocult test). Variable selection was based on the DAG and subject matter knowledge. In Thesis Article 3, the aim was to estimate the direct effect of migration background on HSU by controlling for confounding and mediating variables. The minimal sufficient adjustment set (MSAS) contained the following variables:

- Predisposing characteristics: Sex, Age, Education, Alcohol consumption
- Enabling resources: Study center
- Need factors: Total number of diseases (lifetime), PHQ-9 sum score, General health status

Migration status was modeled by (i) a dichotomous exposure migrant vs. non-migrant, (ii) specific groups of interest (Resettlers, Turkish migrants, Other migrants, Non-migrants), (iii) and regions of origin based on the definition of the United Nations [52].

In addition, we aimed to identify different patterns of HSU based on the participants' responses regarding their use of services from GPs, medical specialists, and psychologists/psychiatrists in the past 12 months. We proposed that these items enable the estimation of the propensity to use health services through a latent profile analysis (LPA). The relationship between an exposure (migration background) and the latent profiles of an outcome (HSU) is in the literature most commonly determined using a three-step procedure [65]. First, the optimal number of latent classes was determined by evaluating model fit indices, specifically the Akaike Information Criterion (AIC), and considering model parsimony. Subsequently, individuals were assigned to the profile for which they had the highest estimated probability of membership based on their response patterns (modal assignment). Putative profile names were derived to describe each class. Finally, migration background and the MSAS were included as predictors in a multinomial regression model to estimate the direct effect of migration status on membership in a given latent class. This general procedure of using latent profile analysis to identify HSU patterns and relate them to predictors is consistent with previous research by Xia et al. [66].

The GeSiD study aimed at being a representative sample of the German population [48]. Therefore, survey analyses were performed to account for the sampling process and non-response. Weights were applied to account for the oversampling of younger participants and the varying non-response proportions due to sociodemographic characteristics of the participants (by sex, age, education, and nationality) and place of residence. A crude analysis of the different outcomes stratified by migration status (generational approach) and multivariable logistic regression analyses were performed. The models were adjusted for

similar variables as in the NAKO (sex, age, education, relationship status, urban/rural residence, and general health status). For group comparisons of categorical variables, the chi-square test for survey samples was used (Rao-Scott-Test, [67]).

For all analyses, we reported effect estimates with 95% confidence intervals (CIs). These were adjusted odds ratios (ORs) for the categorical outcome variables and adjusted rate ratios (RRs) for count outcomes (number of visits to GPs, medical specialists, and psychologists/psychiatrists). Because missing values occurred mainly in the outcome variables, we conducted complete case analyses. Analyses were carried out with the statistical software SAS, Stata, and R. For statistical tests, the significance level was set to 0.05.

## **4 Results**

### **4.1 Description of the study population**

The proportion of migrants differed between the NAKO and the GeSiD study. While 17.1% of the study population had a migration background in the NAKO (12.0% first-generation migrants, 5.1% second-generation migrants), 22.7% of the participants in GeSiD were migrants (12.9% first-generation migrants, 9.8% second-generation migrants). With the weighting scheme applied in GeSiD, these numbers were up-weighted to 25.7% of the study population with a migration background (15.9% first-generation migrants, 9.8% second-generation migrants), which is close to the proportion of migrants in the general population [1]. In the NAKO, the sample size allowed the study of subgroups of first-generation migrants based on region of birth. Migrants from Eastern Europe formed the largest subgroup with 6992 participants (3.4%). Migrants from Western countries (n=5342; 2.6%), resettlers (n=3582; 1.8%), and Turkish migrants (n=3161; 1.5%) were further subgroups. Migrants from other regions of birth (n=5486; 2.7%) were classified into a diverse group of other migrants.

### **4.2 Main analyses**

Tables 3, 4 and 5 summarize the results of the three Thesis Articles [11,18,49]. The adjusted rate ratios (RRs) and adjusted odds ratios (ORs) are displayed with 95% confidence intervals (CIs).

#### **4.2.1 Utilization**

The HSU of first-generation migrants was generally lower than that of non-migrants. Specifically, first-generation migrants had a low use of the HPV vaccination (OR=0.24, 95% CI 0.14-0.38), chlamydia test (OR=0.21, 95% CI 0.11-0.39), and consultations regarding contraceptives among women (OR=0.40, 95% CI 0.28-0.58). Looking at subgroups by region

of birth, migrants from Eastern Europe, from a diverse set of non-Western countries, from Turkey, and resettlers showed a lower use of services by psychologists/psychiatrists than non-migrants. In addition, the two large subgroups of resettlers (OR=0.60, 95% CI 0.50-0.71) and Turkish migrants (OR=0.67, 95% CI 0.51-0.86) had a lower use of colorectal cancer screening than non-migrants. In contrast, for the services of GPs and medical specialists, little or no differences were observed between first-generation migrants and non-migrants. For second-generation migrants, no differences were observed in their HSU compared to non-migrants, except for the HPV vaccination, where a comparatively lower proportion of second-generation migrants were vaccinated (OR=0.48, 95% CI 0.30-0.76).

Language skills were strongly associated with the use of psychologists/psychiatrists, slightly associated with the use of medical specialists, and not with the use of GPs. Migrants with bad language skills were least likely to use health services compared to migrants with very good language skills (Psychologists/Psychiatrists: RR=0.29, 95% CI 0.11-0.74; Medical specialists: RR=0.83, 95% CI 0.70-0.99; General practitioner: RR=0.95, 95% CI 0.81-1.11; Table 4).

#### **4.2.1.1 Latent profile analysis for utilization groups**

For the use of GPs, medical specialists, and psychologists/psychiatrists, we identified three groups of users by the LPA:

- Low users (n=108,492; 73.0%)
- Medium users (n=34,644; 23.3%)
- High users, especially GPs (n=5409; 3.6%)

All migrant subgroups had similar probabilities of belonging to each of the user groups, and no differences were found between migrants and non-migrants (Table 5).



**Table 3.** Adjusted Odds Ratio (OR) and Rate Ratio (RR) Estimates along with 95% Confidence Intervals (CI) for utilization, unmet needs, knowledge, and satisfaction with health services by migration group in comparison to no migration background in NAKO and GeSiD

Migration group							
	First-generation migrants	Second-generation migrants	Western migrants	Eastern European migrants	Resettlers	Turkish migrants	Other migrants
<b>Utilization: Consultation</b>							
GPs RR (95% CI)		0.99 (0.97-1.01)	1.04 (1.00-1.07)	1.04 (1.01-1.07)	1.05 (1.00-1.09)	1.03 (0.98-1.08)	0.98 (0.94-1.02)
Medical Specialists RR (95% CI)		1.01 (0.99-1.03)	1.00 (0.97-1.04)	1.06 (1.02-1.09)	1.06 (1.01-1.11)	1.12 (1.07-1.19)	1.09 (1.04-1.14)
Psychologists/ Psychiatrists RR (95% CI)		1.07 (0.95-1.20)	1.03 (0.87-1.23)	0.71 (0.60-0.84)	0.62 (0.47-0.81)	0.59 (0.46-0.74)	0.63 (0.50-0.79)
Colorectal cancer screening OR (95% CI)		0.99 (0.91-1.08)			0.60 (0.50-0.71)	0.67 (0.51-0.86)	
HPV vaccination OR (95% CI)	0.24 (0.14-0.38)	0.48 (0.30-0.76)					
Chlamydia test OR (95% CI)	0.21 (0.11-0.39)	0.73 (0.42-1.27)					
Sexual problems OR (95% CI)	0.65 (0.39-1.09)	1.01 (0.65-1.56)					
<b>Utilization: Communication</b>							
HIV or other STIs OR (95% CI)	0.90 (0.67-1.22)	1.00 (0.76-1.33)					
Sexual problems in relationship OR (95% CI)	1.27 (0.92-1.74)	1.24 (0.90-1.71)					
Contraceptives (male) OR (95% CI)	1.08 (0.72-1.61)	1.25 (0.80-1.96)					
Contraceptives (female) OR (95% CI)	0.40 (0.28-0.58)	0.85 (0.57-1.27)					
<b>Unmet needs</b>							
HIV or other STIs OR (95% CI)	1.16 (0.89-1.51)	1.32 (0.97-1.81)					
Sexual problems in relationship OR (95% CI)	2.15 (1.64-2.83)	1.38 (1.00-1.90)					
Contraceptives (male) OR (95% CI)	1.19 (0.73-1.95)	1.54 (0.87-2.72)					
Contraceptives (female) OR (95% CI)	1.46 (0.75-2.83)	2.59 (1.29-5.18)					
<b>Knowledge</b>							
HPV vaccination OR (95% CI)	0.23 (0.17-0.31)	0.90 (0.56-1.45)					
Chlamydia test OR (95% CI)	0.35 (0.24-0.50)	0.68 (0.44-1.04)					
<b>Satisfaction</b>							
Consultation due to sexual problems OR (95% CI)	0.52 (0.20-1.37)	0.59 (0.27-1.30)					

GP=General practitioner, HPV=Human papillomaviruses, STIs=Sexually transmitted infections. Reference category for binary variables: No use/unmet need/knowledge/satisfaction

**Table 4.** Count regression model results for outpatient health service use in a period of 12 months with language skills as the exposure variable (NAKO study)

Language skills	General practitioner (n=7,588)		Medical specialists (n=7,590)		Psychologists/ psychiatrists (n=7,555)	
	Adjusted RR <sup>1</sup>	95% CI	Adjusted RR <sup>1</sup>	95% CI	Adjusted RR <sup>1</sup>	95% CI
Good	1.02	0.97–1.07	0.94	0.89–0.99	0.83	0.64–1.07
Medium	1.00	0.94–1.06	1.00	0.93–1.07	0.56	0.39–0.81
Bad	0.95	0.81–1.11	0.83	0.70–0.99	0.29	0.11–0.74

<sup>1</sup>: Adjusted rate ratios are adjusted for age, sex, education, alcohol consumption, number of lifetime diseases, general health status, PHQ-9 sum score, and study center. Reference category: Very good German language skills

**Table 5.** Multinomial regression results for the latent class outcomes based on the outpatient health service use in a period of 12 months with migration background as the exposure variable (NAKO study)

	Medium users <sup>1</sup>		High users (especially GPs) <sup>1</sup>	
	Adjusted OR <sup>2</sup>	95% CI	Adjusted OR <sup>2</sup>	95% CI
Second-generation migrants	1.03	0.97–1.10	0.94	0.82–1.08
Western migrants	1.09	0.99–1.20	1.13	0.91–1.40
Eastern European migrants	1.01	0.92–1.09	1.16	0.97–1.38
Resettlers	1.06	0.93–1.20	0.92	0.69–1.23
Turkish migrants	1.00	0.88–1.15	1.15	0.88–1.50
Other migrants	1.04	0.92–1.16	0.97	0.74–1.28

<sup>1</sup>: Reference category outcome: Low users

<sup>2</sup>: Odds ratios are adjusted for age, sex, education, alcohol consumption, number of lifetime diseases, general health status, PHQ-9 sum score, and study center. Reference category: Non-migrants

OR= Odds ratio

GP= General practitioner

#### 4.2.2 Unmet needs

Migrants had higher unmet needs for sexual health care than non-migrants. First-generation migrants had a particularly high unmet need for consultations about sexual problems in the relationship (OR=2.15, 95% CI 1.64-2.83), while second-generation migrant women expressed a comparatively high unmet need for consultations about contraceptives (OR=2.59, 95% CI 1.29-5.18) (Table 3).

#### 4.2.3 Knowledge

First-generation migrant women (aged 18 to 35 years) had less knowledge about preventive sexual health services. Both the HPV vaccination and the possibility of a yearly chlamydia test in the context of a screening program were less known among first-generation migrant women

(HPV vaccination: OR=0.23, 95% CI 0.17-0.31; Chlamydia test: OR=0.35, 95% CI 0.24-0.50). In contrast, knowledge of both preventive measures among second-generation migrant women was comparable to that of non-migrant women (Table 3).

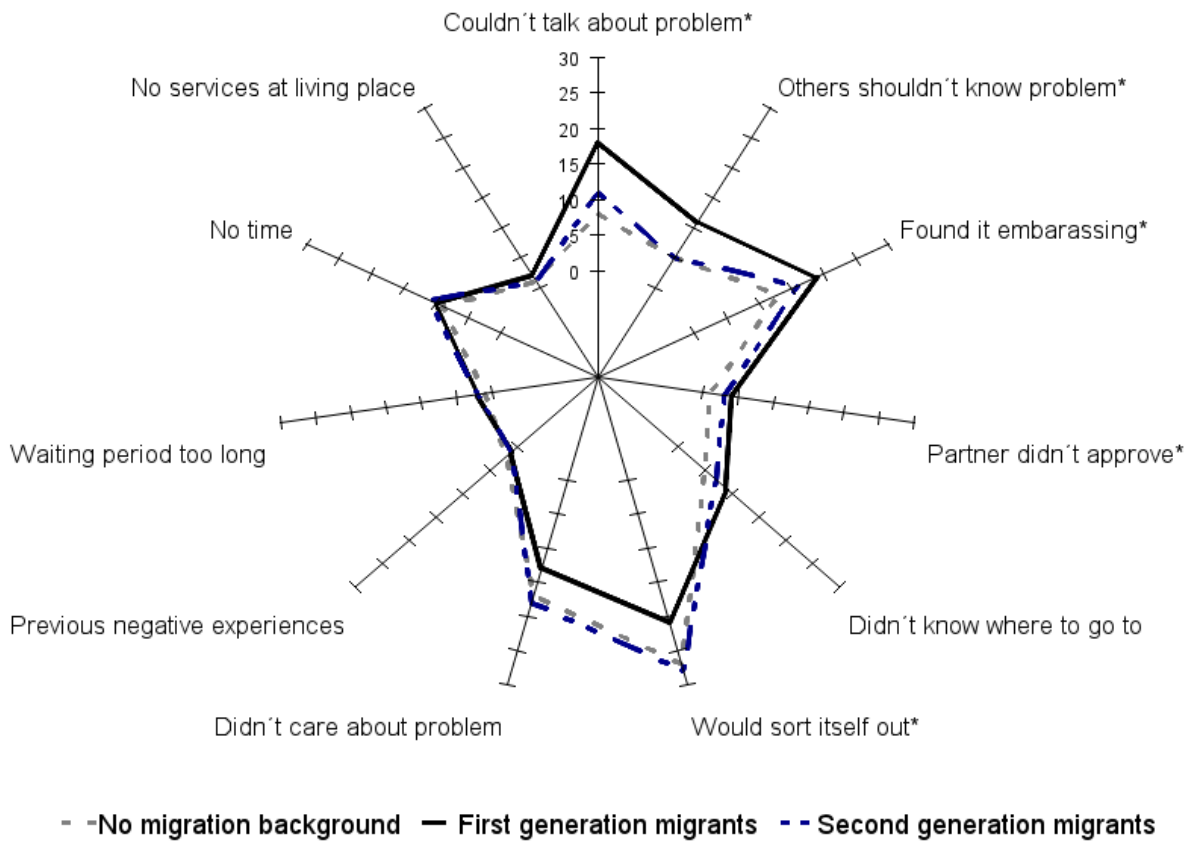
#### **4.2.4 Satisfaction**

Satisfaction with HSU was measured in the subpopulation of persons who used services due to sexual problems. Here, both first-generation (59.1% satisfied) and second-generation migrants (61.4% satisfied) reported a lower satisfaction with services than non-migrants (74.6% satisfied). However, the confidence interval for the effect estimate covered a null effect (First-generation migrants: OR=0.52, 95% CI 0.20-1.37; Second-generation migrants: OR=0.59, 95% CI 0.27-1.30) (Table 3).

#### **4.2.5 Barriers**

Barriers towards HSU were measured among persons who reported a sexual problem but did not use health services related to that problem. For many barriers, a gradient was apparent between first-generation migrants, second-generation migrants and non-migrants. Among migrants, reasons related to language problems, shame, and lack of partner approval were more common than among non-migrants, with first-generation migrants showing the highest proportions, followed by second-generation migrants and non-migrants. In contrast, fewer first-generation migrants reported not seeking medical advice because of the expectation that the problem will sort itself out. Reasons related to waiting times, services at the place of residence, and knowledge about access did not differ between migrants and non-migrants. Interestingly, reasons related to discrimination, such as previous negative experiences, were not barriers to sexual HSU (Figure 3).

**Figure 3.** Barriers towards health service use due to sexual problems (in %) in the GeSiD study



\*: Answers marked with an asterisk (\*) differed between at least two groups.

## **5 Discussion**

### **Summary**

The results of all the studies included in this thesis confirm that the use of health services differs between migrants and non-migrants. As hypothesized, the results varied depending on the specific migrant subgroup and health service under investigation. First-generation migrants had a substantially lower use of services provided by psychologists/psychiatrists and preventive services, such as a chlamydia test in the context of a screening program, HPV vaccination, and the hemocult test. Two subgroups that showed a particularly low use of these services were Turkish migrants and resettlers. In contrast, second-generation migrants utilized health services in a comparable manner as non-migrants, except for a lower utilization of the HPV vaccination. For first-generation migrants, the low use of preventive services was in accordance with a low level of knowledge about these services, while second-generation migrants had similar levels of knowledge as non-migrants. Thus, there have to be other reasons for the lower uptake, such as a lower acceptance of the HPV vaccination/vaccinations in general or barriers to accessing these services. However, we did not explicitly investigate the barriers towards the HPV vaccination, but the barriers to the use of services due to sexual problems. Specifically, first-generation migrants expressed that they did not use services despite a perceived need due to language barriers and feelings of shame. Generally, both first- and second-generation migrants reported higher unmet needs for services related to sexual health. First-generation migrants had comparatively high unmet needs for consultations about sexual problems in the relationship, while second-generation migrant women had high unmet needs for counseling about contraception. In addition, we found an indication of a lower satisfaction with HSU among first- and second-generation migrants compared to non-migrants.

### **Comparison between studies**

In both NAKO and GeSiD, we found a generally lower use of health services among first-generation migrants. In the NAKO, we could further differentiate between regions of origin and identify Turkish migrants and resettlers as two groups with a particularly low HSU. While a categorization based on country of birth was not possible in GeSiD due to the smaller sample size, we distinguished up to 13 different regions of origin in the NAKO [11]. In both studies, we compared second-generation migrants with non-migrants and found a similar HSU, except for the HPV vaccination, which was lower among second-generation migrants in GeSiD. Additionally, we examined unmet needs, knowledge of and satisfaction with health services,

and barriers to HSU in GeSiD, while in the NAKO we explored the relationship between language skills and HSU. Overall, both studies presented a similar picture. HSU was lower among first-generation migrants, while there was little to no difference between second-generation migrants and non-migrants. Because both studies employed a population-representative sampling scheme from the general population and had similar inclusion criteria, the source population was equivalent. However, GeSiD had a higher response proportion (30.2%) than NAKO (17%). In addition, in GeSiD we utilized a weighting procedure to adjust for differences in response proportions across demographic groups and spatial characteristics. Thus, it may be assumed that the results from GeSiD are more generalizable than those from NAKO. However, in both studies questionnaires were only available in German, thereby excluding migrants with insufficient German language skills. Therefore, the lower HSU among first-generation migrants in our studies may underestimate the true difference in their HSU compared to non-migrants in the source population.

## **Comparison to the literature**

In this section, we compare our results with those reported in the literature. A few recent systematic reviews provide good comparisons for many of our findings, one being based on studies from Germany only [28], while the other reviews [29,31,32] included studies from different European countries.

**Utilization.** We found a particularly low HSU among certain migrant groups for screening (colorectal cancer screening and chlamydia test), the HPV vaccination, and mental health services. Regarding cancer screening, Klein and von dem Knesebeck found that the majority of studies in Germany (five out of seven) reported a lower use of cancer screening among migrants [16,20,25,26,28,68–70]. In our analysis, migrants of Turkish origin showed one of the lowest uses of colorectal cancer screening, while in the literature a higher use of breast cancer screening among Turkish women was reported compared to non-migrants [26]. However, this study was an exception. Graetz et al. highlight that among all health services, screenings show the clearest evidence of a lower utilization among migrants in Europe [29]. Thus, our results are consistent with the literature, and we could identify first-generation migrants, particularly Turkish migrants and resettlers, as groups with a comparatively low use of screenings in our analyses [11,18].

In our analyses, both first- and second-generation migrants had lower odds of being vaccinated against HPV. Similarly, a recent systematic review of European studies reported that the majority of studies (36 out of 39) showed lower vaccination coverage among migrants than among non-migrants [31]. In their meta-analysis, Rojas-Venegas et al. found a similar effect size for vaccinations in general (OR=0.50, 95% CI 0.37-0.66) as we found for the HPV vaccination in second-generation migrants (OR=0.48, 95% CI 0.30-0.76), while first-generation migrants had even lower vaccination proportions in our analyses (OR=0.24, 95% CI 0.14-0.38) [18,31].

The utilization of mental health services was lower in all migrant subgroups in our analyses, except for second-generation and Western migrants. While the reported risk of mental health problems is higher among migrants, several studies reported a lower use of services [32,71,72]. Therefore, our findings are consistent with the existing literature.

**Unmet needs.** We found higher unmet needs concerning services related to sexual health, especially regarding consultations about sexual problems in relationships and contraceptives among migrant women. The findings about unmet needs regarding contraceptive counseling among migrants are in accordance with the literature, as this association has been found in various countries and migrant populations [42,73,74]. Our study was the first to examine the association between migration background and unmet needs for counseling about sexual problems in relationships [18].

**Knowledge.** In our analyses, first-generation migrants demonstrated significantly lower knowledge of preventive measures compared to non-migrants. Knowledge of health services is considered a component of health literacy [75], and the health literacy of certain migrants has been reported to be lower than that of non-migrants in several European countries [76–78]. A few recent German studies investigated the health literacy of Turkish migrants and migrants from the former Soviet Union compared to non-migrants, and found no difference between these groups [79–81]. However, the data collection for migrants and non-migrants in these studies was carried out in different years, and no formal hypothesis testing was conducted. However, our analyses differ from those of Berens et al. and Klinger et al [79,80]. This difference may be partly explained by the fact that they used questionnaires in the migrants' native language, while the GeSiD questionnaire was only available in German [18,82].

**Satisfaction.** In our analyses, first- and second-generation migrants reported lower satisfaction with HSU for sexual health care. However, these results were based on small sample sizes and were not significant [18]. Similarly, migrant parents tended to be less satisfied than non-migrant parents when it came to consulting with their children [83]. On the other hand, higher satisfaction among psychiatric patients with a migration background has been reported compared to non-migrants [84]. Here, further studies are needed to investigate the association between migration background and satisfaction with HSU in sufficiently large and generalizable samples.

**Barriers.** Our analyses revealed two primary barriers to HSU among migrants: language difficulties and shame-related concerns. Thus, in our analyses, informal barriers to service use played a role, while lack of access due to legal entitlements, lack of health insurance, or enabling resources such as lack of services at the place of residence were not found to be relevant. Barriers related to shame [37,85,86] and language problems [37,87,88] were as well reported in the literature. Additionally, we did not find an indication of previous discrimination as a reason for not utilizing services [18], although discrimination experience has been reported as a barrier in the literature [85,87]. A recent systematic review found that further commonly reported barriers to HSU related to sexual health were a lack of cultural competencies among health professionals, cost and location of health care, and concerns of confidentiality [37]. For these barriers, we did not find any associations in our analyses. However, the cultural competencies of health professionals were not addressed in our questionnaire, and previous negative experiences with HSU were addressed without explicitly asking about discrimination.

### **Strengths and Limitations**

The strengths of our findings are that they are based on two large studies with a population-based sampling frame. Because of the large sample sizes, we were able to examine subgroups of migrants and account for their heterogeneity based on country of birth and language proficiency. Furthermore, we addressed a wide range of health services, from preventive services and outpatient services to HSU in the context of sexual health. Here, we could further analyze the knowledge about services, unmet needs, satisfaction with services, and barriers to HSU. This allowed us to cover different aspects of the Andersen model of HSU. We also had information on a variety of predisposing characteristics, enabling resources, and need factors for HSU.



However, our results have certain limitations. Firstly, we only captured the heterogeneity of migrants based on migration generations, regions of origin, and language skills, and did not consider other factors such as time since arrival, cultural and religious backgrounds, and acculturation processes. Secondly, our results may be biased for different reasons. Selection bias may have occurred because the response proportions were only 17% in NAKO [47] and 30% in GeSiD [48]. Additionally, an inclusion criterion for both studies was sufficient knowledge of the German language, as questionnaires were only available in German. As migrants with poor language skills are likely to face higher barriers to HSU, the differences between migrants and non-migrants that we found in our studies are probably larger in the general population. Further selection bias may have occurred due to differing numbers of missing values in the questionnaires, especially in the HSU outcomes in NAKO. Here, missing values were recorded more often for migrants than for non-migrants [11,49]. Information bias may have occurred because all our measures were self-reported and not further validated. This was probably most problematic for the reported number of visits by participants to different health professionals in the past 12 months, because it may be doubted that participants recalled the exact number of visits correctly. Regarding measurement, different time frames were another problem, as certain need factors were recorded for the entire lifetime of the participants, whereas the measures for HSU were based on the previous 12 months [49]. Finally, confounding bias may have occurred. However, we attempted to address the issue of confounding by constructing a DAG to represent the assumed underlying data-generating mechanism.

## **Conclusion**

This dissertation is based on three publications from two population-based surveys. The main contributions to the field of research on the health service use of migrants were as follows: (i) the heterogeneity of migrants should be taken into account in the analysis, (ii) two subgroups with a particularly low use of health services were Turkish migrants and resettlers, (iii) the differences between migrants and non-migrants depended on the specific health services examined (iv) a substantially lower use of mental health services and preventive services was observed for migrants compared to non-migrants, and (v) the main barriers to health service use were language problems and reasons related to shame.

## 6 Literature

- [1] Statistisches Bundesamt. Migration und Integration. Bevölkerung nach Migrationshintergrund und Geschlecht. 2022. <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Tabellen/liste-migrationshintergrund-geschlecht.html> (last access March 13, 2024).
- [2] Castles S. The Guest-Worker in Western Europe - An Obituary. *Int Migr Rev* 1986; 20:761–78. <https://doi.org/10.2307/2545735>.
- [3] Münz R, Ulrich RE, University of California. Center for German and European Studies Berkeley; 1998. Changing patterns of migration to Germany, 1945-1997.
- [4] Bundeszentrale für politische Bildung. (Spät-)Aussiedler. 2022. <https://www.bpb.de/kurz-knapp/zahlen-und-fakten/soziale-situation-in-deutschland/61643/spaet-aussiedler/> (last access March 13, 2024).
- [5] Bundesamt für Migration und Flüchtlinge. Migrationsbericht 2020 der Bundesregierung. [https://www.bamf.de/SharedDocs/Anlagen/DE/Forschung/Migrationsberichte/migration-sbericht-2020.pdf?\\_\\_blob=publicationFile&v=20](https://www.bamf.de/SharedDocs/Anlagen/DE/Forschung/Migrationsberichte/migration-sbericht-2020.pdf?__blob=publicationFile&v=20) (last access March 13, 2024).
- [6] Schiller M, Lang C, Schönwälder K, Moutselos M. Vielfalt and diversité: how local actors in France and Germany evaluate immigration and socio-cultural heterogeneity. *Comp Migr Stud* 2020; 8:48. <https://doi.org/10.1186/s40878-020-00205-1>.
- [7] Kurth B-M, Razum O. Editorial: Health monitoring should reflect population diversity. *J Health Monit* 2019; 4:3–6. <https://doi.org/10.25646/6072>.
- [8] Mikolajczyk RT, Akmatov MK, Stich H, Krämer A, Kretzschmar M. Association between acculturation and childhood vaccination coverage in migrant populations: a population based study from a rural region in Bavaria, Germany. *Int J Public Health* 2008; 53:1 80–7. <https://doi.org/10.1007/s00038-008-8002-4>.
- [9] Kajikhina K, Koschollek C, Sarma N, Bug M, Wengler A, Bozorgmehr K, et al. Recommendations for collecting and analysing migration-related determinants in public health research. *J Health Monit* 2023; 8:52–72. <https://doi.org/10.25646/11144>.
- [10] Rechel B, Mladovsky P, Ingleby D, Mackenbach JP, McKee M. Migration and health in an increasingly diverse Europe. *Lancet* 2013; 381:1235–45. [https://doi.org/10.1016/S0140-6736\(12\)62086-8](https://doi.org/10.1016/S0140-6736(12)62086-8).
- [11] Wiessner C, Keil T, Krist L, Zeeb H, Dragano N, Schmidt B, et al. Personen mit Migrationshintergrund in der NAKO Gesundheitsstudie – soziodemografische Merkmale und Vergleiche mit der autochthonen deutschen Bevölkerung. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2020; 63:279–89. <https://doi.org/10.1007/s00103-020-03097-9>.
- [12] Kao DT. Generational cohorts, age at arrival, and access to health services among Asian and Latino immigrant adults. *J Health Care Poor Underserved* 2009; 20:395–414. <https://doi.org/10.1353/hpu.0.0144>.
- [13] Rumbaut RG. Ages, Life Stages, and Generational Cohorts: Decomposing the Immigrant First and Second Generations in the United States. *Int Migr Rev* 2004; 38:1160–205. <https://doi.org/10.1111/j.1747-7379.2004.tb00232.x>.
- [14] Statistisches Bundesamt Deutschland - GENESIS-Online: Ausländerstatistik 2023. <https://www-genesis.destatis.de/genesis/online?operation=statistic&levelindex=0&levelid=1692094150667&code=12521#abreadcrumb> (last access March 13, 2024).
- [15] David M, Borde T, Brenne S, Henrich W, Breckenkamp J, Razum O. Caesarean Section Frequency among Immigrants, Second- and Third-Generation Women, and Non-Immigrants: Prospective Study in Berlin/Germany. *PLOS ONE* 2015; 10:e0127489. <https://doi.org/10.1371/journal.pone.0127489>.

- [16] Rommel A, Saß A-C, Born S, Ellert U. Die gesundheitliche Lage von Menschen mit Migrationshintergrund und die Bedeutung des sozioökonomischen Status: Erste Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1). *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2015; 58(6):543-52. <https://doi.org/10.25646/2308>.
- [17] Rommel A, Kroll LE. Individual and Regional Determinants for Physical Therapy Utilization in Germany: Multilevel Analysis of National Survey Data. *Phys Ther* 2017; 97:512–23. <https://doi.org/10.1093/ptj/pzx022>.
- [18] Wiessner C, von dem Knesebeck O, Gerlich MG, Briken P, Becher H. Migration and Sexual Health Services Use – Results from the German Health and Sexuality Survey (GeSiD). *Sex Res Soc Policy* 2022; 19:1383–94. <https://doi.org/10.1007/s13178-022-00691-1>.
- [19] Glaesmer H, Wittig U, Braehler E, Martin A, Mewes R, Rief W. Health care utilization among first and second generation immigrants and native-born Germans: a population-based study in Germany. *Int J Public Health* 2011; 56:541–8. <https://doi.org/10.1007/s00038-010-0205-9>.
- [20] Brzoska P, Abdul-Rida C. Participation in cancer screening among female migrants and non-migrants in Germany: A cross-sectional study on the role of demographic and socioeconomic factors. *Medicine* 2016; 95:e4242. <https://doi.org/10.1097/MD.00000000000004242>.
- [21] Böhmer MM, Walter D, Krause G, Müters S, Gösswald A, Wichmann O. Determinants of tetanus and seasonal influenza vaccine uptake in adults living in Germany. *Hum Vaccin* 2011; 7:1317–25. <https://doi.org/10.4161/hv.7.12.18130>.
- [22] Ritter S, Dannenmaier J, Jankowiak S, Kaluscha R, Krischak G. Implantation einer Hüft- oder Knieendoprothese und die Inanspruchnahme einer Anschlussrehabilitation. *Rehabilitation* 2018; 57:248–55. <https://doi.org/10.1055/s-0043-102135>.
- [23] Sundmacher L, Kopetsch T. Waiting times in the ambulatory sector - the case of chronically ill patients. *Int J Equity Health* 2013; 12:77. <https://doi.org/10.1186/1475-9276-12-77>.
- [24] Koller D, Mielck A. Regional and social differences concerning overweight, participation in health check-ups and vaccination. Analysis of data from a whole birth cohort of 6-year old children in a prosperous German city. *BMC Public Health* 2009; 9:43. <https://doi.org/10.1186/1471-2458-9-43>.
- [25] Aparicio ML, Döring A, Mielck A, Holle R, KORA Studiengruppe. Unterschiede zwischen Aussiedlern und der übrigen deutschen Bevölkerung bezüglich Gesundheit, Gesundheitsversorgung und Gesundheitsverhalten: eine vergleichende Analyse anhand des KORA-Surveys 2000. *Soz Präventivmed* 2005; 50:107–18. <https://doi.org/10.1007/s00038-004-3088-9>.
- [26] Berens E-M, Stahl L, Yilmaz-Aslan Y, Sauzet O, Spallek J, Razum O. Participation in breast cancer screening among women of Turkish origin in Germany - a register-based study. *BMC Womens Health* 2014; 14:24. <https://doi.org/10.1186/1472-6874-14-24>.
- [27] Wenner J, Razum O, Schenk L, Ellert U, Bozorgmehr K. Gesundheit von Kindern und Jugendlichen aus Familien mit ungesichertem Aufenthaltsstatus im Vergleich zu Kindern mit und ohne Migrationshintergrund: Auswertung der KiGGS-Daten 2003-06. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2016; 59:627–35. <https://doi.org/10.1007/s00103-016-2338-3>.
- [28] Klein J, von dem Knesebeck O. Inequalities in health care utilization among migrants and non-migrants in Germany: a systematic review. *Int J Equity Health* 2018; 17:1–10. <https://doi.org/10.1186/s12939-018-0876-z>.

- [29] Graetz V, Rechel B, Groot W, Norredam M, Pavlova M. Utilization of health care services by migrants in Europe—a systematic literature review. *Br Med Bull* 2017; 121:5–18. <https://doi.org/10.1093/bmb/ldw057>.
- [30] Mipatrini D, Stefanelli P, Severoni S, Rezza G. Vaccinations in migrants and refugees: a challenge for European health systems. A systematic review of current scientific evidence. *Pathogens and Global Health* 2017; 111:59–68. <https://doi.org/10.1080/20477724.2017.1281374>.
- [31] Rojas-Venegas M, Cano-Ibáñez N, Khan KS. Vaccination coverage among migrants: A systematic review and meta-analysis. *Semergen* 2022; 48:96–105. <https://doi.org/10.1016/j.semerg.2021.10.008>.
- [32] Lebano A, Hamed S, Bradby H, Gil-Salmerón A, Durá-Ferrandis E, Garcés-Ferrer J, et al. Migrants' and refugees' health status and healthcare in Europe: a scoping literature review. *BMC Public Health* 2020; 20:1039. <https://doi.org/10.1186/s12889-020-08749-8>.
- [33] Norredam M, Nielsen SS, Krasnik A. Migrants' utilization of somatic healthcare services in Europe - a systematic review. *Eur J Public Health* 2010; 20:555–63. <https://doi.org/10.1093/eurpub/ckp195>.
- [34] Uiters E, Devillé W, Foets M, Spreuwenberg P, Groenewegen PP. Differences between immigrant and non-immigrant groups in the use of primary medical care; a systematic review. *BMC Health Serv Res* 2009; 9:76. <https://doi.org/10.1186/1472-6963-9-76>.
- [35] Sarría-Santamera A, Hijas-Gómez AI, Carmona R, Gimeno-Feliú LA. A systematic review of the use of health services by immigrants and native populations. *Public Health Rev* 2016; 37:28. <https://doi.org/10.1186/s40985-016-0042-3>.
- [36] Crede S, Such E, Mason S. International migrants' use of emergency departments in Europe compared with non-migrants' use: a systematic review. *Eur J Public Health* 2018; 28:61–73. <https://doi.org/10.1093/eurpub/ckx057>.
- [37] Rade DA, Crawford G, Lobo R, Gray C, Brown G. Sexual Health Help-Seeking Behavior among Migrants from Sub-Saharan Africa and South East Asia living in High Income Countries: A Systematic Review. *Int J Environ Res Public Health* 2018; 15:1311. <https://doi.org/10.3390/ijerph15071311>.
- [38] Sareen J, Jagdeo A, Cox BJ, Clara I, ten Have M, Belik S-L, et al. Perceived barriers to mental health service utilization in the United States, Ontario, and the Netherlands. *Psychiatr Serv* 2007; 58:357–64. <https://doi.org/10.1176/ps.2007.58.3.357>.
- [39] Andersen RM. National Health Surveys and the Behavioral Model of Health Services Use. *Medical Care* 2008; 46:647. <https://doi.org/10.1097/MLR.0b013e31817a835d>.
- [40] Babitsch B, Gohl D, von Lengerke T. Re-revisiting Andersen's Behavioral Model of Health Services Use: a systematic review of studies from 1998–2011. *GMS Psychosoc Med* 2012; 9:Doc11. <https://doi.org/10.3205/psm000089>.
- [41] Thode N, Bergmann E, Kamtsiuris P, Kurth B-M. Einflussfaktoren auf die ambulante Inanspruchnahme in Deutschland. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2005; 48:296–306. <https://doi.org/10.1007/s00103-004-1004-3>.
- [42] Gele AA, Musse FK, Qureshi S. Unmet needs for contraception: A comparative study among Somali immigrant women in Oslo and their original population in Mogadishu, Somalia. *PLOS ONE* 2019; 14:e0220783. <https://doi.org/10.1371/journal.pone.0220783>.
- [43] Kolahdooz F, Jang SL, Corriveau A, Gotay C, Johnston N, Sharma S. Knowledge, attitudes, and behaviours towards cancer screening in indigenous populations: a systematic review. *Lancet Oncol* 2014; 15:e504–16. [https://doi.org/10.1016/S1470-2045\(14\)70508-X](https://doi.org/10.1016/S1470-2045(14)70508-X).
- [44] Anderson K, Giacco D, Bird V, Bauer M, Pfennig A, Lasalvia A, et al. Do outcomes of psychiatric hospital treatment differ for migrants and non-migrants? *Soc Psychiatry Psychiatr Epidemiol* 2021; 56:1–9. <https://doi.org/10.1007/s00127-021-02103-y>.

- [45] Aaltonen K, Miettinen J, Airio I, Martikainen JE, Saastamoinen LK, Bell JS, et al. Cost-related barriers to use of health services and prescription medicines in Finland: a cross-sectional survey. *Eur J Public Health* 2015; 25:368–72. <https://doi.org/10.1093/eurpub/cku176>.
- [46] Gazard B, Chui Z, Harber-Aschan L, MacCrimmon S, Bakolis I, Rimes K, et al. Barrier or stressor? The role of discrimination experiences in health service use. *BMC Public Health* 2018; 18:1354. <https://doi.org/10.1186/s12889-018-6267-y>.
- [47] Peters A, Greiser KH, Göttlicher S, Ahrens W, Albrecht M, Bamberg F, et al. Framework and baseline examination of the German National Cohort (NAKO). *Eur J Epidemiol* 2022; 37:1107–24. <https://doi.org/10.1007/s10654-022-00890-5>.
- [48] Matthiesen S, Pietras L, Bode H, Cholmakow-Bodechtel C, Cerwenka S, Pfister M, et al. Methodology of the German National Sex Survey – GeSiD (German Health and Sexuality Survey). *J Sex Res* 2021; 58:1008–18. <https://doi.org/10.1080/00224499.2021.1875188>.
- [49] Wiessner C, Licaj S, Klein J, Bohn B, Brand T, Castell S, et al. Health Service Use Among Migrants in the German National Cohort—The Role of Birth Region and Language Skills. *Int J Public Health* 2024; 69:1606377. <https://doi.org/10.3389/ijph.2024.1606377>.
- [50] Schipf S, Schöne G, Schmidt B, Günther K, Stübs G, Greiser KH, et al. Die Basiserhebung der NAKO Gesundheitsstudie: Teilnahme an den Untersuchungsmodulen, Qualitätssicherung und Nutzung von Sekundärdaten. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2020; 63:254–66. <https://doi.org/10.1007/s00103-020-03093-z>.
- [51] Statistisches Bundesamt. Bevölkerung und Erwerbstätigkeit. Bevölkerung mit Migrationshintergrund - Ergebnisse des Mikrozensus 2021. [https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publikationen/Downloads-Migration/migrationshintergrund-2010220217004.pdf?\\_\\_blob=publicationFile](https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publikationen/Downloads-Migration/migrationshintergrund-2010220217004.pdf?__blob=publicationFile) (last access March 13, 2024).
- [52] United Nations. Standard country or area codes for statistical use (M49) 2019. <https://unstats.un.org/unsd/methodology/m49/> (last access March 13, 2024).
- [53] Razum O, Zeeb H, Meesmann U, Schenk L, Bredehorst M, Brzoska P, et al. Migration und Gesundheit: Schwerpunktbericht der Gesundheitsberichterstattung des Bundes. Berlin: Robert-Koch-Inst; 2008. [https://edoc.rki.de/bitstream/handle/176904/3194/253bKE5YVJxo\\_28.pdf?sequence=1&isAllowed=y](https://edoc.rki.de/bitstream/handle/176904/3194/253bKE5YVJxo_28.pdf?sequence=1&isAllowed=y) (last access March 13, 2024).
- [54] Briken P, Matthiesen S, Pietras L, Wiessner C, Klein V, Reed GM, et al. Estimating the Prevalence of Sexual Dysfunction Using the New ICD-11 Guidelines. *Dtsch Arztebl Int* 2020; 117:653–8. <https://doi.org/10.3238/arztebl.2020.0653>.
- [55] Robert Koch-Institut. Impfeempfehlungen der STIKO. *Epidemiologisches Bulletin* 30/2007. [https://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2007/Ausgabenlinks/30\\_07.pdf?\\_\\_blob=publicationFile](https://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2007/Ausgabenlinks/30_07.pdf?__blob=publicationFile) (last access March 13, 2024).
- [56] Gemeinsamer Bundesausschuss. Screening auf genitale Chlamydia trachomatis-Infektionen bei Frauen 2008. [https://www.g-ba.de/downloads/40-268-533/2008-01-30-Abschluss\\_Chlamydien.pdf](https://www.g-ba.de/downloads/40-268-533/2008-01-30-Abschluss_Chlamydien.pdf) (last access March 13, 2024).
- [57] UNESCO. International Standard Classification of Education 1997. [http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-1997-en\\_0.pdf](http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-1997-en_0.pdf) (last access March 13, 2024).
- [58] Reinert DF, Allen JP. The Alcohol Use Disorders Identification Test: An Update of Research Findings. *Alcohol Clin Exp Res* 2007; 31:185–99. <https://doi.org/10.1111/j.1530-0277.2006.00295.x>.

- [59] Löwe B, Unützer J, Callahan CM, Perkins AJ, Kroenke K. Monitoring depression treatment outcomes with the patient health questionnaire-9. *Med Care* 2004; 42:1194–1201. <https://doi.org/10.1097/00005650-200412000-00006>.
- [60] Traeger AC, Hübscher M, Henschke N, Williams CM, Maher CG, Moseley GL, et al. Emotional distress drives health services overuse in patients with acute low back pain: a longitudinal observational study. *Eur Spine J* 2016; 25:2767–73. <https://doi.org/10.1007/s00586-016-4461-0>.
- [61] Campbell C, Douglas A, Williams L, Cezard G, Brewster DH, Buchanan D, et al. Are there ethnic and religious variations in uptake of bowel cancer screening? A retrospective cohort study among 1.7 million people in Scotland. *BMJ Open* 2020; 10:e037011. <https://doi.org/10.1136/bmjopen-2020-037011>.
- [62] Textor J, van der Zander B, Gilthorpe MS, Liškiewicz M, Ellison GT. Robust causal inference using directed acyclic graphs: the R package ‘dagitty’. *Int J Epidemiol* 2016; 45:1887–94. <https://doi.org/10.1093/ije/dyw341>.
- [63] Rodrigues D, Kreif N, Lawrence-Jones A, Barahona M, Mayer E. Reflection on modern methods: constructing directed acyclic graphs (DAGs) with domain experts for health services research. *Int J Epidemiol* 2022; 51:1339–48. <https://doi.org/10.1093/ije/dyac135>.
- [64] Deutsche Gesellschaft für Epidemiologie, Deutsche Gesellschaft für Medizinische Informatik Biometrie und Epidemiologie, Deutsche Gesellschaft für Sozialmedizin, Deutsche Region der Internationalen Bio-, Technologie- und, Methodenplattform für die Vernetzte Medizinische Forschung E. V, et al. Leitlinien und Empfehlungen zur Sicherung von Guter Epidemiologischer Praxis 2018. [https://www.dgepi.de/assets/Leitlinien-und-Empfehlungen/Leitlinien\\_fuer\\_Gute\\_Epidemiologische\\_Praxis\\_GEP\\_vom\\_September\\_2018.pdf](https://www.dgepi.de/assets/Leitlinien-und-Empfehlungen/Leitlinien_fuer_Gute_Epidemiologische_Praxis_GEP_vom_September_2018.pdf) (last access March 13, 2024).
- [65] Vermunt JK. Latent Class Modeling with Covariates: Two Improved Three-Step Approaches. *Political Analysis* 2010; 18:450–69. <https://doi.org/10.1093/pan/mpq025>.
- [66] Xia T, Iles R, Ross Iles, Newnam S, Lubman DI, Collie A, et al. Patterns of health service use following work-related injury and illness in Australian truck drivers: A latent class analysis. *Am J Ind Med* 2020; 63:180–7. <https://doi.org/10.1002/ajim.23072>.
- [67] Rao JNK, Scott AJ. The Analysis of Categorical Data from Complex Sample Surveys: Chi-Squared Tests for Goodness of Fit and Independence in Two-Way Tables. *J Am Stat Assoc* 1981; 76:221–30. <https://doi.org/10.1080/01621459.1981.10477633>.
- [68] Zeeb H, Baune BT, Vollmer W, Cremer D, Krämer A. Gesundheitliche Lage und Gesundheitsversorgung von erwachsenen Migranten - ein Survey bei der Schuleingangsuntersuchung. *Gesundheitswesen* 2004; 66:76–84. <https://doi.org/10.1055/s-2004-812825>.
- [69] Brand T, Kleer D, Samkange-Zeeb F, Zeeb H. Prävention bei Menschen mit Migrationshintergrund: Teilnahme, migrationssensible Strategien und Angebotscharakteristika. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2015; 58:584–92. <https://doi.org/10.1007/s00103-015-2149-y>.
- [70] Lemke D, Berkemeyer S, Mattauch V, Heidinger O, Pebesma E, Hense H-W. Small-area spatio-temporal analyses of participation rates in the mammography screening program in the city of Dortmund (NW Germany). *BMC Public Health* 2015; 15:1190. <https://doi.org/10.1186/s12889-015-2520-9>.
- [71] Kiesepää V, Torniaainen-Holm M, Jokela M, Suvisaari J, Gissler M, Markkula N, et al. Immigrants’ mental health service use compared to that of native Finns: a register study. *Soc Psychiatry Psychiatr Epidemiol* 2020; 55:487–96. <https://doi.org/10.1007/s00127-019-01774-y>.

- [72] Castaneda AE, Çilenti K, Rask S, Lilja E, Skogberg N, Kuusio H, et al. Migrants Are Underrepresented in Mental Health and Rehabilitation Services - Survey and Register-Based Findings of Russian, Somali, and Kurdish Origin Adults in Finland. *Int J Environ Res Public Health* 2020; 17:6223. <https://doi.org/10.3390/ijerph17176223>.
- [73] Aptekman M, Rashid M, Wright V, Dunn S. Unmet contraceptive needs among refugees. *Can Fam Physician* 2014; 60:e613-619. PMID: 25642489.
- [74] Ellawela Y, Nilaweera I, Holton S, Rowe H, Kirkman M, Jordan L, et al. Contraceptive use and contraceptive health care needs among Sri Lankan migrants living in Australia: Findings from the understanding fertility management in contemporary Australia survey. *Sex Reprod Healthc* 2017; 12:70–5. <https://doi.org/10.1016/j.srhc.2017.03.003>.
- [75] Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: A systematic review and integration of definitions and models. *BMC Public Health* 2012; 12:80. <https://doi.org/10.1186/1471-2458-12-80>.
- [76] Bergman L, Nilsson U, Dahlberg K, Jaensson M, Wångdahl J. Health literacy and e-health literacy among Arabic-speaking migrants in Sweden: a cross-sectional study. *BMC Public Health* 2021; 21:2165. <https://doi.org/10.1186/s12889-021-12187-5>.
- [77] Gele AA, Pettersen KS, Torheim LE, Kumar B. Health literacy: the missing link in improving the health of Somali immigrant women in Oslo. *BMC Public Health* 2016; 16:1134. <https://doi.org/10.1186/s12889-016-3790-6>.
- [78] Kickbusch I, Pelikan JM, Apfel F, Tsouros AD, editors. *Health literacy: the solid facts*. Copenhagen: World Health Organization Regional Office for Europe; 2013 <https://iris.who.int/bitstream/handle/10665/326432/9789289000154-eng.pdf?sequence=1> (last access March 13, 2024).
- [79] Klinger J, Berens E-M, Carol S, Schaeffer D. Gesundheitskompetenz von Personen mit ex-sowjetischem und türkischem Migrationshintergrund in Deutschland. *Gesundheitswesen* 2023; 85:887–94. <https://doi.org/10.1055/a-2035-9107>.
- [80] Berens E-M, Klinger J, Carol S, Schaeffer D. Differences in health literacy domains among migrants and their descendants in Germany. *Front Public Health* 2022; 10:988782. <https://doi.org/10.3389/fpubh.2022.988782>.
- [81] Schaeffer D, Klinger J, Berens E-M, Gille S, Griese L, Vogt D, et al. Gesundheitskompetenz in Deutschland vor und während der Corona-Pandemie. *Gesundheitswesen* 2021; 83:781–8. <https://doi.org/10.1055/a-1560-2479>.
- [82] Matthiesen S, Dekker A, Briken P. Pilotstudie zur Erwachsenensexualität in Deutschland – Erste Ergebnisse zu Machbarkeit und Methodenvergleich. *Z Sex Forsch* 2018; 31:218–36. <https://doi.org/10.1055/a-0663-4354>.
- [83] Frank LK, Schenk L, Rommel A, Thamm R, Ellert U, Lampert T. Inanspruchnahme ambulant ärztlicher Leistungen und Zufriedenheit mit der Versorgung bei Kindern und Jugendlichen mit Migrationshintergrund – Ergebnisse der KiGGS-Studie. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2020; 63:103–12. <https://doi.org/10.1007/s00103-019-03069-8>.
- [84] Gaigl G, Täumer E, Allgöwer A, Becker T, Breilmann J, Falkai P, et al. The role of migration in mental healthcare: treatment satisfaction and utilization. *BMC Psychiatry* 2022; 22:116. <https://doi.org/10.1186/s12888-022-03722-8>.
- [85] Agu J, Lobo R, Crawford G, Chigwada B. Migrant Sexual Health Help-Seeking and Experiences of Stigmatization and Discrimination in Perth, Western Australia: Exploring Barriers and Enablers. *Int J Environ Res Public Health* 2016; 13:485. <https://doi.org/10.3390/ijerph13050485>.
- [86] Lindkvist P, Johansson E, Hylander I. Fogging the issue of HIV - barriers for HIV testing in a migrated population from Ethiopia and Eritrea. *BMC Public Health* 2015; 15:82. <https://doi.org/10.1186/s12889-014-1333-6>.

- [87] Shangase P, Egbe CO. Barriers to accessing HIV services for Black African communities in Cambridgeshire, the United Kingdom. *J Community Health* 2015; 40:20–6. <https://doi.org/10.1007/s10900-014-9889-8>.
- [88] Åkerman E, Essén B, Westerling R, Larsson E. Healthcare-seeking behaviour in relation to sexual and reproductive health among Thai-born women in Sweden: a qualitative study. *Cult Health Sex* 2017; 19:194–207. <https://doi.org/10.1080/13691058.2016.1214746>.



## 7 List of Publications

### 7.1 Thesis Article 1

Wiessner, C., Keil, T., Krist, L., Zeeb, H., Dragano, N., Schmidt, B., Ahrens, W., Berger, K., Castell, S., Fricke, J., Führer, A., Gastell, S., Greiser, H., Guo, F., Jaeschke, L., Jochem, C., Jöckel, K. H., Kaaks, R., Koch-Gallenkamp, L., Krause, G., Kuss O, Legath N, Leitzmann M, Lieb W, Meinke-Franze C, Meisinger C, Mikolajczyk R, Obi N, Pischon T, Schipf S, Schmoor C, Schramm S, Schulze MB, Sowarka N, Waniek S, Wigmann C, Willich SN, Becher, H. (2020). Personen mit Migrationshintergrund in der NAKO Gesundheitsstudie – soziodemografische Merkmale und Vergleiche mit der autochthonen deutschen Bevölkerung [Persons with migration background in the German National Cohort (NAKO)-sociodemographic characteristics and comparisons with the German autochthonous population]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*, 63(3), 279–289. <https://doi.org/10.1007/s00103-020-03097-9>

#### 7.1.1 Online Supplement Material

An online supplement is available at:

[https://static-content.springer.com/esm/art%3A10.1007%2Fs00103-020-03097-9/MediaObjects/103\\_2020\\_3097\\_MOESM1\\_ESM.pdf](https://static-content.springer.com/esm/art%3A10.1007%2Fs00103-020-03097-9/MediaObjects/103_2020_3097_MOESM1_ESM.pdf)

#### 7.1.2 Statement of own contributions

- Conceptualization of research idea
- Implementation of methodology
- Data analysis and visualization of results
- Preparation of original manuscript draft
- Revision of the manuscript

Bundesgesundheitsbl 2020 · 63:279–289  
<https://doi.org/10.1007/s00103-020-03097-9>  
 Online publiziert: 7. Februar 2020  
 © Der/die Autor(en) 2020



Christian Wiessner<sup>1</sup> · Thomas Keil<sup>2,3,4</sup> · Lilian Krist<sup>2</sup> · Hajo Zeeb<sup>5,6</sup> · Nico Dragano<sup>7</sup> ·  
 Børge Schmidt<sup>8</sup> · Wolfgang Ahrens<sup>5,9</sup> · Klaus Berger<sup>10</sup> · Stefanie Castell<sup>11</sup> ·  
 Julia Fricke<sup>2</sup> · Amand Führer<sup>12</sup> · Sylvia Gastell<sup>13</sup> · Halina Greiser<sup>14</sup> · Feng Guo<sup>15</sup> ·  
 Lina Jaeschke<sup>16</sup> · Carmen Jochem<sup>17</sup> · Karl-Heinz Jöckel<sup>8</sup> · Rudolf Kaaks<sup>14</sup> ·  
 Lena Koch-Gallenkamp<sup>15</sup> · Gérard Krause<sup>11,18</sup> · Oliver Kuss<sup>19</sup> · Nicole Legath<sup>10</sup> ·  
 Michael Leitzmann<sup>17</sup> · Wolfgang Lieb<sup>20</sup> · Claudia Meinke-Franze<sup>21</sup> ·  
 Christa Meisinger<sup>22,23,24</sup> · Rafael Mikolajczyk<sup>12</sup> · Nadia Obi<sup>1</sup> · Tobias Pischon<sup>16,25,26,27</sup> ·  
 Sabine Schipf<sup>21</sup> · Claudia Schmoor<sup>28</sup> · Sara Schramm<sup>8</sup> · Matthias B. Schulze<sup>29</sup> ·  
 Nicole Sowarka<sup>24,30</sup> · Sabina Waniek<sup>20</sup> · Claudia Wigmann<sup>31</sup> · Stefan N. Willich<sup>2</sup> ·  
 Heiko Becher<sup>1</sup>

<sup>1</sup> Institut für Medizinische Biometrie und Epidemiologie, Universitätsklinikum Hamburg-Eppendorf, Hamburg, Deutschland; <sup>2</sup> Institut für Sozialmedizin, Epidemiologie und Gesundheitsökonomie, Charité – Universitätsmedizin Berlin, Berlin, Deutschland; <sup>3</sup> Institut für Klinische Epidemiologie und Biometrie, Universität Würzburg, Würzburg, Deutschland; <sup>4</sup> Landesinstitut für Gesundheit, Bayerisches Landesamt für Gesundheit und Lebensmittelsicherheit, Bad Kissingen, Deutschland; <sup>5</sup> Leibniz-Institut für Präventionsforschung und Epidemiologie – BIPS, Bremen, Deutschland; <sup>6</sup> Health Sciences Bremen, Universität Bremen, Bremen, Deutschland; <sup>7</sup> Institut für Medizinische Soziologie, Centre for Health and Society, Medizinische Fakultät, Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Deutschland; <sup>8</sup> Medizinische Informatik, Biometrie und Epidemiologie (IMIBE), Medizinische Fakultät, Universitätsklinikum Essen, Universität Duisburg-Essen, Essen, Deutschland; <sup>9</sup> Institut für Statistik, Fachbereich Mathematik und Informatik, Universität Bremen, Bremen, Deutschland; <sup>10</sup> Institut für Epidemiologie und Sozialmedizin, Universität Münster, Münster, Deutschland; <sup>11</sup> Abteilung für Epidemiologie, Helmholtz-Zentrum für Infektionsforschung (HZI), Braunschweig, Deutschland; <sup>12</sup> Institut für Medizinische Epidemiologie, Biometrie und Informatik (IMEBI), Medizinische Fakultät, Martin-Luther-Universität Halle-Wittenberg, Halle, Deutschland; <sup>13</sup> NAKO Studienzentrum, Deutsches Institut für Ernährungsforschung Potsdam-Rehbrücke, Nuthetal, Deutschland; <sup>14</sup> Abteilung Epidemiologie von Krebserkrankungen, Deutsches Krebsforschungszentrum (DKFZ), Heidelberg, Deutschland; <sup>15</sup> Abteilung Klinische Epidemiologie und Altersforschung, Deutsches Krebsforschungszentrum (DKFZ), Heidelberg, Deutschland; <sup>16</sup> Forschergruppe Molekulare Epidemiologie, Max-Delbrück-Centrum für Molekulare Medizin in der Helmholtz-Gemeinschaft (MDC), Berlin, Deutschland; <sup>17</sup> Institut für Epidemiologie und Präventivmedizin, Universität Regensburg, Regensburg, Deutschland; <sup>18</sup> Medizinische Hochschule Hannover (MHH), Hannover, Deutschland; <sup>19</sup> Institut für Biometrie und Epidemiologie, Deutsches Diabetes-Zentrum (DDZ), Leibniz-Zentrum für Diabetes-Forschung, Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Deutschland; <sup>20</sup> Institut für Epidemiologie, Christian-Albrechts-Universität zu Kiel, Kiel, Deutschland; <sup>21</sup> Institut für Community Medicine, Universitätsmedizin Greifswald, Greifswald, Deutschland; <sup>22</sup> SFG Klinische Epidemiologie, Helmholtz Zentrum München, Neuherberg, Deutschland; <sup>23</sup> Lehrstuhl für Epidemiologie am UNIKA-T Augsburg, Ludwig-Maximilians-Universität München, Augsburg, Deutschland; <sup>24</sup> NAKO Studienzentrum, Universitätsklinikum Augsburg, Augsburg, Deutschland; <sup>25</sup> Charité – Universitätsmedizin Berlin, Berlin, Deutschland; <sup>26</sup> Partnerstandort Berlin, Deutsches Zentrum für Herz-Kreislauf-Forschung (DZHK), Berlin, Deutschland; <sup>27</sup> MDC/BIH Biobank, Max-Delbrück-Centrum für Molekulare Medizin in der Helmholtz-Gemeinschaft (MDC) und Berlin Institute of Health (BIH), Berlin, Deutschland; <sup>28</sup> Zentrum Klinische Studien, Universitätsklinikum Freiburg, Medizinische Fakultät, Albert-Ludwigs-Universität Freiburg, Freiburg, Deutschland; <sup>29</sup> Abteilung Molekulare Epidemiologie, Deutsches Institut für Ernährungsforschung Potsdam-Rehbrücke, Nuthetal, Deutschland; <sup>30</sup> Institut für Epidemiologie, Helmholtz Zentrum München, Neuherberg, Deutschland; <sup>31</sup> IUF-Leibniz Institut für umweltmedizinische Forschung, Düsseldorf, Deutschland

## Personen mit Migrationshintergrund in der NAKO Gesundheitsstudie – soziodemografische Merkmale und Vergleiche mit der autochthonen deutschen Bevölkerung

**Zusatzmaterial online**

Zusätzliche Informationen sind in der Online-Version dieses Artikels (<https://doi.org/10.1007/s00103-020-03097-9>) enthalten.

**Einleitung**

Personen mit Migrationshintergrund (PmM) stellen mit einer Anzahl von 19,3 Mio. Menschen und einem Anteil von 23,6% an der Gesamtbevölkerung eine große und in den letzten Jahren wachsende Bevölkerungsgruppe in Deutschland dar [1]. So ist etwa innerhalb der letzten 10 Jahre ein Zuwachs von fast 5 Mio. Personen zu verzeichnen [2]. Für das Gesundheitssystem ergeben sich Herausforderungen durch diese wachsende Bevölkerungsgruppe aufgrund von Unterschieden in der Mortalität [3–5], Morbidität [6] und einem unterschiedlichen Bedarf und Inanspruchnahmeverhalten medizinischer Dienstleistungen zwischen PmM und Personen ohne Migrationshintergrund (PoM; [7–9]).

Die größten Migrantengruppen in Deutschland sind türkeistämmige Personen und (Spät-)Aussiedler. Als (Spät-)Aussiedler bezeichnet man Zuwanderer deutscher Abstammung, die aus einem Staat des Ostblocks bzw. des ehemaligen Ostblocks in die Bundesrepublik Deutschland kamen, um dort ansässig zu werden. Bis Ende der 1980er-Jahre kamen Aussiedler vor allem aus Polen und Rumänien, seit 1990 meist aus den Nachfolgestaaten der Sowjetunion. Als Spätaussiedler werden Menschen bezeichnet, die ab dem 01.01.1993 nach Deutschland übergesiedelt sind [10]. Im Folgenden betrachten wir Aussiedler und Spätaussiedler aus der früheren Sowjetunion und bezeichnen sie in diesem Artikel als „Aussiedler“.

Der in vielen Studien vorgenommene Vergleich zwischen PmM und PoM vernachlässigt jedoch die Heterogenität in der Gruppe der PmM [11]. Deutsche Studien zur Inanspruchnahme medizinischer Dienstleistungen unterscheiden in 12 Fällen zwischen verschiedenen Migrantengruppen wie türkeistämmigen Personen oder Aussiedlern und der autochthonen Bevölkerung, in

10 Fällen werden Migranten nach erster/zweiter Migrantengeneration oder ein-/zweiseitigem Migrationshintergrund eingeteilt, während 40 Studien lediglich zwischen Migranten und Nichtmigranten unterscheiden [9]. Zudem wird als problematisch angesehen, dass verschiedene europäische Länder unterschiedliche Kriterien für die Definition des Migrationsstatus wie das Geburtsland oder die Nationalität verwenden [11]. Für Deutschland liegt seit 2006 der vielfach zitierte Mindestindikatorenatz von Schenk et al. vor, in dem Studienteilnehmende nach Geburtsland, Staatsangehörigkeit, Muttersprache und dem Geburtsland ihrer Eltern befragt werden [12]. Dieser kommt jedoch nicht immer zur Anwendung. Zudem ist die Beteiligung von PmM an Gesundheits-surveys niedriger als bei PoM [13].

In den Vorstudien der NAKO Gesundheitsstudie wurden Methoden für die Rekrutierung der beiden größten Migrantengruppen in Deutschland untersucht [14, 15]. Dabei zeigte sich eine deutlich unterdurchschnittliche Teilnahmequote bei türkeistämmigen Personen, während diese bei der Gruppe der Aussiedler vergleichbar mit der deutschen autochthonen Bevölkerung war. Für alle anderen, zahlenmäßig deutlich kleineren Gruppen lagen keine gesicherten Erkenntnisse vor. Insgesamt musste davon ausgegangen werden, dass der Anteil von teilnehmenden PmM in der NAKO-Studienpopulation unter dem tatsächlichen Anteil in der Bevölkerung liegen würde, wobei über den tatsächlichen Anteil keine A-priori-Annahmen gemacht wurden. Zu einem geringeren Anteil von PmM an den Teilnehmenden trägt auch die Bedingung hinreichender Deutschkenntnisse für die Teilnahme an der NAKO bei.

Studien zu Migrantengruppen haben in der Epidemiologie eine besondere Bedeutung, da sie u. a. zu einem besseren Verständnis der Ätiologie von Krankheiten beitragen. Des Weiteren erlauben sie Ungleichheiten des Gesundheitsstatus von PmM im Vergleich zu autochthonen Bevölkerungen aufzudecken, die oftmals mit einem niedrigeren sozioökonomischen Status einhergehen und zu einer schlechteren gesundheitlichen Ver-

sorgung führen können. Beispiele hierfür sind Studien über asiatische Migrantinnen und Migranten in den USA oder türkische Migrantinnen und Migranten in Deutschland [16–20].

In diesem Beitrag werden soziodemografische Charakteristika der PmM, die bis zur Halbzeit der NAKO-Basiserhebung an der Datenerhebung teilgenommen haben, im Vergleich zu den teilnehmenden PoM deskriptiv dargestellt. Ziel ist es, mögliche Forschungsfragen aufzuzeigen und dabei die Heterogenität einer häufig als homogen ausgewerteten Gruppe herauszustellen. Als exemplarische Variable, mit der Unterschiede verschiedener PmM-Gruppen in Bezug auf die Gesundheitsversorgung illustriert werden sollen, betrachten wir die Inanspruchnahme der Darmkrebsfrüherkennung (Hämoccult-Test) in den letzten 5 Jahren im Vergleich zu PoM.

**Methoden****Datenbasis und Studienpopulation**

In der NAKO wurden Personen eingeschlossen, die auf Zufallsstichproben aus den Einwohnermeldeämtern basieren. Voraussetzung für den Einschluss war ein Erstwohnsitz in einer der Studienregionen, der Altersbereich von 20–69 Jahren und eine hinreichende Beherrschung der deutschen Sprache (vgl. [21, 22]). PmM wurden somit mit einem erwarteten Anteil gezogen, der dem tatsächlichen Anteil in dem jeweiligen Studienzentrum für diesen Altersbereich entsprach. Insgesamt wurden zur Basisuntersuchung von März 2014 bis Juli 2019 über 200.000 Personen in 18 Studienzentren untersucht und befragt. Im Jahr 2017 wurde nach den ersten 100.000 Teilnehmenden ein „Data Freeze 100k“ beschlossen, für den eine systematische Qualitätsprüfung und Bereinigung der Daten erfolgte. Dieser Datensatz zur Halbzeit der Basiserhebung (Midterm Baseline Dataset) bildet die Grundlage der folgenden Analysen, wobei Daten von 101.816 Personen zur Verfügung standen.

Bundesgesundheitsbl 2020 · 63:279–289 <https://doi.org/10.1007/s00103-020-03097-9>  
 © Der/die Autor(en) 2020

C. Wiessner · T. Keil · L. Krist · H. Zeeb · N. Dragano · B. Schmidt · W. Ahrens · K. Berger · S. Castell · J. Fricke · A. Führer · S. Gastell · H. Greiser · F. Guo · L. Jaeschke · C. Jochem · K.-H. Jöckel · R. Kaaks · L. Koch-Gallenkamp · G. Krause · O. Kuss · N. Legath · M. Leitzmann · W. Lieb · C. Meinke-Franze · C. Meisinger · R. Mikolajczyk · N. Obi · T. Pischon · S. Schipf · C. Schmoor · S. Schramm · M. B. Schulze · N. Sowarka · S. Waniek · C. Wigmann · S. N. Willich · H. Becher

## Personen mit Migrationshintergrund in der NAKO Gesundheitsstudie – soziodemografische Merkmale und Vergleiche mit der autochthonen deutschen Bevölkerung

### Zusammenfassung

**Hintergrund.** Personen mit Migrationshintergrund (PmM) unterscheiden sich als Bevölkerungsgruppe hinsichtlich Morbidität, Mortalität und Inanspruchnahme des Gesundheitssystems meist von der autochthonen Bevölkerung, sie nehmen jedoch seltener an Gesundheitsstudien teil. Die Gruppe der PmM ist sehr heterogen, was in Studien bisher kaum berücksichtigt wird.

**Ziel der Arbeit.** Es werden soziodemografische Charakteristika der PmM in der NAKO Gesundheitsstudie (Alter, Geschlecht, Zeit seit Migration, Bildung) dargestellt. Zudem wird exemplarisch untersucht, ob der Migrationshintergrund mit der Nutzung des Angebots zur Früherkennung von Darmkrebs (Hämoccult-Test) zusammenhängt.

**Methoden.** Daten der ersten 101.816 Teilnehmenden der NAKO wurden deskriptiv und kartografisch ausgewertet. Die Zuweisung des Migrationshintergrunds erfolgte anhand der Definition des Statistischen Bundesamts und basiert auf Staatsangehörigkeit, Geburtsland, Einreisejahr und Geburtsland der Eltern.

**Ergebnisse.** Der Anteil der PmM liegt bei 16,0%. Die Verteilung über die 18 Studienzentren variiert zwischen 6% (Neubrandenburg) und 33% (Düsseldorf). Mit 153 Herkunftsländern sind in der NAKO die meisten Länder vertreten. Bei allen Variablen zeigen sich deutliche Unterschiede zwischen den verschiedenen Herkunftsregionen. Am Hämoccult-Test nehmen türkeistämmige Personen (OR = 0,67) und Aussiedler aus der

ehemaligen Sowjetunion (OR = 0,60) seltener teil. PmM, die in Deutschland geboren sind, unterscheiden sich diesbezüglich nicht von der autochthonen Bevölkerung (OR = 0,99). **Diskussion.** PmM in der NAKO sind eine sehr heterogene Gruppe. Jedoch lassen sich aufgrund der Stichprobengröße einzelne Untergruppen der PmM hinsichtlich ihrer Herkunftsregion separat untersuchen.

### Schlüsselwörter

Krebsfrüherkennung · Migration · Soziodemografie · Sozialepidemiologie · Gesundheitsversorgung

## Persons with migration background in the German National Cohort (NAKO)—sociodemographic characteristics and comparisons with the German autochthonous population

### Abstract

**Background.** Persons with a migration background (PmM) as a population group usually differ from the autochthonous population in terms of morbidity, mortality, and use of the health care system, but they participate less frequently in health studies. The PmM group is very heterogeneous, which has hardly been taken into account in studies so far.

**Objectives.** Sociodemographic characteristics of PmM in the NAKO health study (age, sex, time since migration, education) are presented. In addition, it is examined through an example whether migration background is related to the use of cancer screening for colorectal cancer (hemoccult test).

**Methods.** Data of the first 101,816 persons of the NAKO were analyzed descriptively and cartographically. The migration background was assigned on the basis of the definition of the Federal Statistical Office, based on nationality, country of birth, year of entry, and country of birth of the parents.

**Results.** Overall, the PmM proportion is 16.0%. The distribution across the 18 study centers varies considerably between 6% (Neubrandenburg) and 33% (Düsseldorf). With 153 countries of origin, most countries are represented in the NAKO. All variables show clear differences between the different regions of origin. In the hemoccult test, persons of Turkish origin (OR = 0.67) and resettlers

(OR = 0.60) have a lower participation rate. PmM born in Germany do not differ in this respect from the autochthonous population (OR = 0.99).

**Conclusion.** PmM in the NAKO are a very heterogeneous group. However, due to the sample size, individual subgroups of migrants can be studied separately with respect to region of origin.

### Keywords

Cancer screening · Migration · Sociodemography · Social epidemiology · Health services

### Definition des Migrationshintergrunds

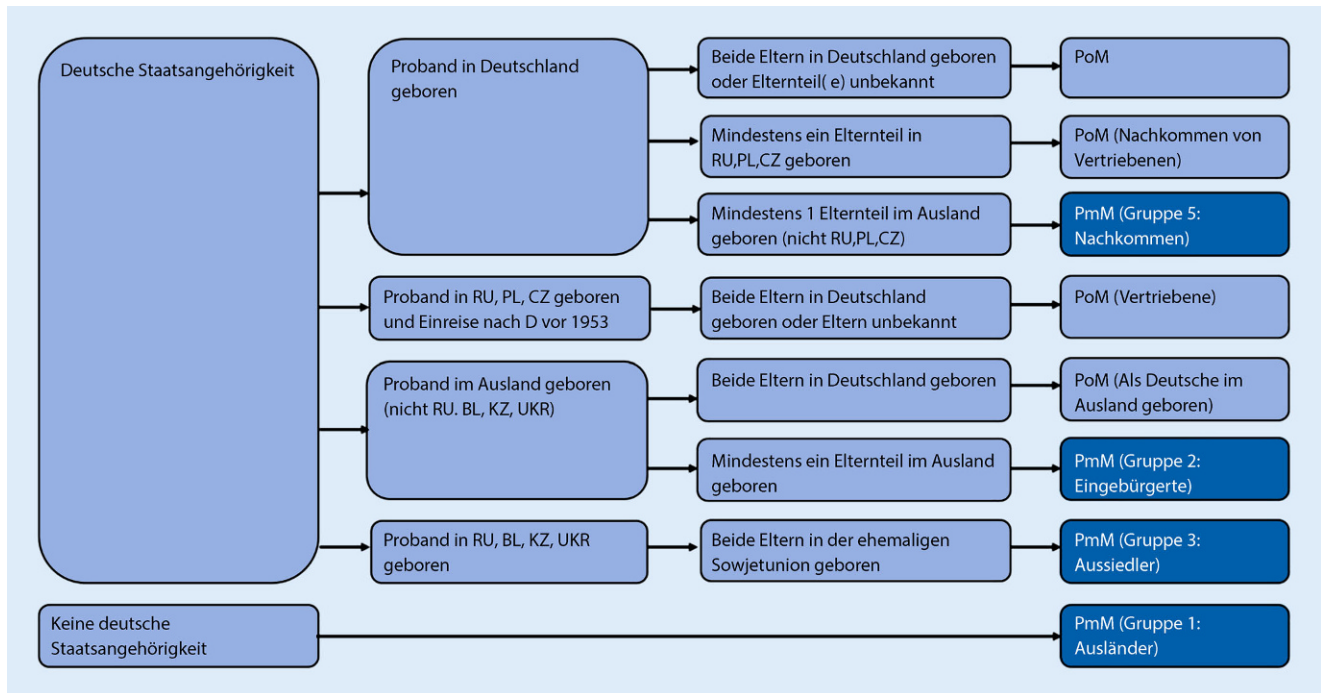
Die Einteilung der PmM erfolgte anhand der Definition des Statistischen Bundesamtes [1], die wie folgt lautet: „Eine Person hat einen Migrationshintergrund, wenn sie selbst oder mindestens ein Elternteil die deutsche Staatsangehörigkeit nicht durch Geburt besitzt.“

Vom Statistischen Bundesamt werden fünf verschiedene Gruppen von PmM unterschieden:

1. zugewanderte und nichtzugewanderte Ausländer,
2. zugewanderte und nichtzugewanderte Eingebürgerte,
3. (Spät-)Aussiedler,
4. Personen, die die deutsche Staatsangehörigkeit durch Adoption durch

- einen deutschen Elternteil erhalten haben,
5. mit deutscher Staatsangehörigkeit geborene Kinder der vier zuvor genannten Gruppen.

Mit den in der NAKO erhobenen Variablen war eine Identifizierung dieser Gruppen nur näherungsweise möglich, da zwar das Geburtsland der Eltern, nicht



**Abb. 1** ▲ Definition des Migrationshintergrunds in der NAKO. (Darstellung in Anlehnung an [23]. BL Weißrussland, CZ Tschechien, D Deutschland, KZ Kasachstan, PL Polen, RU Russland, UKR Ukraine, PmM Personen mit Migrationshintergrund, PoM Personen ohne Migrationshintergrund)

aber deren Staatsangehörigkeit erfragt wurde. Eine mögliche Adoption (Gruppe 4) wurde ebenfalls nicht abgefragt. Die Gruppen 1–3 und 5 sowie PoM wurden daher anhand der Staatsangehörigkeit, des Geburtslands und ggf. des Einreisejahrs sowie des Geburtslands der Eltern bestimmt (Abb. 1) [23].

Innerhalb der Gruppe der PoM wurden ebenfalls unterschiedliche Untergruppen definiert:

1. Personen mit deutscher Staatsangehörigkeit und Geburtsland Deutschland sowie beide Eltern in Deutschland geboren,
2. Personen, die als deutsche Staatsangehörige im Ausland geboren wurden,
3. Vertriebene nach dem 2. Weltkrieg,
4. Nachkommen von Vertriebenen.

Zudem musste mit unvollständigen Informationen umgegangen werden und es wurde eine weitere Gruppe gebildet, in der mindestens ein Elternteil unbekannt ist, während der Teilnehmende die deutsche Staatsangehörigkeit besitzt und selbst in Deutschland geboren ist. Diese Teilnehmenden wurden als PoM de-

finiert. Datensätze von Teilnehmenden, denen aufgrund fehlender Werte durch den in Abb. 1 dargestellten Algorithmus kein Migrationsstatus zugewiesen werden konnte ( $n = 76$ ), wurden durch zwei der Autoren (CW und HB) einzeln betrachtet. Bei Übereinstimmung der zugewiesenen Kategorie wurde der Migrationsstatus entsprechend festgelegt, bei 25 Personen blieb der fehlende Wert bestehen.

Zudem wurden PmM nach Herkunftsregion/Herkunftsland klassifiziert. Zwei gesondert ausgewiesene Gruppen nach der Herkunft sind die türkeistämmigen Personen, bei denen die Person selbst oder mindestens ein Elternteil in der Türkei geboren wurde, und die Aussiedler.

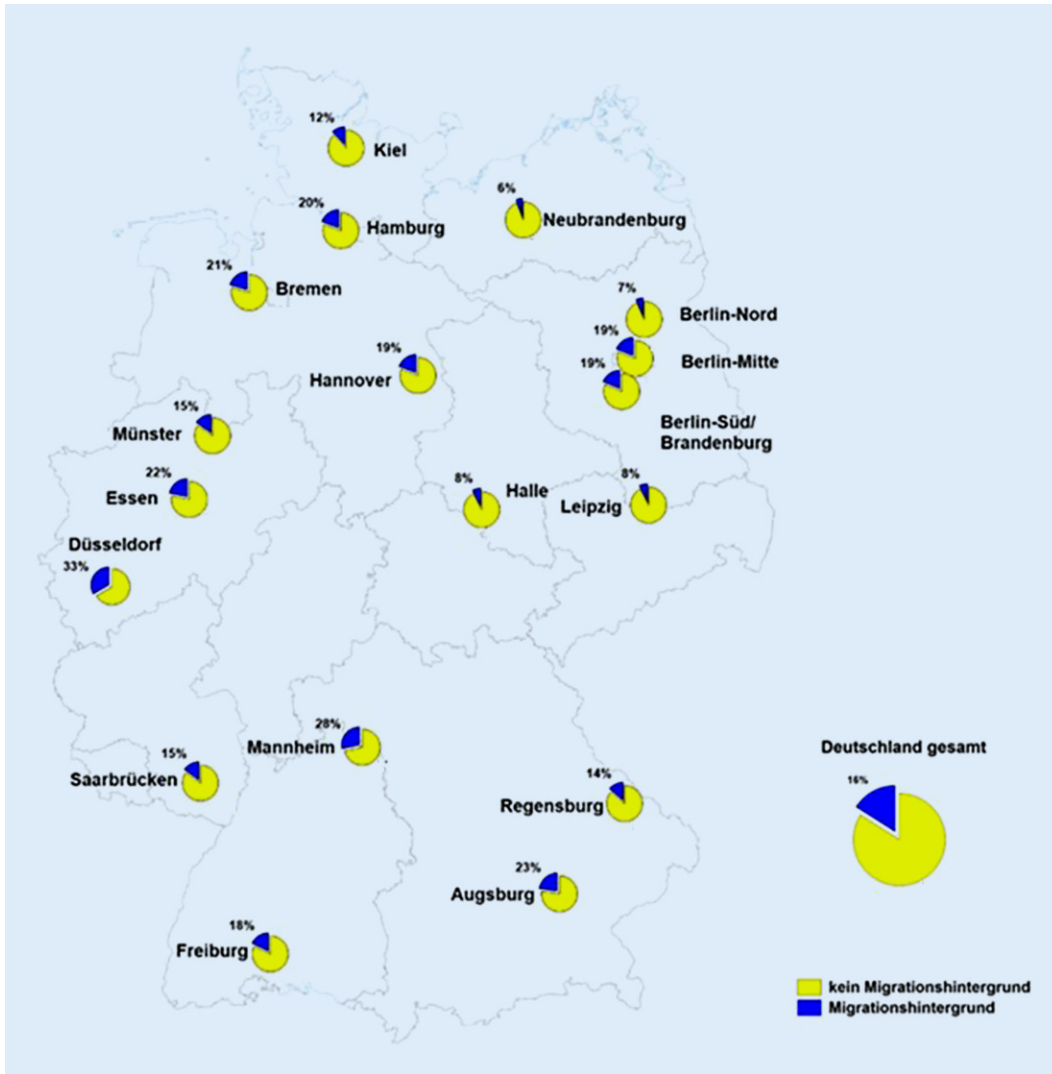
### Statistische Analyse

Es wurde eine deskriptive Auswertung der Studienpopulation hinsichtlich des Migrationsstatus für ausgewählte Variablen (Alter, Geschlecht, Bildung, Zeit seit Einreise) durchgeführt. Zudem wurde der Migrationshintergrund stratifiziert nach den 18 Studienzentren ausgewer-

tet und auf einer Deutschlandkarte dargestellt (Abb. 2). Die Anzahl der Teilnehmenden aus den einzelnen Herkunftsländern wurde auf einer Weltkarte abgebildet (Abb. 3).

Eine Analyse, ob sich PmM hinsichtlich ihres Inanspruchnahmeverhaltens des Hämocult-Tests zur Darmkrebsfrüherkennung von PoM unterscheiden, wurde mittels dichotomer logistischer Regression für dieses Outcome durchgeführt (die Ausprägungen Teilnahme „Ja, mehrfach“ und „Ja, einmal“ für die Teilnahme an der Untersuchung des Stuhls auf okkultes Blut (Hämocult) in den vergangenen fünf Jahren wurden zusammengefasst zu „Ja“ versus Ausprägung Teilnahme „nein“). Diese Auswertung ist auf die Studienpopulation ab 50 Jahren beschränkt, da diese Früherkennungsmaßnahme für Personen ab 50 Jahren von den gesetzlichen Krankenkassen angeboten wird. Der Migrationsstatus wurde auf drei unterschiedliche Weisen modelliert: Modell 1: als nominale Variable mit den zwei Ausprägungen Migrationshintergrund Ja/Nein, Modell 2: als nominale Variable mit 4 Kategorien (PoM, türkeistämmig, Aussiedler, sonsti-





**Abb. 2** ◀ Anteil Migrationshintergrund in den 18 Studienzentren der NAKO zur Halbzeit der Basiserhebung

ge PmM), Modell 3: als nominale Variable mit 15 Kategorien (PoM, 14 Herkunftsregionen/-länder der PmM, Definition nach [24]). In die Modelle eingeschlossen wurden die Variablen Geschlecht, Alter in Altersgruppen (50–59, 60+), das Studienzentrum und die Bildungsjahre (Schule/Studium und Berufsausbildung) als kategorielle Variable (bis zu 10 Jahre, 11–13 Jahre, 14–17 Jahre, 18+ Jahre). Die Auswertung erfolgte als Complete-Case-Analyse.

Alle Analysen wurden mit SAS-Software (Version 9.4; SAS Institute, Cary, North Carolina, USA) durchgeführt. Die Erstellung der Karten erfolgte mit Easymap (Version 11.0; Lutum+Tappert, Bonn, Deutschland).

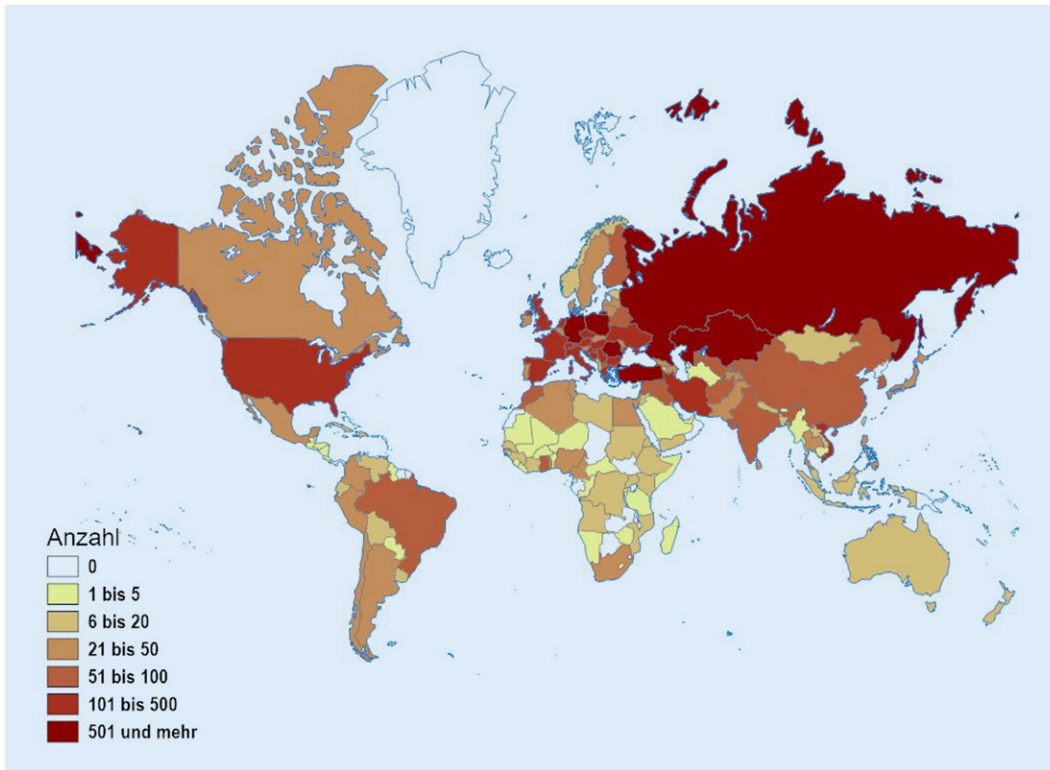
## Ergebnisse

### Deskription der PmM

Im Midterm Baseline Dataset der NAKO haben 16.293 (16,0 %) Personen einen Migrationshintergrund (Tab. 1). Die Geschlechterverteilung ist bei PmM und PoM ähnlich (53,5 % bzw. 53,9 % Frauen bei PoM und PmM). Unter den Aussiedlern ist der Anteil der Frauen höher als bei PoM (62,0 %), bei den türkeistämmigen Personen niedriger (46,0 %). Bei der Altersverteilung zeigt sich, dass PmM (Median 52 Jahre) jünger sind als PoM (Median 54 Jahre). Türkeistämmige Personen (Median 46 Jahre) und Aussiedler (Median 50 Jahre) sind im Mittel noch einmal jünger. Eine detaillierte Verteilung auf die Altersgruppen

findet sich in Tab. 1. Die Einreise liegt bei den im Ausland geborenen PmM mehrheitlich mehr als 21 Jahre zurück (46,0 % aller PmM), 30,6 % der PmM sind in Deutschland geboren. Die Einreise bei türkeistämmigen Personen liegt im Mittel noch länger zurück (64,7 % seit mindestens 21 Jahren in Deutschland lebend), während Aussiedler im Mittel noch nicht so lange in Deutschland leben (mit 47,6 % ist ein großer Anteil vor 11–20 Jahren eingereist).

Bei den Bildungsjahren liegt der Anteil der PoM mit maximal 10 Bildungsjahren (niedrigste Kategorie) bei 1,9 %, bei den PmM bei 6,5 %. In den mittleren beiden Bildungskategorien ist der Anteil der PoM höher, während in der Kategorie „mindestens 18 Bildungsjahre“ der Anteil bei PmM mit 22,7 % größer ist als bei PoM



**Abb. 3** ◀ Anzahl der Personen mit Migrationshintergrund nach Herkunftsland zur Halbzeit der NAKO-Basiserhebung

mit 20,5%. Ein Vergleich der Bildungszeit von türkeistämmigen Personen mit PoM zeigt deutliche Unterschiede, hier liegt der Anteil der türkeistämmigen Personen mit maximal 10 Bildungsjahren bei einem Fünftel (19,8%) und damit um den Faktor 10 höher als bei PoM, bei türkeistämmigen Frauen liegt der Anteil sogar bei 23,7%. Insgesamt ist die durchschnittliche Bildungszeit von türkeistämmigen Personen damit niedriger als bei PoM. Die Aussiedler hingegen weisen ähnliche Bildungszeiten wie PoM auf. Während in den mittleren beiden Bildungskategorien die Anteile bei den Aussiedlern und PoM sehr ähnlich sind, haben Aussiedler jedoch häufiger maximal 10 Bildungsjahre (5,2% vs. 1,9%) und seltener mindestens 18 Bildungsjahre (18,2% vs. 20,5%).

Für die Teilnahme an der Früherkennungsuntersuchung für Darmkrebs gilt, dass bei PoM mehr als die Hälfte (54,4%) der befragten Teilnehmenden ab 50 Jahren diese wahrgenommen hat. PmM nahmen seltener daran teil (44,1%). Bei den Aussiedlern (32,4%) und türkeistämmigen Personen (27,0%) sind die Teilnehmeraten noch niedriger, wobei hier der Anteil an fehlenden Werten mit 33,0% (Aussiedler) und 41,8% (türkeistämmige

Personen) deutlich höher ist als bei PoM (10,2%).

Die Aufteilung der PmM nach Herkunftsregionen demonstriert, dass der größte Anteil der PmM in Deutschland geboren ist (31,6%), gefolgt von Osteuropa (27,3%), Westasien (8,4%) und Südeuropa (7,7%). In der Demografie zeigen sich Unterschiede zwischen den Herkunftsregionen (Tab. 2). Der Frauenanteil liegt zwischen 25,4% (Nordafrika) und 77,2% (Ostasien). Das mediane Alter variiert zwischen 48 Jahren (Subsahara-Afrika und Zentralasien) und 56 Jahren (Westeuropa). In der Altersverteilung ähneln europäische PmM den PoM (medianes Alter 54 Jahre), während Personen aus nichteuropäischen Herkunftsregionen im Mittel jünger sind.

Hinsichtlich der Bildungsjahre sind die Verteilungen der in Deutschland geborenen PmM (69,0% mit mehr als 13 Bildungsjahren) und der PoM (69,4% mit mehr als 13 Bildungsjahren) vergleichbar (Tab. 2). Zwischen den anderen Herkunftsregionen und PoM liegen deutliche Unterschiede vor. In Zentralamerika und der Karibik, Nordamerika und Ostasien geborene PmM haben häufiger lange Bildungszeiten

(84,7%, 83,7% und 82,9% mit mehr als 13 Bildungsjahren), während PmM aus Südeuropa, Südostasien und Westasien häufig kürzere Bildungszeiten aufweisen (48,3%, 48,2%, 41,5% mit mehr als 13 Bildungsjahren).

Eine Stratifizierung nach Studienzentren demonstriert die Ungleichverteilung der PmM über das deutsche Bundesgebiet in der NAKO-Stichprobe (Abb. 2). Der Anteil an PmM variiert zwischen 6% (Neubrandenburg) und 33% (Düsseldorf). In den ostdeutschen Studienzentren (mit Ausnahme der Studienzentren Berlin-Mitte und Berlin-Süd/Brandenburg) liegt der Anteil der PmM unter dem der westdeutschen Studienzentren. Zudem variiert der Anteil der Herkunftsregionen zwischen den Studienzentren, wobei Osteuropa in allen Studienzentren die am häufigsten vorkommende Herkunftsregion ist. Der Anteil der in Osteuropa geborenen PmM liegt zwischen 32,1% (Berlin-Mitte) und 63,5% (Neubrandenburg). Bei anderen Herkunftsregionen sind die relativen Unterschiede noch ausgeprägter, z. B. liegt der Anteil der in Südasien Geborenen zwischen 0,8% (Halle) und 9,7% (Hamburg).

**Tab. 1** Ausgewählte Charakteristika der NAKO-Teilnehmenden zur Halbzeit der Basiserhebung nach Migrationshintergrund<sup>a</sup>

	<b>PoM n = 85.498 (84,0%)</b>	<b>PmM n = 16.293 (16,0%)</b>	<b>Davon türkeistäm- mig n = 1384 (1,4%)</b>	<b>Davon Aussiedler<sup>f</sup> n = 1596 (1,6%)</b>
<b>Geschlecht (%)</b>				
Männlich	39.741 (46,5%)	7513 (46,1%)	747 (54,0%)	606 (38,0%)
Weiblich	45.757 (53,5%)	8780 (53,9%)	637 (46,0%)	990 (62,0%)
<b>Altersgruppe<sup>b</sup> (%)</b>				
20–29	5930 (6,9%)	1150 (7,6%)	123 (8,9%)	139 (8,7%)
30–39	7667 (9,0%)	1935 (11,9%)	212 (15,3%)	263 (16,5%)
40–49	18.052 (21,1%)	4007 (24,6%)	523 (37,8%)	365 (22,9%)
50–59	25.088 (29,4%)	4309 (26,5%)	351 (25,4%)	433 (27,1%)
60+	28.754 (33,6%)	4889 (30,0%)	175 (12,6%)	396 (24,8%)
<b>Jahre seit Einreise</b>				
1–5	–	675 (4,1%)	11 (0,8%)	9 (0,6%)
6–10	–	640 (3,9%)	17 (1,2%)	40 (2,5%)
11–20	–	2438 (15,0%)	110 (8,0%)	760 (47,6%)
21+	–	7378 (45,3%)	887 (64,1%)	786 (49,2%)
In Deutsch- land geboren	–	5142 (31,6%)	358 (25,9%)	0 (0%)
Fehlende Werte	–	20 (0,1%)	1 (0,1%)	1 (0,1%)
<b>Bildungsjahre</b>				
Bis zu 10	1662 (1,9%)	1061 (6,5%)	274 (19,8%)	83 (5,2%)
11–13	22.242 (26,1%)	3852 (23,6%)	378 (27,3%)	384 (24,1%)
14–17	36.778 (43,0%)	5619 (34,5%)	297 (21,5%)	655 (41,0%)
Mindestens 18	17.559 (20,5%)	3691 (22,7%)	137 (9,9%)	291 (18,2%)
In Ausbildung	1225 (1,4%)	322 (2,0%)	33 (2,4%)	26 (1,6%)
Fehlende Werte	6032 (7,1%)	1748 (10,7%)	265 (19,1%)	157 (9,8%)
<b>Okkultbluttest (Teilnehmende ≥50 Jahre)</b>				
Nie	19.031 (35,4%)	3113 (33,9%)	164 (31,2%)	287 (34,7%)
Ja, ein Mal	18.049 (33,5%)	2608 (28,4%)	104 (19,8%)	192 (23,2%)
Ja, mehrfach	11.243 (20,9%)	1439 (15,7%)	38 (7,2%)	76 (9,2%)
Fehlende Werte	5485 (10,2%)	2023 (22,0%)	220 (41,8%)	273 (33,0%)

*PmM* Personen mit Migrationshintergrund, *PoM* Personen ohne Migrationshintergrund

<sup>a</sup>Bei 25 Personen konnte der Migrationshintergrund nicht bestimmt werden

<sup>b</sup>Bei 10 Personen standen die Informationen zum Alter nicht zur Verfügung

<sup>c</sup>Definition von Aussiedlern siehe Text

Insgesamt kommen die ersten 101.816 Teilnehmenden der NAKO aus 153 Ländern. Die Aufteilung der PmM auf die jeweiligen Geburtsländer ist in **Abb. 3** in der Übersicht dargestellt (Länderliste im Online-Zusatzmaterial Tab. Z1). PmM aus allen Kontinenten und den 15 United-Nations-(UN-)Regionen haben an der NAKO teilgenommen. Die häufigsten Geburtsländer innerhalb der einzelnen Regionen sind Polen ( $n = 1817$ ; Osteuropa), Türkei ( $n = 1005$ ; Westasien), Kasachstan ( $n = 714$ ; Zentralasien), Italien ( $n = 303$ ; Südeuropa), Österreich ( $n = 293$ ; Westeuropa), Iran ( $n = 266$ ; Südasien), Großbritannien ( $n = 161$ ; Nordeuropa), USA ( $n = 127$ ; Nordamerika), Vietnam ( $n = 115$ ; Südostasien), China ( $n = 93$ ; Ostasien), Ghana ( $n = 81$ ; Subsahara-Afrika), Brasilien ( $n = 77$ ; Südamerika), Marokko ( $n = 68$ ; Nordafrika), Mexiko ( $n = 29$ ; Lateinamerika und Karibik) und Australien ( $n = 12$ ; Ozeanien; [24]). Weitere häufig vorkommende Geburtsländer sind Russland ( $n = 1082$ ), Rumänien ( $n = 595$ ) und die Ukraine ( $n = 310$ ).

### Zusammenhang Migrationsstatus – Früherkennung Darmkrebs (Hämoccult-Test)

Bei PmM ist die aus dem logistischen Regressionsmodell geschätzte Wahrscheinlichkeit, dass sie Untersuchungen zur Darmkrebsvorsorge in Anspruch nehmen, deutlich geringer als bei der autochthonen deutschen Bevölkerung (Modell 1, Odds Ratio (OR) = 0,82, 95%-Konfidenzintervall (KI): [0,78; 0,87], **Abb. 4**). Bei einer Aufteilung in Türkeistämmige (Modell 2, OR = 0,67, 95%-KI: [0,51; 0,86]), Aussiedler (OR = 0,60, 95%-KI: [0,50; 0,71]) und Personen mit anderem Migrationshintergrund (OR = 0,86, 95%-KI: [0,81; 0,91]) ergeben sich deutliche Unterschiede zwischen den analysierten Gruppen. Eine weitere Aufgliederung in die Herkunftsländer/-regionen (Modell 3) verdeutlicht, dass in Deutschland geborene PmM sich in ihrem Inanspruchnahmeverhalten des Hämoccult-Tests nicht von PoM unterscheiden (OR = 0,99, 95%-KI: [0,91; 1,08]). Für die restlichen Herkunftsländer liegen mit Ausnahme der Region



**Tab. 2** Demografische Merkmale der Personen mit Migrationshintergrund (PmM), die bis zur Halbzeit an der NAKO-Basiserhebung teilgenommen haben, nach Herkunftsregionen im Vergleich zu Personen ohne Migrationshintergrund (PoM)

Herkunftsregion/ Herkunftsland <sup>a</sup>	Geschlecht		Alter Median (IQA)	Bildung <sup>b</sup>	
	Männlich (%)	Weiblich (%)		Bis 13 Jahre	Mehr als 13 Jahre
PoM	39.741 (46,5 %)	45.757 (53,5 %)	54 (17)	23.904 (30,6 %)	54.337 (69,4 %)
PmM					
Deutschland	2415 (47,0 %)	2727 (53,0 %)	51 (21)	1428 (31,0 %)	3182 (69,0 %)
Nordeuropa	179 (40,6 %)	262 (59,4 %)	54 (20)	77 (20,1 %)	307 (79,9 %)
Westeuropa	359 (46,0 %)	421 (54,0 %)	56 (19)	164 (23,6 %)	532 (76,4 %)
Südeuropa	633 (50,6 %)	617 (49,4 %)	53 (19)	563 (51,7 %)	526 (48,3 %)
Osteuropa	1748 (39,4 %)	2686 (60,6 %)	55 (21)	1156 (29,4 %)	2771 (70,6 %)
Nordamerika	91 (57,6 %)	67 (42,4 %)	51 (16)	24 (16,3 %)	123 (83,7 %)
Zentralamerika/ Karibik	29 (42,6 %)	39 (57,4 %)	49,5 (13,5)	9 (15,3 %)	50 (84,7 %)
Südamerika	94 (38,2 %)	152 (61,8 %)	52 (17)	41 (19,4 %)	170 (80,6 %)
Nordafrika	153 (74,6 %)	52 (25,4 %)	50 (18)	71 (43,3 %)	93 (56,7 %)
Subsahara-Afrika	227 (60,2 %)	150 (39,8 %)	48 (14)	144 (49,5 %)	147 (50,5 %)
Westasien	807 (58,9 %)	562 (41,1 %)	49 (12)	617 (58,5 %)	438 (41,5 %)
Zentralasien	336 (39,1 %)	523 (60,9 %)	48 (19)	304 (40,3 %)	451 (59,7 %)
Südasien	297 (61,6 %)	185 (38,4 %)	52 (16)	163 (39,5 %)	250 (60,5 %)
Südostasien	85 (33,9 %)	166 (66,1 %)	50 (15)	101 (51,8 %)	94 (48,2 %)
Ostasien	42 (22,8 %)	142 (77,2 %)	52 (21,5)	27 (17,1 %)	131 (82,9 %)
Ozeanien	8 (38,1 %)	13 (61,9 %)	50 (20)	5 (29,4 %)	12 (70,6 %)
Gesamt	47.244 (46,4 %)	54.521 (53,6 %)	53 (17)	28.798 (31,2 %)	63.614 (68,8 %)

IQA Interquartilsabstand

<sup>a</sup>Bei 26 Personen standen keine Informationen zum Geburtsland zur Verfügung oder das Geburtsland ließ sich keiner Region zuordnen

<sup>b</sup>Die Kategorien „Fehlende Werte“ („Missing“) und „in Ausbildung“ sind hier nicht dargestellt

Südostasien/Ozeanien (OR = 1,13, 95 %-KI: [0,70; 1,83]) die Odds Ratios unterhalb von 1. Personen aus Zentralasien haben verglichen mit PoM die niedrigste Wahrscheinlichkeit der Teilnahme am Hämo-cult-Test (OR = 0,48, 95 %-KI: [0,37; 0,63]). Aufgrund der niedrigeren Fallzahlen werden bei einer Aufgliederung der PmM in die Herkunftsregionen die Schätzungen unsicherer. Für 7 der 14 Regionen liegt allerdings auch das obere Ende des Konfidenzintervalls unterhalb der 1 (Nordeuropa, Osteuropa, Nordafrika, Westasien, Zentralasien, Südasien, Ostasien). Wie in der Diskussion näher ausgeführt, ist eine Unterschätzung des Effekts bedingt durch unterschiedliche Anteile fehlender Werte wahrscheinlich.

## Diskussion

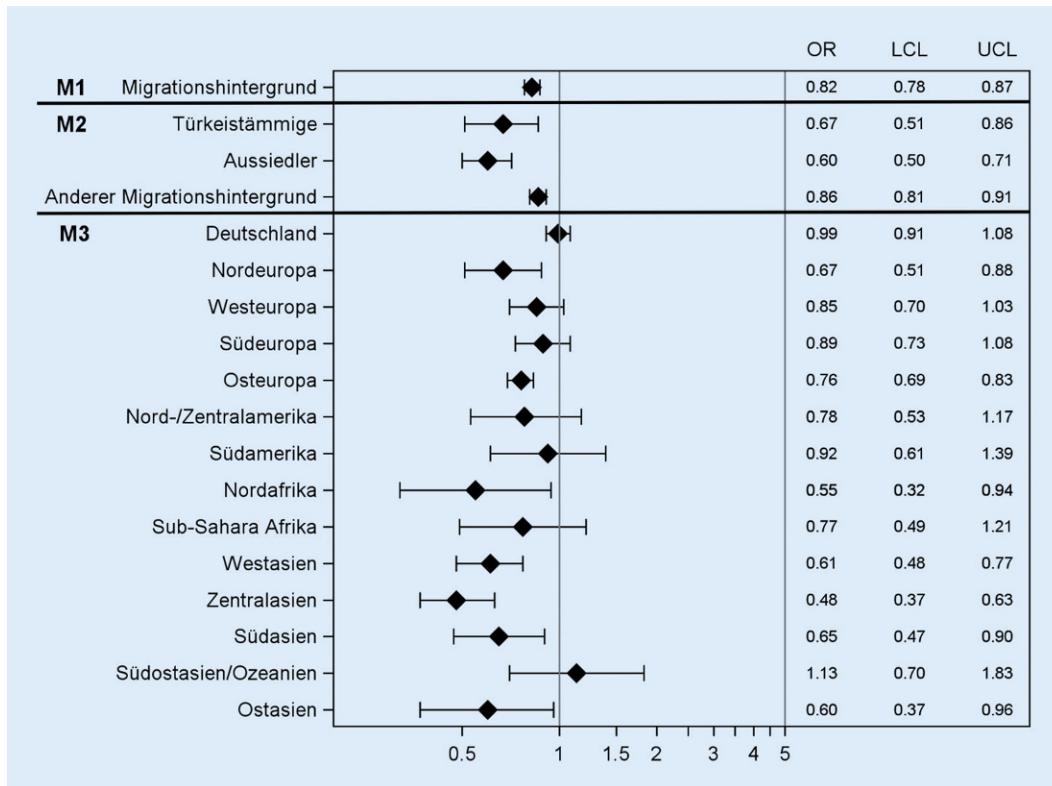
### Hauptergebnisse

Die deskriptive Analyse von über 100.000 Teilnehmenden der NAKO in Bezug auf deren Migrationshintergrund weist die NAKO als eine Studie mit extrem vielfältigem Teilnehmerspektrum aus. PmM aus allen Kontinenten und insgesamt 153 Ländern sind in der Studie vertreten und 16 % der Teilnehmenden weisen einen Migrationshintergrund auf. Wie **Abb. 2** zeigt, gibt es nur wenige Länder der Welt, aus denen kein NAKO-Teilnehmender entstammt. Die Ergebnisse bestätigen damit den Status von Deutschland als Einwanderungsland eindrucksvoll. Die in der Gesamtbevölkerung häufigsten Herkunftsländer Türkei, Russland und Polen sind auch

die am häufigsten in der Studie vertretenen. Der Altersdurchschnitt und die Geschlechterverteilung weisen zwischen den betrachteten Gruppen Unterschiede auf und die für einige Gruppen erheblichen deskriptiven Unterschiede zu PoM in Bezug auf die Bildungsjahre bestätigen einerseits bekanntes Wissen, demonstrieren andererseits aber auch die Notwendigkeit der differenzierten Auswertung für entsprechende Vergleiche in zukünftigen Analysen. Der Anteil von 16 % PmM ist niedriger als der Bundesdurchschnitt von 23,6 % [1], aber dabei ist zu berücksichtigen, dass viele Studienzentren in Regionen liegen, in denen der Anteil an PmM niedriger ist als im Bundesdurchschnitt. Es ist auf der Basis unserer Daten nicht möglich, die Responsequote nach Migrantenstatus zu berechnen. Jedoch haben die Pretests der NAKO gezeigt, dass insbesondere bei der größten Migrantengruppe in Deutschland, den türkeistämmigen Personen, eine niedrige Teilnahmequote erwartet werden musste [14, 15]. Hier haben insbesondere die Frauen einen niedrigen Teilnahmeanteil. Ungeachtet der niedrigen Teilnahmequote sind die Türkeistämmigen neben den Aussiedlern die zahlenmäßig größte Gruppe unter den PmM. Unter der realistischen Annahme einer ähnlichen Verteilung in den zweiten 100.000 Personen wird man somit in der NAKO zwei Migrantengruppen mit jeweils über 2000 Personen erwarten können, die eine hochwertige Grundlage für zukünftige spezifische epidemiologische Untersuchungen bieten werden.

### Ergebnisse zur Inanspruchnahme des Hämo-cult-Tests

Aufgrund der Größe der NAKO sind auch Detailauswertungen in Bezug auf Herkunftsregionen möglich, wie die Analyse der Inanspruchnahme des Hämo-cult-Tests verdeutlicht. Hierbei hat sich gezeigt, dass ein einfacher Vergleich zwischen PmM und PoM, der die Heterogenität der PmM vernachlässigt, unzureichend ist. In den Analysen, bei denen die Heterogenität der PmM berücksichtigt wurde (Modell 2 und Modell 3, **Abb. 4**), sind deutliche Unterschiede



**Abb. 4** ◀ Odds Ratios der Teilnahme an Früherkennungsuntersuchungen für Darmkrebs (Hämoccult-Test). (Unterteilungen nach: Modell 1 (M1): Migrationshintergrund Ja/Nein. Modell 2 (M2): Besondere Gruppen (Türkeistämmige/Aussiedler/anderer Migrationshintergrund). Modell 3 (M3): Geburtsregion/ Geburtsland. Vergleichsgruppe: Personen ohne Migrationshintergrund (OR Odds Ratio, LCL Lower Confidence Limit, UCL Upper Confidence Limit). Alle Modelle adjustiert für Alter, Geschlecht, Studienzentrum, Bildung)

zwischen verschiedenen Migranten- gruppen zu beobachten. Interessant ist hier, dass PmM, die in Deutschland geboren sind, keine Unterschiede in der Inanspruchnahme des Hämoccult- Tests zeigen, während PmM, die nicht in Deutschland geboren sind, diese Früherkennungsuntersuchung für Darmkrebs weniger nutzten. Diese Unterscheidung zwischen in Deutschland und nicht in Deutschland geborenen PmM sollte bei Auswertungen somit mindestens erfolgen. Je nach Forschungsfrage bietet sich eine Aufteilung der im Ausland geborenen PmM nach relevanten Gruppen (wie in Modell 2), Herkunftsregionen/ Herkunftsändern (wie in Modell 3) oder Länge des Aufenthalts in Deutschland an. Für Letzteres wäre eine Aufteilung in PmM der ersten und zweiten Generation denkbar oder eine feingliedrigere Aufteilung nach Jahren seit Einreise oder dem Alter bei Einreise.

Die Analyse des Zeitraums seit Einreise bei PmM, die nicht in Deutschland geboren wurden, zeigt, dass der überwiegende Anteil der teilnehmenden PmM bereits seit über 10 Jahren, die meisten sogar seit über 20 Jahren in Deutschland leben. Dies ist ein wesentlicher Unter-

schied zu der Gesamtheit der PmM in Deutschland, in welcher der Anteil dieser Personen niedriger ist [25]. Damit kann eine kurze Zeit seit Einreise nicht als wesentlicher Grund für eine geringere Nutzung von Vorsorgeuntersuchungen angesehen werden.

PmM – und hier besonders ausgeprägt: Aussiedler und türkeistämmige Personen – weisen bei der Variablen zur Teilnahme am Hämoccult-Test einen deutlich höheren Anteil an fehlenden Werten auf als PoM. Wir vermuten, dass der überwiegende Teil dieser Personen, evtl. aus Unkenntnis über den Sachverhalt, keine Antwort gegeben hat und somit die korrekte Antwort ein „Nein“ wäre. In diesem Fall wären die hier berechneten Effektschätzer, die auf einer Complete-Case-Analyse basieren, eine Unterschätzung des wahren Effekts. Der Unterschied in der Inanspruchnahme dieser Vorsorgeuntersuchung wäre demnach noch höher. Eine detaillierte Untersuchung, bei der auch andere Früherkennungsmaßnahmen analysiert werden und bei der die Zeit seit Einreise berücksichtigt ist, wird in späteren Publikationen erfolgen.

## Vergleich mit Ergebnissen anderer Studien

Die Mehrheit deutscher Studien zur Inanspruchnahme medizinischer Dienstleistungen unterscheidet lediglich zwischen PoM und PmM ohne die Heterogenität der PmM zu berücksichtigen [9]. Beispiele für Studien, die unterschiedliche Migrantengruppen mit den PoM vergleichen, sind folgende: Aparicio et al. (2005) vergleichen Aussiedler mit Nichtaussiedlern und finden ebenfalls eine deutlich geringere Wahrnehmung von Krebsvorsorgeuntersuchungen bei den Aussiedlern [26]. Studien zur gesundheitlichen Versorgung der türkeistämmigen Personen sind zahlreicher [27–31]. Im Gegensatz zu einer niedrigeren Inanspruchnahme des Hämoccult- Tests in unseren Analysen fanden Berens et al. (2014) höhere Teilnehmeraten am Brustkrebsscreening und Zollmann et al. (2016) eine höhere Inanspruchnahme von psychosomatischen Rehabilitationsmaßnahmen unter türkeistämmigen Personen im Vergleich zur autochthonen Bevölkerung [27, 31]. Neben der Inanspruchnahme medizinischer Dienstleistungen bieten sich in der NAKO

vielfältige Möglichkeiten, die Morbidität und Mortalität der PmM zu untersuchen. Wie in der Übersichtsarbeit von Arnold et al. (2010) für das Krebsrisiko und Moore et al. (2019) für die mentale Gesundheit dargestellt, lassen sich auch in der NAKO Krankheitshäufigkeiten nach Herkunftsregionen aufschlüsseln [32, 33]. Der Anteil von 16,0% PmM in der NAKO ist vergleichbar mit dem Anteil in der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1 des Robert Koch-Instituts) (RKI) (ungewichtet 14,2%), wobei für die NAKO noch keine statistischen Korrekturen vorgenommen wurden [13].

### Limitationen und Stärken

Entsprechend der in dieser Arbeit angewandten Definition des Statistischen Bundesamtes [1] wurden die Informationen über das Geburtsland, die Staatsangehörigkeit und das Einreisejahr der Teilnehmenden sowie das Geburtsland der Eltern verwendet. Informationen über die Staatsangehörigkeit der Eltern standen nicht zur Verfügung. Aufgrund des Zweiten Weltkriegs und der damit verbundenen Vertreibungen ergaben sich deshalb Herausforderungen bei der Zuordnung zu den einzelnen Personengruppen, besonders bei der Gruppe der Nachkommen von Vertriebenen, die als PoM definiert wurden. Diese Gruppe ist sehr groß ( $n = 17.684$ ), da viele Eltern der NAKO-Teilnehmenden in den Ländern Polen, Russland oder Tschechien geboren wurden. Hier kann nicht ausgeschlossen werden, dass es zu Fehlklassifikationen kam. Weitere mögliche Fehlklassifikationen können durch fehlende Werte in einzelnen Variablen entstanden sein, die die Unterscheidung zwischen PmM und PoM erschwert haben. Die Datenvollständigkeit war insgesamt jedoch sehr hoch (beim Geburtsland z. B. lagen nur bei 21 von 101.816 Personen keine Informationen vor), sodass dieses Problem als nicht gravierend angesehen wird. Zu den Stärken der NAKO bezüglich der Analysen nach Migrationshintergrund zählen zweifellos die Größe der Studie und die detaillierte Erfassung von Variablen zur Beschreibung des Migrationshintergrundes der Teilnehmenden. Damit bie-

ten sich bisher nicht vorhandene Möglichkeiten, differenzierte epidemiologische Auswertungen in Bezug auf unterschiedliche Bevölkerungsgruppen in Deutschland vorzunehmen und so vorhandene Erkenntnislücken in deskriptiver und ätiologischer Hinsicht wie auch in Bezug auf Versorgungsaspekte zu schließen.

### Schlussfolgerung

Die PmM sind eine sehr große, heterogene Teilkohorte der NAKO, die verschiedene homogene Teilgruppen enthält. Mit diesen Teilgruppen sind spezifische Untersuchungen möglich. Sie erlauben zukünftig den Vergleich verschiedener Bevölkerungsgruppen sowohl hinsichtlich der Verteilung von Risikofaktoren als auch der Variablen zur gesundheitlichen Versorgung. Dies gilt insbesondere im Hinblick auf die Gesamtkohorte, bei der über 30.000 PmM erwartet werden können. Die bisherigen Ergebnisse haben gezeigt, dass von einem deutlichen Unterschied im Gesundheitsverhalten zwischen einzelnen Migrantengruppen im Vergleich zur autochthonen deutschen Bevölkerung auszugehen ist. Beispielsweise könnten spezifische Angebote zur Nutzung von Vorsorgeuntersuchungen auf der Basis unserer Ergebnisse gerechtfertigt werden.

Die Heterogenität der PmM verdeutlicht die Notwendigkeit, Untergruppen von Migranten separat zu untersuchen. Die Einteilung von PmM nach Herkunftsregionen kann dabei in einigen Fällen sinnvoll sein. Unsere Ergebnisse haben gezeigt, dass die Fallzahlen auch für separate Migrantengruppen innerhalb der NAKO hinreichend groß sind, sodass detaillierte Analysen mit direktem Bezug auf den Migrationsstatus möglich und sinnvoll erscheinen. Dies ist angesichts einer bisher fehlenden umfangreichen Migrantenkohorte in Deutschland ein entscheidender Fortschritt, der einen Beitrag leisten kann zur Hauptthematik der NAKO – der Erforschung von chronischen Erkrankungen und deren Ursachen.

### Korrespondenzadresse

#### Christian Wiessner

Institut für Medizinische Biometrie und Epidemiologie, Universitätsklinikum Hamburg-Eppendorf  
Martinistr. 52, 20251 Hamburg, Deutschland  
c.wiessner@uke.de

**Danksagung.** Wir danken allen Teilnehmerinnen und Teilnehmern der NAKO Gesundheitsstudie sowie den Mitarbeiterinnen und Mitarbeitern der NAKO Gesundheitsstudie. Unser Dank gilt des Weiteren Frau Sylvia Binting, Charité Berlin, für die Erstellung der kartografischen Darstellungen.

**Förderung.** Dieses Projekt wurde mit Daten der NAKO Gesundheitsstudie durchgeführt ([www.nako.de](http://www.nako.de)). Die NAKO Gesundheitsstudie wird durch das Bundesministerium für Bildung und Forschung (BMBF, Förderkennzeichen 01ER1301A/B/C und 01ER1511D), die Bundesländer und die Helmholtz-Gemeinschaft gefördert sowie durch die beteiligten Universitäten und Institute der Leibniz-Gemeinschaft finanziell unterstützt. Christian Wiessner und Heiko Becher wurden durch eine Förderung des Bundesministeriums für Bildung und Forschung (BMBF) unterstützt (Förderkennzeichen 01ER1306, PERGOLA).

**Funding.** Open Access funding provided by Projekt DEAL.

### Einhaltung ethischer Richtlinien

**Interessenkonflikt.** C. Wiessner, T. Keil, L. Krist, H. Zeeb, N. Dragano, B. Schmidt, W. Ahrens, K. Berger, S. Castell, J. Fricke, A. Führer, S. Gastell, H. Greiser, F. Guo, L. Jaeschke, C. Jochem, K.-H. Jöckel, R. Kaaks, L. Koch-Gallenkamp, G. Krause, O. Kuss, N. Legath, M. Leitzmann, W. Lieb, C. Meinke-Franze, C. Meisinger, R. Mikolajczyk, N. Obi, T. Pischon, S. Schipf, C. Schmoor, S. Schramm, M.B. Schulze, N. Sowarka, S. Waniak, C. Wigmann, S.N. Willich und H. Becher geben an, dass kein Interessenkonflikt besteht.

Alle beschriebenen Untersuchungen am Menschen wurden mit Zustimmung der zuständigen Ethik-Kommission, im Einklang mit nationalem Recht sowie gemäß der Deklaration von Helsinki von 1975 (in der aktuellen, überarbeiteten Fassung) durchgeführt. Von allen Teilnehmenden liegt eine Einverständniserklärung vor.

**Open Access** Dieser Artikel wird unter der Creative Commons Namensnennung 4.0 International Lizenz veröffentlicht, welche die Nutzung, Vervielfältigung, Bearbeitung, Verbreitung und Wiedergabe in jeglichem Medium und Format erlaubt, sofern Sie den/die ursprünglichen Autor(en) und die Quelle ordnungsgemäß nennen, einen Link zur Creative Commons Lizenz beifügen und angeben, ob Änderungen vorgenommen wurden.

Die in diesem Artikel enthaltenen Bilder und sonstiges Drittmaterial unterliegen ebenfalls der genannten Creative Commons Lizenz, sofern sich aus der Abbildungslegende nichts anderes ergibt. Sofern das betreffende Material nicht unter der genannten Creative Commons Lizenz steht und die betreffende Handlung nicht nach gesetzlichen Vorschriften erlaubt ist, ist für

die oben aufgeführten Weiterverwendungen des Materials die Einwilligung des jeweiligen Rechteinhabers einzuholen.

Weitere Details zur Lizenz entnehmen Sie bitte der Lizenzinformation auf <http://creativecommons.org/licenses/by/4.0/deed.de>.

## Literatur

1. Statistisches Bundesamt (2018) Fachserie 1 Reihe 2.2. Bevölkerung und Erwerbstätigkeit. Bevölkerung mit Migrationshintergrund – Ergebnisse des Mikrozensus 2017
2. Statistisches Bundesamt (2019) Migration und Integration. Bevölkerung nach Migrationshintergrund und Geschlecht. <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Tabellen/liste-migrationshintergrund-geschlecht.html>. Zugegriffen: 19. Aug. 2019
3. Razum O, Zeeb H, Gerhardus A (1998) Cardiovascular mortality of Turkish nationals residing in west Germany. *Ann Epidemiol* 8(5):334–341
4. Kaucher S, Leier V, Deckert A et al (2017) Time trends of cause-specific mortality among resettlers in Germany, 1990 through 2009. *Eur J Epidemiol* 32(4):289–298
5. Ikram MUZ (2016) Social determinants of ethnic minority health in Europe
6. Abbott A (2016) The mental-health crisis among migrants. *Nature* 538(7624):158
7. Norredam M, Nielsen SS, Krasnik A (2009) Migrants' utilization of somatic healthcare services in Europe—a systematic review. *Eur J Public Health* 20(5):555–563
8. Uiters E, Devillé W, Foets M, Spreeuwenberg P, Groenewegen PP (2009) Differences between immigrant and non-immigrant groups in the use of primary medical care; a systematic review. *BMC Health Serv Res* 9(1):76
9. Klein J, von dem Knesebeck O (2018) Inequalities in health care utilization among migrants and non-migrants in Germany: a systematic review. *Int J Equity Health* 17(1):160
10. Panagiotidis J (2015) Aussiedler/Spätaussiedler. <https://ome-lexikon.uni-oldenburg.de/p32717>. Zugegriffen: 15. Jan. 2020
11. Rechel B, Mladovsky P, Ingleby D, Mackenbach JP, McKee M (2013) Migration and health in an increasingly diverse Europe. *Lancet* 381(9873):1235–1245
12. Schenk L, Bau AM, Borde T et al (2006) Mindestindikatorensatz zur Erfassung des Migrationsstatus. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 49(9):853–860
13. Saß AC, Grüne B, Bretschneider AK, Rommel A, Razum O, Ellert U (2015) Beteiligung von Menschen mit Migrationshintergrund an Gesundheitssurveys des Robert Koch-Instituts. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 58(6):533–542
14. Reiss K, Dragano N, Ellert U et al (2014) Comparing sampling strategies to recruit migrants for an epidemiological study. Results from a German feasibility study. *Eur J Public Health* 24(5):721–726
15. Winkler V, Leitzmann M, Obi N et al (2014) Response in individuals with and without foreign background and application to the national cohort in Germany: which factors have an effect? *Int J Public Health* 59(3):555–563
16. Flood DM, Weiss NS, Cook LS, Emerson JC, Schwartz SM, Potter JD (2000) Colorectal cancer incidence in Asian migrants to the United States and their descendants. *Cancer Causes Control* 11(5):403–411
17. Singh GK, Hiatt RA (2006) Trends and disparities in socioeconomic and behavioural characteristics, life expectancy, and cause-specific mortality of native-born and foreign-born populations in the United States, 1979–2003. *Int J Epidemiol* 35(4):903–919
18. Razum O, Zeeb H, Akgün HS, Yilmaz S (1998) Low overall mortality of Turkish residents in Germany persists and extends into a second generation: merely a healthy migrant effect? *Trop Med Int Health* 3(4):297–303
19. Aarabi G, Reissmann DR, Seedorf U, Becher H, Heydecke G, Kofahl C (2018) Oral health and access to dental care—a comparison of elderly migrants and non-migrants in Germany. *Ethn Health* 23(7):703–717
20. Hagenfeld D, Zimmermann H, Korb K et al (2019) Periodontal health and use of oral health services: a comparison of Germans and two migrant groups. *Int J Environ Res Public Health* 16(16):3000
21. Schipf S et al (2020) Die Basiserhebung der NAKO Gesundheitsstudie: Teilnahme an den Untersuchungsmodulen und ihre Qualitätssicherung. Im Druck
22. German National Cohort (GNC) Consortium (2014) The German national cohort: aims, study design and organization. *Eur J Epidemiol* 29:371–382
23. Razum O, Zeeb H, Meesmann U et al (2008) Schwerpunktbericht der Gesundheitsberichterstattung des Bundes – Migration und Gesundheit
24. UN Statistics Division (2019) Standard country or area codes for statistical use (M49). <https://unstats.un.org/unsd/methodology/m49/>. Zugegriffen: 28. Aug. 2019
25. Bundeszentrale für politische Bildung (2018) Ausländische Bevölkerung nach Aufenthaltsdauer. <http://www.bpb.de/nachschlagen/zahlen-und-fakten/soziale-situation-in-deutschland/61628/aufenthaltsdauer>. Zugegriffen: 3. Sept. 2019
26. Aparicio ML, Döring A, Mielck A, Holle R (2005) Unterschiede zwischen Aussiedlern und der übrigen deutschen Bevölkerung bezüglich Gesundheit, Gesundheitsversorgung und Gesundheitsverhalten: eine vergleichende Analyse anhand des KORA-Surveys 2000. *Soz Präventivmed* 50(2):107–118
27. Berens EM, Stahl L, Yilmaz-Aslan Y, Sauzet O, Spallek J, Razum O (2014) Participation in breast cancer screening among women of Turkish origin in Germany—a register-based study. *BMC Womens Health* 14(1):24
28. David M, Borde T, Brenne S et al (2014) Comparison of perinatal data of immigrant women of Turkish origin and German women—results of a prospective study in Berlin. *Geburtshilfe Frauenheilkd* 74(05):441–448
29. Kavuk I, Weimar C, Kim BT et al (2006) One-year prevalence and socio-cultural aspects of chronic headache in Turkish immigrants and German natives. *Cephalalgia* 26(10):1177–1181
30. Spallek J, Lehnhardt J, Reeske A, Razum O, David M (2014) Perinatal outcomes of immigrant women of Turkish, middle eastern and north African origin in Berlin, Germany: a comparison of two time periods. *Arch Gynecol Obstet* 289(3):505–512
31. Zollmann P, Pimmer V, Rose AD, Erbstößer S (2016) Psychosomatische Rehabilitation bei deutschen und ausländischen Versicherten der Rentenversicherung im Vergleich. *Rehabilitation* 55(06):357–368
32. Arnold M, Razum O, Coebergh JW (2010) Cancer risk diversity in non-western migrants to Europe: an overview of the literature. *Eur J Cancer* 46(14):2647–2659
33. Moore L, Jayaweera H, Redshaw M, Quigley M (2019) Migration, ethnicity and mental health: evidence from mothers participating in the millennium cohort study. *Public Health* 171:66–75

## **7.2 Thesis Article 2**

Wiessner, C., von dem Knesebeck, O., Gerlich, M. G., Briken, P., & Becher, H. (2022). Migration and sexual health services use—Results from the German health and sexuality survey (GeSiD). *Sexuality Research and Social Policy*, 19(3), 1383-1394. <https://doi.org/10.1007/s13178-022-00691-1>

### **7.2.1 Statement of own contributions**

- Conceptualization of research idea
- Implementation of methodology
- Data analysis and visualization of results
- Preparation of original manuscript draft
- Revision of the manuscript





# Migration and Sexual Health Services Use – Results from the German Health and Sexuality Survey (GeSiD)

Christian Wiessner<sup>1,2</sup> · Olaf von dem Knesebeck<sup>3</sup> · Miriam G. Gerlich<sup>4</sup> · Peer Briken<sup>2</sup> · Heiko Becher<sup>1</sup>

Accepted: 14 January 2022  
© The Author(s) 2022

## Abstract

**Introduction** Migration background is an important predisposing characteristic of health service use (HSU). In this cross-sectional survey, we aim to explore the association between migration background and HSU in the context of sexual health.

**Methods** In a population-representative sample of 4,955 persons from all German federal states (data collection 2018/2019), we examined the HSU of first-generation (15.9% of the total sample) and second-generation migrants (9.8%) compared to non-migrants (74.3%). Outcomes of sexual HSU ranged from primary and secondary prevention measures such as human papillomaviruses (HPV) vaccination and chlamydia test to HSU due to sexual problems in the relationship, and consultations on contraceptives, and HIV or other STIs.

**Results** Generally, first-generation migrants used sexual health services less often than non-migrants. Notably, first-generation migrant women had lower odds of being vaccinated against HPV (OR = 0.24; 95% CI: 0.14; 0.38), of a lifetime use of both a chlamydia test in the context of a screening program for young women (OR = 0.21; 95% CI: 0.11; 0.39), and a HSU due to contraceptives (OR = 0.40; 95% CI: 0.28; 0.58). Second-generation migrants resembled more closely the non-migrants, only showing differences regarding the use of the HPV vaccination (OR = 0.48; 95% CI: 0.30; 0.76).

**Policy Implications** First-generation migrants showed remarkable differences in the HSU compared to non-migrants. Therefore, this group should be targeted with the aim of a more equitable HSU that is mainly based on the needs for health services and not restricted due to formal or informal barriers. Both migration generations had lower odds of being vaccinated against HPV indicating the need for a better education regarding the benefits and risks of vaccinations.

**Keywords** Health service use · HPV vaccination · Chlamydia test · Contraceptives · Migration · Generational cohorts approach · Native population

---

Peer Briken and Heiko Becher are joint last authors.

---

✉ Christian Wiessner  
c.wiessner@uke.de

<sup>1</sup> Institute of Medical Biometry and Epidemiology, University Medical Center Hamburg-Eppendorf, Martinistr. 52, 20246 Hamburg, Germany

<sup>2</sup> Institute of Sex Research, Sexual Medicine and Forensic Psychiatry, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

<sup>3</sup> Institute of Medical Sociology, University Medical Center Hamburg Eppendorf, Hamburg, Germany

<sup>4</sup> Federal Centre for Health Education, Cologne, Germany

## Introduction

Globally, 3.5% (272 million people) of the world population are international migrants (United Nations, 2020a). In Germany, persons with a migration background are a large and increasing group as well. In the past decade, their share of the total population rose from 18.8% to 26.0% (Statistisches Bundesamt, 2020). However, migrants are a highly diverse group. This diversity is among others reflected in different countries of origin from various cultural backgrounds, the reasons for migration, the time since arrival in the host country, and their education (Kao, 2009; Rechel et al., 2013; Wiessner et al., 2020). One way to operationalize the diversity in migrant populations is to distinguish

between first- and second-generation migrants (Glaesmer et al., 2011). First-generation migrants have an own migration experience, while second-generation migrants are descendants of persons who migrated. Previous comparisons between first- and second-generation migrants and the native population investigated different outcomes, such as education, earnings, employment (Algan et al., 2010), and health service use (Glaesmer et al., 2011), but as far as we know not sexual health.

## Health Service Use of Migrants

Health service use (HSU) is a complex behavior that is influenced by many factors, migration status being one of them. Several systematic reviews found that migrants differ in their HSU compared to the native population with an overall tendency to lower utilization proportions among migrants (Norredam et al., 2010; Uiters et al., 2009; Sarría-Santamera et al., 2016; Klein & von dem Knesebeck, 2018). However, the utilization patterns depend on the specific health services under investigation, the classification of migrants, and the country where the study is conducted. In Germany, first-generation migrants used the services of medical specialists, and preventive measures such as cancer screening less often, whereas second-generation migrants showed utilization behaviors that were more similar to the native population (Glaesmer et al., 2011; Rommel et al., 2015; Wiessner et al., 2020). Notably, there is a growing awareness that no general pattern regarding HSU of migrants can be observed and, thus, scientific investigations have to be seen in the light of the context of the health system of a country, and the migrant groups as well as the specific health services under investigation (Uiters et al., 2009).

The HSU in the sexual health context is less thoroughly investigated than e.g. the use of primary care among migrants. Migrant populations in Canada and Germany were found to have lower vaccination proportions against human papillomaviruses (HPV), and have a lower awareness towards the HPV immunization compared to the native population (Remschmidt et al., 2014; Sadry et al., 2013). In the Netherlands, migrants were later diagnosed with HIV, and had a higher likelihood of experiencing difficulties in the use of general healthcare services as well as a lower awareness towards post-exposure prophylaxis than non-migrants (Bil et al., 2019). A lower knowledge about different sexually transmitted infections (STIs) was also found in 9th grade school children with a migration background in a sample in Germany compared to non-migrant children (von Rosen et al., 2018). A recent systematic review found that migrants from South East Asia and Sub-Saharan Africa faced multiple barriers in high-income countries regarding the access to health care services related to sexual health (Rade et al.,

2018). These barriers included a low knowledge about the health care system and a resulting difficulty to navigate in it, feelings of stigma, shame and embarrassment to talk about sexual health, and a lacking cultural competency of health care providers.

## Andersen Model of Health Service Use

The knowledge about the health care system is one factor that influences the HSU. Further factors are incorporated into Andersen's behavioral model of health service use that is most commonly used in this context, and which will be the conceptual model for our analyses (Andersen, 2008; Babitsch et al., 2012). In this model, HSU is influenced by three groups of factors: "predisposing characteristics," "enabling resources," and "need factors." Predisposing characteristics describe the observation that persons differ in their propensity to use health services based on their demographics, health beliefs, and social structure. Thus, migration status is a predisposing characteristic. Enabling resources are those factors that allow people to use health services, such as the financial ability, an existing health insurance, or the availability of health services in proximity to the living place. Need factors are those factors that directly influence the HSU due to illness, the wish for prevention, or other counseling needs. In this paper we differentiate between need factors that influence HSU as a predictor, and additionally we investigate if migration status is a predictor for unmet needs, i.e., where participants stated a wish for the use of health services, but did not consult a medical professional.

## Current Study – Aim and Hypotheses

In this study, we aim to investigate if migration status is associated with the HSU. Additionally, we study the relationship between migration status and unmet needs of health services, the knowledge of specific preventive measures, and the satisfaction with consultations. The health services under investigation are consultations due to sexual problems, and the use of the primary and secondary preventive measures of a HPV vaccination, and a chlamydia test. With both the HPV vaccination and the chlamydia test, we aimed to investigate unfulfilled potentials to avoid STIs through a use of health services that is aligned with the effort to limit the spread of these STIs. Thereby, both personal and public health may be improved. Moreover, we examine the use of health services in which participants either stated that they communicated with a physician or wish to communicate with a physician due to sexual problems in the relationship, HIV or other STIs, and contraceptives. An unfulfilled wish to communicate with a medical professional is conceptualized as an unmet need. Finally, we compare the migration generations with non-migrants regarding the knowledge about the

preventive measures of a HPV vaccination and a chlamydia test, and the satisfaction with consultations concerning sexual problems. For the sexual problems, we further explore the reasons not to use health services, although a problem was experienced. Generally, we hypothesized that first-generation migrants differ in the various dimensions compared to non-migrants, while we expected that the knowledge and HSU from second-generation migrants resembled more closely the one observed for non-migrants.

## Methods

### Study Design and Sample

The data analyzed stem from the German Health and Sexuality Survey (GeSiD), a cross-sectional study with a population-representative sampling scheme (Matthiesen et al., 2021). Two hundred sample points from all German federal states were randomly chosen, from which 18- to 75-year-old participants were randomly sampled. The data collection took place from October 2018 to September 2019, and the final dataset comprised 4,955 persons, which corresponded to a response proportion of 30.2% (Response Proportion 4 according to: American Association for Public Opinion Research, 2016). All persons living in private households were eligible to be included in the study; only persons living in an institution were excluded by study design.

Trained interviewers conducted interviews in the participant's homes. Prior to the interviewer's visit, the sampled participants received an invitation letter with brief information about the study. The data were acquired by a computer-assisted personal interview (CAPI), and a computer-assisted self-interview (CASI). In the CAPI part, general sociodemographic questions were asked, while the CASI part contained the more sensitive questions. The questionnaire was pretested in a pilot study among 1,555 participants and

comprised 263 questions in German language (Matthiesen et al., 2018). Average time for an interview was 51 minutes. The GeSiD study received approval from the Ethical Board of the State Psychotherapy Chamber in Hamburg (reference: 07/2018-PTK-HH). A detailed description of the methodology of the GeSiD study can be found in Matthiesen et al. (2021).

### Conceptual Model

A conceptual model on the basis of Andersen's behavioral model of health service use was developed that categorized the predictors into enabling resources, need factors, and predisposing characteristics. The migration background is a predisposing characteristic, while further factors that influence HSU were included into the analyses as covariates (gender, age, education, and relationship status as predisposing characteristics, urban/rural residence as an enabling resource, and general health status as a need factor). Outcomes were classified into knowledge about the health care system, HSU (differentiated into either consultations due to a specific medical reason, or the communication about an issue during a medical visit), unmet needs, and satisfaction with health services used (Table 1). We were interested not only in the knowledge about the health care system, HSU, and satisfaction with HSU as outcomes, but also whether migrants differ in their unmet needs for sexual health services from non-migrants. Therefore, we included unmet needs as outcomes in our analyses, which is a slight deviation from the Andersen model as it is commonly used.

### Measures of Predictors

*Migration Background as a Predisposing Characteristic* The migration background was assigned in accordance with the definition of the German Statistical Office (Statistisches Bundesamt, 2018). A person has a migration background,

**Table 1** Conceptual model of health behavior on the basis of Andersen's model of health service use

<b>Predictors</b>				
Predisposing characteristics	Enabling resources	Need factors		
<b>Migration background</b>	Urban/rural residence	General health status		
Gender				
Age				
Education				
Relationship status				
<b>Outcomes</b>				
Knowledge	Health service use: Consultation	Health service use: Communication	Unmet needs	Satisfaction
HPV vaccination	HPV vaccination	Sexual problems in relationship	Sexual problems in relationship	Satisfaction with consultation due to sexual problems
Chlamydia test	Chlamydia test	HIV or other STIs	HIV or other STIs	
	Sexual problems	Contraceptives	Contraceptives	



if the person itself or at least one parent did not have the German citizenship at birth. Questions about the birth country of the participant and her/his parents, and the current citizenship(s) of the participant and her/his parents' citizenship at birth were used to evaluate the migration status. Participants with a migration background who were born in Germany are considered second-generation migrants, while those with an own migration experience are subsequently termed first-generation migrants. For 4,931 of 4,955 participants, the migration status could be obtained, while 24 participants did not provide sufficient information for classification and were thus excluded from further analyses.

**Further Predisposing Characteristics** Education was categorized into low (no completed school or primary education), medium (secondary education), and high (tertiary education). Relationship status was a binary measure indicating whether participants were in a relationship or not. Age was treated as a continuous variable, and sex as a binary variable using the information from the registry office.

**Enabling Resources** The residence of participants was obtained by registry data, and dichotomized into rural (living in a settlement of up to 5,000 inhabitants) and urban (living in a settlement of more than 5,000 inhabitants).

**Need Factors** General health status was measured as one item on a 5-point scale ranging from very good to very poor.

## Outcome Measures

**Knowledge About Health Services** The survey asked women about their awareness of two preventive measures, vaccination against HPV between the ages of 9 and 14 years, and a yearly free-of-charge chlamydia test (screening) for young women as secondary prevention which is offered for sexually active women under 25 years in Germany.

### Health Service Use: Consultation

For the HPV vaccination and the chlamydia test, those women who knew these preventive measures were asked if they were vaccinated against HPV/ever were tested for chlamydia in the context of the screening program. Women aged between 18 and 35 were questioned, because both preventive measures were only recommended since 2007 (HPV vaccination, Robert Koch-Institut, 2007), respectively 2008 (Chlamydia screening program, Gemeinsamer Bundesausschuss, 2008), and incorporated into the free-of-charge offer of German insurance companies. Moreover, all participants were asked if they had sought professional advice and support in the past 5 years due to any sexual problem. Sexual problems under consideration were a reduced sexual desire,

problems to reach an orgasm, reduced reactions to sexual stimuli (only women), pain during sex (only women), premature ejaculation (only men), and problems to get an erection (only men) (Briken et al., 2020).

### Health Service Use: Communication and Unmet Needs

Participants were further asked if they ever talked to a physician or had the wish to talk to a physician about the following three topics:

- Sexual problems in the relationship
- HIV/AIDS or other STIs
- Contraceptives

The questions had three possible answers, “Yes, I talked to a physician,” “No, but I would like to,” and “No, and I don't want to.” Those participants who stated that they did not talk to a physician but would like to were regarded to have an unmet need.

### Satisfaction with Services Used

For the health service use due to sexual problems, the participants who visited a medical professional were questioned about their satisfaction with the consultation. Satisfaction was measured on a 5-point scale ranging from very satisfied to very dissatisfied. This scale was dichotomized into high degree of satisfaction (very satisfied, quite satisfied) vs. low degree of satisfaction (neither satisfied nor dissatisfied, quite dissatisfied, very dissatisfied).

### Reasons Not to Use Health Service Despite a Perceived Need

Participants who had a need for health services due to sexual problems, but did not consult a medical professional were asked about the reasons why they did not seek for help. Eleven options were given that were e.g. related to shame (“I found it embarrassing,” “I didn't want others to know about my problem”), language problems (“I couldn't talk about my problem”), preferences of the partner (“My partner didn't approve”), and the services in the community (“There were no such services offered where I live,” “The waiting periods were too long”).

### Statistical Analysis

In the GeSiD study, the selection of participants was carried out as a stratified and clustered random sample. Due to varying response proportions in different population groups (by sex, age, education, nationality, and region) and an oversampling of young participants (18–35 years), a weighting was

applied in order to get a representative sample of the German population in the age range 18 to 75 years. Therefore, a survey data analysis was carried out that accounted for the strata, cluster, and weights. In a first step, a crude analysis of the proportions for the different outcomes was conducted that was stratified by migration status. Then, multiple logistic regressions were employed. All regression models included migration background as the main predisposing characteristic of interest, and adjusted for gender, age, education, relationship status, urban/rural residence, and general health status. The following outcomes were binary and thus analyzed via binary logistic regression:

- Knowledge (HPV vaccination, and chlamydia test)
- Health service use: consultation (HPV vaccination, chlamydia test, sexual problems)
- Satisfaction with consultation due to sexual problems

The outcomes related to “Health service use: communication” and “Unmet needs” had three independent categories, and were therefore assessed via multinomial logistic regression. These were the questions related to sexual problems in a relationship, HIV/AIDS or other STIs, and contraceptives. The communication with a physician and unmet needs in these topics were compared to the category “both no use and no need” as the reference category.

For all outcomes, we report adjusted odds ratios (aOR) with the corresponding 95% confidence interval (CI). First- and second-generation migrants were compared to non-migrants as the reference category. Interactions between gender and migration status were assessed via significance of the regression coefficient (significance level  $\alpha = 0.05$ ). If an interaction was present, the model was stratified by

gender. A complete case analysis was conducted, because for all regression models less than 5% of eligible participants were lost due to missing values.

Additionally, cross tabulations were computed between migration status and the reasons not to use health services regarding sexual problems. Cross tabulations for categorical variables were compared by the chi-square test for survey samples (the Rao-Scott test, Rao & Scott, 1981). All analyses were conducted with SAS software version 9.4 (SAS Institute, Cary, NC); for figures the ggplot2 package of the statistical software R was used.

## Results

Among 4,931 participants where we could assign a migration status, 636 (12.9%) were first-generation migrants, and 484 (9.8%) second-generation migrants (Table 2). First- and second-generation migrants were in comparison to non-migrants on average younger, had more often a low education, and a better general health status. However, there were no differences in the general health status after adjustment for age (not shown in detail). Additionally, first-generation migrants were more often highly educated compared to non-migrants, while there were no sex differences between the three groups. The most common foreign birth countries of migrants were Poland ( $n = 76$ ), Russia ( $n = 62$ ), Kazakhstan ( $n = 43$ ), Turkey ( $n = 40$ ), and Syria ( $n = 30$ ). Three out of four second-generation migrants and 1 out of 5 first-generation migrants had German as their mother language (Table 3). While the majority of first-generation migrants (93.3%) had a two-sided migration background,

**Table 2** Sociodemographic characteristics

	Persons without migration background (unweighted $N = 3811$ , weighted $N = 3660$ )	Persons with migration background (1st generation) (unweighted $N = 636$ , weighted $N = 783$ )	Persons with migration background (2nd generation) (unweighted $N = 484$ , weighted $N = 483$ )	$p$ -value
Female gender (%)	50.0	49.9	48.6	0.880
Age (Mean(SD))	48.4 (15.3)	41.9 (15.7)	37.2 (14.6)	<0.001
In relationship (%)	76.8	75.3	68.9	0.007
Education (%)				
Low	29.5	38.3	37.4	<0.001
Medium	35.1	20.2	26.5	
High	35.5	41.5	36.1	
General health status (%)				
Very good	23.1	32.4	35.4	<0.001
Good	52.6	50.3	45.7	
Average	19.8	13.8	14.8	
Poor	3.6	2.2	3.1	
Very poor	0.9	1.4	0.9	
Urban residence (%)	83.7	93.0	91.7	<0.001

**Table 3** Characteristics of the persons with migration background

	Persons with migration background (1st generation, <i>N</i> =636)	Persons with migration background (2nd generation, <i>N</i> =484)
<b>Place of Origin (% (<i>n</i>))</b>		
Africa	3.8 (24)	
Asia	33.9 (212)	
Northern/Western Europe	9.6 (60)	
Eastern Europe	39.6 (248)	
Southern Europe	13.9 (87)	
Northern America	0.6 (4)	
Middle/Southern America	3.4 (21)	
Missing values	(10)	
<b>Place of origin father (% (<i>n</i>))</b>		
Africa		3.1 (15)
Asia		22.9 (111)
Northern/Western Europe		7.6 (37)
Eastern Europe		19.8 (96)
Southern Europe		16.7 (81)
Northern America		1.0 (5)
Middle/Southern America		1.7 (8)
Germany		27.1 (131)
<b>Place of origin mother (% (<i>n</i>))</b>		
Africa		1.7 (8)
Asia		21.7 (105)
Northern/Western Europe		7.4 (36)
Eastern Europe		20.9 (101)
Southern Europe		13.0 (63)
Northern America		0.8 (4)
Middle/Southern America		1.2 (6)
Germany		33.3 (161)
<b>German mother language (% (<i>n</i>))</b>		
Yes	19.5 (123)	75.6 (365)
Missing values	(5)	(1)
<b>One-sided/two-sided migration back- ground (% (<i>n</i>))</b>		
One-sided	6.9 (36)	55.3 (259)
Two-sided	93.1 (488)	44.7 (209)
Missing values	(112)	(16)

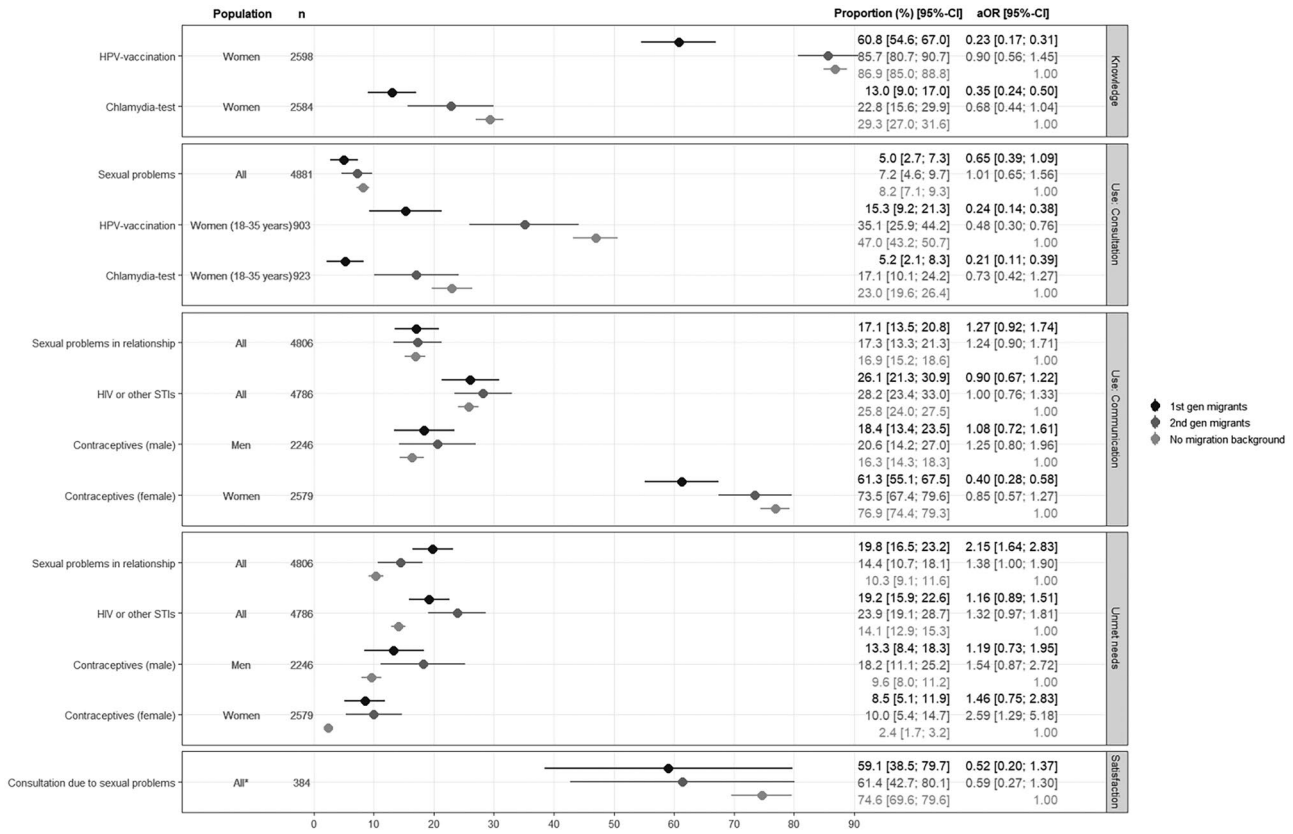
second-generation migrants more often had a one-sided migration history of their parents (55.3%).

Results from crude analyses (proportions stratified by migration status) as well as the multiple regression models (adjusted odds ratios (aOR)) are depicted in Fig. 1. Generally, first-generation migrants differed in various dimensions compared to non-migrants, while second-generation migrants resembled more closely the non-migrant population. First-generation migrant women were less aware of the preventive measures HPV vaccination (aOR = 0.23, 95% CI 0.17–0.31) and chlamydia test (aOR = 0.35, 95% CI 0.24–0.50) than non-migrant women, while second-generation migrant women were in between these numbers.

The utilization of the two preventive measures HPV vaccination and the chlamydia test differed between the migration generations, and non-migrants. While almost half of the non-migrant women between 18 and 35 years

got a vaccination (47.0%), only about one-third of the second-generation migrant women (35.1%, aOR = 0.48, 95% CI 0.30–0.76) and 1 out of 7 of the first-generation women (15.3%, aOR = 0.24, 95% CI 0.14–0.38) used the HPV vaccination. Similarly, non-migrant women used the free-of-charge chlamydia test most often (23.0%), followed by second- (17.1%, aOR = 0.73, 95% CI 0.42–1.27) and first-generation migrant women (5.2%, aOR = 0.21, 95% CI 0.11–0.39). The HSU due to sexual problems showed small differences between the three groups; first-generation migrants consulted a medical professional with the lowest probability (aOR = 0.65, 95% CI 0.39–1.09).

The outcomes related to the communication with a medical professional or the unfulfilled wish to talk to a doctor (unmet needs) about a specific issue differed between both migration generations and non-migrants. First- and second-generation migrants reported higher unmet needs for professional



**Fig. 1** Knowledge about preventive measures, need factors, use of health services, and satisfaction with a professional consultation due to sexual problems stratified by migration status, and odds ratios from multiple logistic regression models comparing first- and second-generation migrants to persons without a migration background. Odds ratios with

95% confidence intervals [95% CI] are adjusted for gender, age, education, relationship status, urban/rural residence, and general health status. First-gen migrants: persons with a migration background and an own migration experience. Second-gen migrants: persons with a migration background that were born in Germany

consultations than non-migrants. First-generation migrants experienced comparatively high unmet needs for HSU concerning sexual problems in the relationship (aOR=2.15, 95% CI 1.64–2.83), while second-generation migrants had comparatively high unmet needs for a HSU concerning contraceptives (female: aOR=2.59, 95% CI 1.29–5.18, male: aOR=1.54, 95% CI 0.87–2.72). Communication about sexual problems, HIV, or other STIs and contraceptives was similar for the two migration generations and non-migrants. However, first-generation women spoke about contraceptives less frequently (aOR=0.40, 95% CI 0.28–0.58) than second-generation women and the non-migrant women.

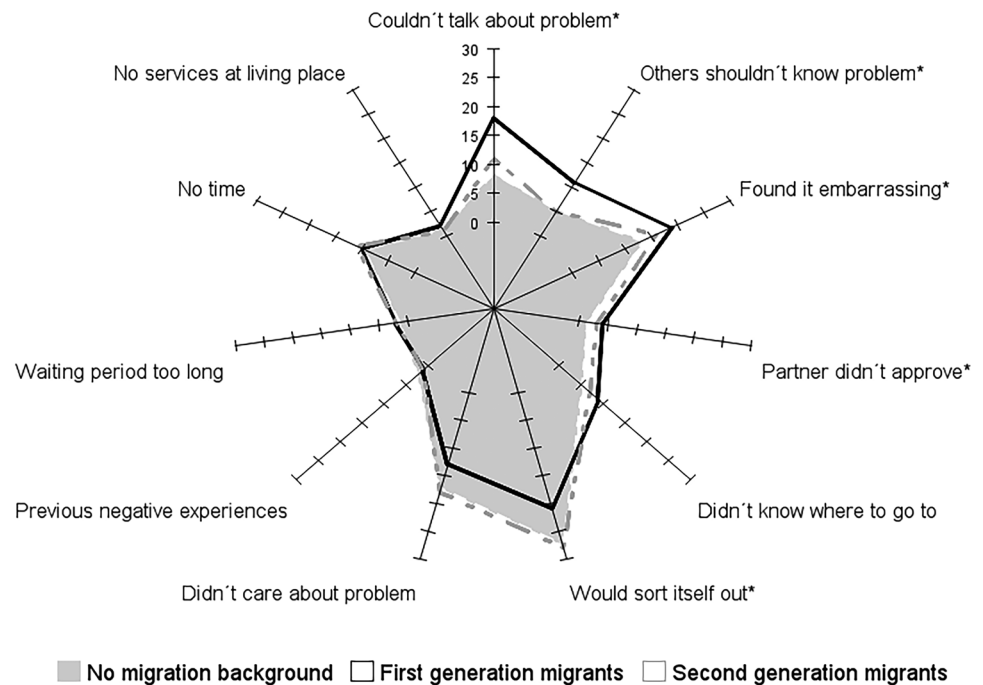
Satisfaction with consultations in the subpopulation of persons seeking medical advice for sexual problems differed between migrants and non-migrants. Both first- (59.1% satisfied, aOR = 0.52, 95% CI 0.20–1.37) and second-generation migrants (61.4% satisfied, aOR = 0.59, 95% CI 0.27–1.30) were less satisfied with the consultations compared to non-migrants (74.6% satisfied).

The reasons not to use health services regarding sexual problems differed between non-migrants and the two migration generations (Fig. 2). Significant differences were found for the following reasons:

- “I couldn’t talk about my problem” (17.9% first-generation migrants, 12.1% second-generation migrants, 8.6% non-migrants respectively)
- “I didn’t want others to know about my problem” (11.6%, 5.7%, 5.6%)
- “I found it embarrassing” (19.7%, 15.6%, 13.6%)
- “My partner didn’t approve” (4.2%, 3.4%, 1.2%)
- “I assumed that the problem would sort itself out” (20.8%, 27.9%, 27.7%)

First-generation migrants reported reasons related to shame, language problems, and partner approval more often than non-migrants, while they expected it less often that the problem would settle without professional help.

**Fig. 2** Reasons not to seek professional advice despite a perceived need for a consultation due to sexual problems stratified by migration status. Answers marked with an asterisk (\*) differ significantly between at least two groups indicated by the chi-square test for survey samples (Rao-Scott test)



## Discussion

Our aim was to compare first- and second-generation migrants with non-migrants regarding sexual HSU, knowledge about health services, unmet needs, and satisfaction with HSU in a population-representative study. Generally, first-generation migrants differed in many dimensions from the non-migrants. In contrast, non-migrants and second-generation migrants showed a more similar behavior regarding many of the outcomes. The only HSU where both migration generations differed significantly from non-migrants was the HPV vaccination. While first-generation migrant women (60.8%) had a lower knowledge about the existence of this primary prevention measure, second-generation migrant women (85.7%) and native-born German women (86.9%) did not differ in their awareness. Thus, the differences in the vaccination proportions between these two groups cannot be explained by the knowledge about the existence of this prevention measure. Additionally, the chlamydia test and HSU concerning contraceptives (in the female population) were less often used by first-generation migrants compared to non-migrants, and second-generation migrants. The differences in HSU between first- and second-generation migrants show the necessity to take into account the heterogeneity of migrant populations, an argument brought up by other authors as well (Norredam et al., 2010; Rechel et al., 2013).

## Migration Status

The identification and classification of migrants in the HSU literature is as diverse as the migration population itself.

Migration status is identified by varying combinations of characteristics like nationality, country of birth, ethnicity/race, mother language, and self-identification (Uiters et al., 2009). Classifications may be done by specific regions/countries of origin (e.g., Lagerlund et al., 2002), one- or two-sided migration background (e.g., Brzoska & Abdul-Rida, 2016), time since arrival (e.g., Rivera et al., 2015), acculturation assessment (e.g., Mikołajczyk et al., 2008), and migration generation (e.g., Glaesmer et al., 2011). Still, often a simple binary categorization “migrants vs. non-migrants” is used (e.g., Knopf et al., 2012). We identified the participants’ migration status by their own and their parents’ nationality at birth and their birth country. Subsequently, we classified migrants by their generation; i.e., we differentiated between migrants who were born abroad (first-generation migrants), and persons who were born in Germany, while their parents had a migration experience (second-generation migrants). The differences that we found between first- and second-generation migrants corroborate the need to take the diversity of migrant populations into account. In a previous work (Wiessner et al., 2020), we investigated the use of colorectal cancer screening in a large cohort study, and found that the migration generation was the characteristic explaining the largest part of the difference in HSU between migrants and non-migrants. Glaesmer et al. (2011) came to similar conclusions investigating the HSU of general practitioners and medical specialists.

## Health Service Use in the Context of Sexuality

In this paper, we explored the communication with a physician about sexual problems in the relationship, HIV or other



STIs, and contraceptives. We further investigated the HSU regarding consultations due to sexual problems, a chlamydia test in the context of a screening program, and a HPV vaccination. Notably, Renschmidt et al. (2014) found a similar association between migration background and HPV vaccine uptake in a sample of women between 20 and 25 years from Germany. In a Canadian study, a positive association between the knowledge about the HPV vaccination and an interest to be vaccinated was found in a population of Caucasian and non-Caucasian women (Sadry et al., 2013). In contrast, our results revealed that second-generation migrants in Germany had a similar knowledge about the HPV vaccination compared to non-migrants, but had a substantial lower HPV vaccine uptake. For the remaining health services under investigation, no significant differences between second-generation migrants and non-migrants were found, albeit there were tendencies towards a lower awareness about the possibility to be tested for chlamydia, and the actual HSU of a chlamydia test. However, second-generation migrants showed higher unmet needs regarding HSU. Particularly, second-generation migrants had high unmet needs concerning the communication with a physician about contraceptives. This finding is in accordance with the literature, where unmet needs for a HSU concerning contraceptive advice in migrant population were found in different countries and migrant populations (Allotey et al., 2004; Aptekman et al., 2014; Ellawela et al., 2017; Gele et al., 2019). Globally, nearly 200 million women in the reproductive age have an unmet need for the use of contraceptives, which, as a result, leads to mistimed or unwanted pregnancies that contribute to high rates of abortions (United Nations, 2020b). By addressing the unmet needs for health services concerning contraceptives, these unwanted effects may be reduced in migrant populations. Markedly, both migration generations had comparatively high unmet needs for all outcomes in our analysis. First-generation migrants reported particularly high unmet needs for health services regarding sexual problems in the relationship. Medical professionals should be aware that 1 out of 5 first-generation migrants have unmet needs to communicate about sexual problems in the relationship.

We further investigated the satisfaction with the HSU. Both migration generations were less satisfied with consultations due to sexual problems compared to non-migrants. However, the number of persons who consulted a physician due to sexual problems was small ( $n = 384$ ), and the results were not significant. Yet, only 59.1% of the first-generation migrants, and 61.4% of the second-generation migrants were satisfied with the consultations compared to 74.6% of the non-migrants. Therefore, the satisfaction with sexual HSU in migrant populations is a topic for further research, ideally in larger samples than ours. In a recent German study, parents with a migration background were less satisfied with the ambulant health care provision for their children

compared to parents without a migration background (Frank et al., 2020).

## Access and Barriers to Health Service Use

Formal and informal barriers restrict the access to health services. Formal barriers for HSU of migrants are considered to be legal entitlements, not having a health insurance, and costs for services (Rechel et al., 2013). These barriers are greatest for asylum seekers and undocumented migrants. In our sample of participants living in private homes, the more informal barriers were hypothesized to be the greater source of variability in HSU between migrants and non-migrants. These include language problems, problems to navigate in the health system, inadequate health literacy, social exclusion, and discrimination (Rechel et al., 2013). In our study, we investigated the reasons not to use health services due to sexual problems, although a need was perceived. While second-generation migrants and non-migrants did not differ significantly in their motives for no HSU, first-generation migrants showed differences. Informal barriers played an important role not to consult a physician. Reasons related to shame (“I didn’t want others to know about my problem,” “I found it embarrassing”) and language problems (“I couldn’t talk about my problem”) were more frequently mentioned by first-generation migrants compared to the other two groups. In contrast, first-generation migrants less frequently expected that the problem would sort itself out without professional support compared to both second-generation migrants and non-migrants. Markedly, formal barriers did not play a role for no HSU; the access to services was comparable between the three groups. No services at the living place and too long waiting periods were mentioned by few participants from both migration generations and non-migrants.

## Strengths and Limitations

Our study was the first to investigate different outcomes of sexual HSU in a large German sample. The data in our study were obtained by population-representative sampling, and persons with a migration background (unweighted: 22.7%, weighted: 25.7%) were represented similar to the general population (26.0%, Statistisches Bundesamt, 2020). Additionally, we asked about different dimensions of HSU; thereby we obtained a comprehensive view of the HSU in the sexual health context of migrants and non-migrants in Germany. However, we also need to mention some limitations. Firstly, we classified migrants by their migration generation, and ignored further heterogeneity arising e.g. from different countries/regions of origin, cultural and religious backgrounds, and the time since arrival. The time since arrival was not assessed in our survey, but would have been an important information

especially for the HSU of the HPV vaccination (recommended for girls between the ages of 9 and 14 years), and the chlamydia test (offered once a year free of charge for sexually active women under 25 years as a screening program). Secondly, sufficient language skills were needed to participate in the interview. Therefore, migrants with little knowledge of the German language were not included in our survey. Thus, our results are probably biased and differences of HSU between migrants and non-migrants may be underestimated.

## Policy Implications and Conclusion

Our results imply that actions should be taken to improve equity in the access to sexual health services. Potential interventions should take into account the diversity of migrant populations and be tailored towards the needs of different migrant groups (Rechel et al., 2013). The health literacy of migrants should be improved, and differences in the knowledge about health service provision and prevention measures should be minimized. Otherwise, inequalities in the utilization of medical services may potentially contribute to harmful consequences. For example, migrants from Sub-Saharan Africa and Caribbean countries living in European countries have substantially higher mortality rates due to HIV/AIDS compared to native-born populations (Ikram et al., 2016). Generally, access to health services should be guided by needs. The unmet needs in both migration generations, and the substantially lower HSU of first-generation migrations in our study are indicators that there is room for improvement towards an equitable access to and utilization of health services. Cultural competences among health care workers that may be improved in the training could reduce informal barriers of HSU. For future scientific studies, it would be interesting to investigate the migrant population in more depth, i.e., to consider regions/countries of origin, length of stay, acculturation, religious beliefs, and their associations to HSU. Overall, our results imply that policy makers should be aware of the differences in HSU between specific migrant groups and non-migrants, and a reduction of barriers to access is necessary.

**Funding** Open Access funding enabled and organized by Projekt DEAL. The research leading to these results received funding from the Bundeszentrale für gesundheitliche Aufklärung (Federal Center for Health Education) under Grant [Z2/25.5.2.1/16] (pilot study) and Grant [Z2/25.5.2.1/18] (main study).

## Declarations

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Consent to Participate** Informed consent was obtained from all individual participants included in the study.

**Conflict of Interest** The authors declare no competing interests.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Algan, Y., Dustmann, C., Glitz, A., & Manning, A. (2010). The economic situation of first and second-generation immigrants in France, Germany and the United Kingdom. *The Economic Journal*, *120*, 4–30.
- Allotey, P., Manderson, L., Baho, S., & Demian, L. (2004). Reproductive health for resettling refugee and migrant women. *Health Issues*, *78*, 12–17.
- American Association for Public Opinion Research. (2016). Standard definitions: Final dispositions of case codes and outcome rates for surveys (Report No. 9). Retrieved from: [https://www.aapor.org/AAPOR\\_Main/media/publications/Standard-Defintitions20169theditionfinal.pdf](https://www.aapor.org/AAPOR_Main/media/publications/Standard-Defintitions20169theditionfinal.pdf)
- Andersen, R. M. (2008). National health surveys and the behavioral model of health services use. *Medical Care*, *46*(7), 647–653. <https://doi.org/10.1097/MLR.0b013e31817a835d>
- Aptekman, M., Rashid, M., Wright, V., & Dunn, S. (2014). Unmet contraceptive needs among refugees. *Canadian Family Physician*, *60*(12), 613–619.
- Babitsch, B., Gohl, D., & von Lengerke, T. (2012). Re-revisiting Andersen's behavioral model of health services use: A systematic review of studies from 1998–2011. *Psycho-social Medicine*, *9*, Doc11. <https://doi.org/10.3205/psm000089>
- Bil, J. P., Zuure, F. R., Alvarez-Del Arco, D., Prins, J. M., Brinkman, K., Leyten, E., van Sighem, A., Burns, F., & Prins, M. (2019). Disparities in access to and use of HIV-related health services in the Netherlands by migrant status and sexual orientation: A cross-sectional study among people recently diagnosed with HIV infection. *BMC Infectious Diseases*, *19*(906), 1–13. <https://doi.org/10.1186/s12879-019-4477-2>
- Briken, P., Matthiesen, S., Pietras, L., Wiessner, C., Klein, V., Reed, G. M., & Dekker, A. (2020). Estimating the prevalence of sexual dysfunction using the new ICD-11 Guidelines. *Deutsches Arzteblatt International*, *117*(39), 653–658. <https://doi.org/10.3238/arztebl.2020.0653>
- Brzoska, P., & Abdul-Rida, C. (2016). Participation in cancer screening among female migrants and non-migrants in Germany: A cross-sectional study on the role of demographic and socioeconomic factors. *Medicine*, *95*(30), 1–7. <https://doi.org/10.1097/MD.0000000000004242>
- Ellawela, Y., Nilaweera, I., Holton, S., Rowe, H., Kirkman, M., Jordan, L., McNamee, K., Bayly, C., McBain, J., Sinnott, V., & Fisher, J. (2017). Contraceptive use and contraceptive health care needs among Sri Lankan migrants living in Australia: Findings from

- the understanding fertility management in contemporary Australia survey. *Sexual & Reproductive Healthcare*, 12, 70–75.
- Frank, L. K., Schenk, L., Rommel, A., Thamm, R., Ellert, U., & Lampert, T. (2020). Inanspruchnahme ambulant ärztlicher Leistungen und Zufriedenheit mit der Versorgung bei Kindern und Jugendlichen mit Migrationshintergrund – Ergebnisse der KiGGS-Studie [Utilization of outpatient medical services and satisfaction with care in children and adolescents with a migration background-results of the KiGGS study]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*, 63(1), 103–112. <https://doi.org/10.1007/s00103-019-03069-8>
- Gemeinsamer Bundesausschuss. (2008). Screening auf genitale Chlamydia trachomatis-Infektionen bei Frauen. Abschlussbericht des Unterausschusses Familienplanung des Gemeinsamen Bundesausschusses.
- Glaesmer, H., Wittig, U., Braehler, E., Martin, A., Mewes, R., & Rief, W. (2011). Health care utilization among first and second generation immigrants and native-born Germans: A population-based study in Germany. *International Journal of Public Health*, 56(5), 541–548. <https://doi.org/10.1007/s00038-010-0205-9>
- Gele, A. A., Musse, F. K., & Qureshi, S. (2019). Unmet needs for contraception: A comparative study among Somali immigrant women in Oslo and their original population in Mogadishu, Somalia. *PLoS One*, 14(8), e0220783. <https://doi.org/10.1371/journal.pone.0220783>
- Ikram, U. Z., Mackenbach, J. P., Harding, S., Rey, G., Bhopal, R. S., Regidor, E., Rosato, M., Juel, K., Stronks, K., & Kunst, A. E. (2016). All-cause and cause-specific mortality of different migrant populations in Europe. *European Journal of Epidemiology*, 31(7), 655–665. <https://doi.org/10.1007/s10654-015-0083-9>
- Kao, D. T. (2009). Generational cohorts, age at arrival, and access to health services among Asian and Latino immigrant adults. *Journal of Health Care for the Poor and Underserved*, 20(2), 395–414. <https://doi.org/10.1353/hpu.0.0144>
- Klein, J., & von dem Knesebeck, O. (2018). Inequalities in health care utilization among migrants and non-migrants in Germany: A systematic review. *International Journal for Equity in Health*, 17(1), 160. <https://doi.org/10.1186/s12939-018-0876-z>
- Knopf, H., Hölling, H., Huss, M., & Schlack, R. (2012). Prevalence, determinants and spectrum of attention-deficit hyperactivity disorder (ADHD) medication of children and adolescents in Germany: Results of the German health interview and examination survey (KiGGS). *British Medical Journal Open*, 2(6), e000477. <https://doi.org/10.1136/bmjopen-2011-000477>
- Lagerlund, M., Maxwell, A. E., Bastani, R., Thurfjell, E., Ekbohm, A., & Lambe, M. (2002). Sociodemographic predictors of non-attendance at invitational mammography screening - A population-based register study (Sweden). *Cancer Causes & Control : CCC*, 13(1), 73–82. <https://doi.org/10.1023/a:1013978421073>
- Matthiesen, S., Dekker, A., & Briken, P. (2018). Pilot study on adult sexuality in Germany - First results on feasibility and comparison of methods. *Zeitschrift Fur Sexualforschung*, 31(3), 218–236. <https://doi.org/10.1055/a-0663-4354>
- Matthiesen, S., Pietras, L., Bode, H., Cholmakow-Bodechtel, C., Cerwenka, S., Pfister, M., von Räden, U., Steinacker, G., Wiessner, C., Briken, P., & Dekker, A. (2021). Methodology of the German national sex survey – GeSiD (German health and sexuality survey). *Journal of Sex Research*, 58(8), 1008–1018. <https://doi.org/10.1080/00224499.2021.1875188>
- Mikolajczyk, R. T., Akmatov, M. K., Stich, H., Krämer, A., & Kretschmar, M. (2008). Association between acculturation and childhood vaccination coverage in migrant populations: A population based study from a rural region in Bavaria, Germany. *International Journal of Public Health*, 53(4), 180–187. <https://doi.org/10.1007/s00038-008-8002-4>
- Norredam, M., Nielsen, S. S., & Krasnik, A. (2010). Migrants' utilization of somatic healthcare services in Europe - A systematic review. *European Journal of Public Health*, 20(5), 555–563. <https://doi.org/10.1093/eurpub/ckp195>
- Rade, D. A., Crawford, G., Lobo, R., Gray, C., & Brown, G. (2018). Sexual health help-seeking behavior among migrants from Sub-Saharan Africa and South East Asia living in high income countries: A systematic review. *International Journal of Environmental Research and Public Health*, 15(7), 1311. <https://doi.org/10.3390/ijerph15071311>
- Rao, J. N., & Scott, A. J. (1981). The analysis of categorical data from complex sample surveys: Chi-squared tests for goodness of fit and independence in two-way tables. *Journal of the American Statistical Association*, 76(374), 221–230.
- Rechel, B., Mladovsky, P., Ingleby, D., Mackenbach, J. P., & McKee, M. (2013). Migration and health in an increasingly diverse Europe. *The Lancet*, 381(9873), 1235–1245. [https://doi.org/10.1016/S0140-6736\(12\)62086-8](https://doi.org/10.1016/S0140-6736(12)62086-8)
- Remtschmidt, C., Fesenfeld, M., Kaufmann, A. M., & Deléré, Y. (2014). Sexual behavior and factors associated with young age at first intercourse and HPV vaccine uptake among young women in Germany: Implications for HPV vaccination policies. *BMC Public Health*, 14, 1248. <https://doi.org/10.1186/1471-2458-14-1248>
- Robert Koch-Institut. (2007). Impfpfehlungen der STIKO. Epidemiologisches Bulletin 30. Retrieved from: [https://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2007/Ausgabenlinks/30\\_07.pdf?\\_\\_blob=publicationFile](https://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2007/Ausgabenlinks/30_07.pdf?__blob=publicationFile)
- Rivera, B., Casal, B., & Currais, L. (2015). Length of stay and mental health of the immigrant population in Spain: Evidence of the healthy immigrant effect. *Applied Economics*, 47(19), 1972–1982.
- Rommel, A., Saß, A. C., Born, S., & Ellert, U. (2015). Die gesundheitliche Lage von Menschen mit Migrationshintergrund und die Bedeutung des sozioökonomischen Status : Erste Ergebnisse der Studie zur Gesundheit Erwachsener in Deutschland (DEGS1) [Health status of people with a migrant background and impact of socio-economic factors: First results of the German Health Interview and Examination Survey for Adults (DEGS1)]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*, 58(6), 543–552. <https://doi.org/10.1007/s00103-015-2145-2>
- Sadry, S. A., De Souza, L. R., & Yudin, M. H. (2013). The impact of ethnicity on awareness and knowledge of and attitudes towards the human papillomavirus and vaccine among adult women. *Journal of Obstetrics and Gynaecology Canada*, 35(11), 995–1003. [https://doi.org/10.1016/S1701-2163\(15\)30787-8](https://doi.org/10.1016/S1701-2163(15)30787-8)
- Sarría-Santamera, A., Hijas-Gómez, A. I., Carmona, R., & Gimeno-Feliú, L. A. (2016). A systematic review of the use of health services by immigrants and native populations. *Public Health Reviews*, 37, 28. <https://doi.org/10.1186/s40985-016-0042-3>
- Statistisches Bundesamt. (2018). Fachserie 1 Reihe 2.2. Bevölkerung und Erwerbstätigkeit. Bevölkerung mit Migrationshintergrund – Ergebnisse des Mikrozensus 2017. Retrieved from: [https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publikationen/Downloads-Migration/migrationshintergrund-2010220177004.pdf?\\_\\_blob=publicationFile&v=4](https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Publikationen/Downloads-Migration/migrationshintergrund-2010220177004.pdf?__blob=publicationFile&v=4)
- Statistisches Bundesamt. (2020). Bevölkerung nach Migrationshintergrund und Geschlecht. Retrieved from: <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Tabellen/liste-migrationshintergrund-geschlecht.html>
- Uiters, E., Devillé, W., Foets, M., Spreeuwenberg, P., & Groenewegen, P. P. (2009). Differences between immigrant and non-immigrant groups in the use of primary medical care; a systematic review. *BMC Health Services Research*, 9, 76. <https://doi.org/10.1186/1472-6963-9-76>
- United Nations. (2020a). World migration report. Retrieved from: [https://www.un.org/sites/un2.un.org/files/wmr\\_2020.pdf](https://www.un.org/sites/un2.un.org/files/wmr_2020.pdf)
- United Nations. (2020b). World family planning. Retrieved from: <https://www.un.org/development/desa/pd/sites/www.un.org/>



[development.desa.pd/files/files/documents/2020/Sep/unpd\\_2020\\_worldfamilyplanning\\_highlights.pdf](https://development.desa.pd/files/files/documents/2020/Sep/unpd_2020_worldfamilyplanning_highlights.pdf)

- von Rosen, F. T., von Rosen, A. J., Müller-Riemenschneider, F., Damberg, I., & Tinnemann, P. (2018). STI knowledge in Berlin adolescents. *International Journal of Environmental Research and Public Health*, *15*(1), 110. <https://doi.org/10.3390/ijerph15010110>
- Wiessner, C., Keil, T., Krist, L., Zeeb, H., Dragano, N., Schmidt, B., Ahrens, W., Berger, K., Castell, S., Fricke, J., Führer, A., Gastell, S., Greiser, H., Guo, F., Jaeschke, L., Jochem, C., Jöckel, K. H., Kaaks, R., Koch-Gallenkamp, L., ... Becher, H. (2020). Personen

mit Migrationshintergrund in der NAKO Gesundheitsstudie – soziodemografische Merkmale und Vergleiche mit der autochthonen deutschen Bevölkerung [Persons with migration background in the German National Cohort (NAKO)-sociodemographic characteristics and comparisons with the German autochthonous population]. *Bundesgesundheitsblatt, Gesundheitsforschung, Gesundheitsschutz*, *63*(3), 279–289. <https://doi.org/10.1007/s00103-020-03097-9>

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

### **7.3 Thesis Article 3**

Wiessner C, Licaj S, Klein J, Bohn B, Brand T, Castell S, Führer A, Harth V, Heier M, Heise J-K, Holleczeck B, Jaskulski S, Jochem C, Koch-Gallenkamp L, Krist L, Leitzmann M, Lieb W, Meinke-Franze C, Mikolajczyk R, Moreno Velásquez I, Obi N, Pischon T, Schipf S, Thierry S, Willich SN, Zeeb H, Becher, H (2024). Health Service Use Among Migrants in the German National Cohort – The Role of Birth Region and Language Skills. *International Journal of Public Health*, 69:1606377. <https://doi.org/10.3389/ijph.2024.1606377>.

#### **7.3.1 Online Supplement Material**

An online supplement is available at:

<https://www.ssph-journal.org/journals/international-journal-of-public-health/articles/10.3389/ijph.2024.1606377/full>

#### **7.3.2 Statement of own contributions**

- Conceptualization of research idea
- Implementation of methodology
- Data analysis and visualization of results
- Preparation of original manuscript draft
- Revision of the manuscript



# Health Service Use Among Migrants in the German National Cohort—The Role of Birth Region and Language Skills

Christian Wiessner<sup>1\*</sup>, Sara Licaj<sup>1</sup>, Jens Klein<sup>2</sup>, Barbara Bohn<sup>3</sup>, Tilman Brand<sup>4</sup>, Stefanie Castell<sup>5</sup>, Amand Führer<sup>6</sup>, Volker Harth<sup>7</sup>, Margit Heier<sup>8,9</sup>, Jana-Kristin Heise<sup>5</sup>, Bernd Holleczyk<sup>10</sup>, Stefanie Jaskulski<sup>11</sup>, Carmen Jochem<sup>12</sup>, Lena Koch-Gallenkamp<sup>13</sup>, Lilian Krist<sup>14</sup>, Michael Leitzmann<sup>12</sup>, Wolfgang Lieb<sup>15</sup>, Claudia Meinke-Franze<sup>16</sup>, Rafael Mikolajczyk<sup>6</sup>, Ilais Moreno Velásquez<sup>17</sup>, Nadia Obi<sup>1,7</sup>, Tobias Pischon<sup>17,18,19</sup>, Sabine Schipf<sup>16</sup>, Sigrid Thierry<sup>8,20</sup>, Stefan N. Willich<sup>14</sup>, Hajo Zeeb<sup>4</sup> and Heiko Becher<sup>21</sup>

## OPEN ACCESS

### Edited by:

Sonja Merten,  
 Swiss Tropical and Public Health  
 Institute, Switzerland

### Reviewed by:

Stefan Essig,  
 University of Lucerne, Switzerland  
 One reviewer who chose to remain  
 anonymous

### \*Correspondence

Christian Wiessner,  
 ✉ c.wiessner@uke.de

This Original Article is part of the IJPH Special Issue "Migration Health Around the Globe—A Construction Site With Many Challenges"

Received: 07 July 2023

Accepted: 14 February 2024

Published: 06 March 2024

### Citation:

Wiessner C, Licaj S, Klein J, Bohn B, Brand T, Castell S, Führer A, Harth V, Heier M, Heise J-K, Holleczyk B, Jaskulski S, Jochem C, Koch-Gallenkamp L, Krist L, Leitzmann M, Lieb W, Meinke-Franze C, Mikolajczyk R, Moreno Velásquez I, Obi N, Pischon T, Schipf S, Thierry S, Willich SN, Zeeb H and Becher H (2024) Health Service Use Among Migrants in the German National Cohort—The Role of Birth Region and Language Skills. *Int J Public Health* 69:1606377. doi: 10.3389/ijph.2024.1606377

<sup>1</sup>Institute of Medical Biometry and Epidemiology, University Medical Center Hamburg-Eppendorf, Hamburg, Germany, <sup>2</sup>Institute of Medical Sociology, Center for Psychosocial Medicine, University Medical Center Hamburg-Eppendorf, Hamburg, Germany, <sup>3</sup>NAKO e.V., Heidelberg, Germany, <sup>4</sup>Leibniz Institute for Prevention Research and Epidemiology—BIPS, Bremen, Germany, <sup>5</sup>Department of Epidemiology, Helmholtz Center for Infection Research, Brunswick, Germany, <sup>6</sup>Institute of Medical Epidemiology, Biostatistics, and Informatics, Interdisciplinary Center for Health Sciences, Medical School of the Martin Luther University Halle-Wittenberg, Halle, Germany, <sup>7</sup>Institute for Occupational and Maritime Medicine Hamburg, University Medical Center Hamburg-Eppendorf, Hamburg, Germany, <sup>8</sup>Institute of Epidemiology, Helmholtz Zentrum München—German Research Center for Environmental Health (GmbH), Neuherberg, Germany, <sup>9</sup>KORA Study Centre, University Hospital Augsburg, Augsburg, Germany, <sup>10</sup>Saarland Cancer Registry, Saarbrücken, Germany, <sup>11</sup>Institute for Prevention and Cancer Epidemiology, Faculty of Medicine and Medical Center, University of Freiburg, Freiburg, Germany, <sup>12</sup>Department of Epidemiology and Preventive Medicine, University of Regensburg, Regensburg, Germany, <sup>13</sup>Department of Clinical Epidemiology and Aging Research, German Cancer Research Center (DKFZ), Heidelberg, Germany, <sup>14</sup>Institute of Social Medicine, Epidemiology and Health Economics, Charité University Medicine Berlin, Berlin, Germany, <sup>15</sup>Institute of Epidemiology, Faculty of Medicine, University of Kiel, Kiel, Germany, <sup>16</sup>Institute for Community Medicine, University Medical Center Greifswald, Greifswald, Germany, <sup>17</sup>Max-Delbrueck-Center for Molecular Medicine in the Helmholtz Association (MDC), Molecular Epidemiology Research Group, Berlin, Germany, <sup>18</sup>Max-Delbrueck-Center for Molecular Medicine in the Helmholtz Association (MDC), Biobank Technology Platform, Berlin, Germany, <sup>19</sup>Charité—Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Berlin, Germany, <sup>20</sup>Augsburg University Hospital, Augsburg, Germany, <sup>21</sup>Heidelberg Institute of Global Health, Heidelberg University Hospital, Heidelberg, Germany

**Objective:** To compare health service use (HSU) between migrants and non-migrants in Germany.

**Methods:** Using data from the population-based German National Cohort (NAKO), we compared the HSU of general practitioners, medical specialists, and psychologists/psychiatrists between six migrant groups of different origins with the utilization of non-migrants. A latent profile analysis (LPA) with a subsequent multinomial regression analysis was conducted to characterize the HSU of different groups. Additionally, separate regression models were calculated. Both analyses aimed to estimate the direct effect of migration background on HSU.

**Results:** In the LPA, the migrant groups showed no relevant differences compared to non-migrants regarding HSU. In separate analyses, general practitioners and medical specialists were used comparably to slightly more often by first-generation migrants from Eastern Europe, Turkey, and resettlers. In contrast, the use of psychologists/

psychiatrists was substantially lower among those groups. Second-generation migrants and migrants from Western countries showed no differences in their HSU compared to non-migrants.

**Conclusion:** We observed a low mental HSU among specific migrant groups in Germany. This indicates the existence of barriers among those groups that need to be addressed.

**Keywords:** migrant health, health service research, mental health, German National Cohort, NAKO

## INTRODUCTION

Migrants are a large and rapidly growing group in many European countries, and they face specific challenges in navigating society, such as orientation in the healthcare system [1]. In Germany, people with migration background constitute nearly 27% of approximately 82 million inhabitants, including both first- and second-generation migrants [2]. First-generation migrants are those with foreign nationality or a foreign country of birth who migrated themselves, while second-generation migrants have at least one foreign or foreign-born parent and have no migration experience of their own.

### Health Service Use of Migrants

Although all EU member states recognize the right to the highest possible standard of physical and mental health, inequalities in health service use (HSU) between migrant and non-migrant populations exist in many European countries and may lead to adverse health outcomes [3–5]. However, general consistent patterns of HSU across countries and different migrant groups can hardly be identified, though an equitable access to health services might be related to a strong primary care system [6, 7]. In the most recent systematic review on HSU, which covered results from 10 European countries, general practitioners (GPs) were more often contacted by migrants than by non-migrants in some studies, while the opposite was observed as well [7, 8]. For medical specialists, the majority of studies indicated a lower use of outpatient specialist services by migrants compared to non-migrants. While the use of medical specialists among migrants was higher in the Nordic countries [9, 10], in Germany, the Czech Republic, Italy, and Spain a lower HSU was observed [8, 11–13]. Similarly, a recent systematic review, which included further studies published in German, found a lower use of services by medical specialists and a slightly higher use of services by GPs by migrants compared to non-migrants [4]. For preventive services, such as oral health check-ups, cancer screening, and mental health services, a consistent pattern of a lower use among migrants compared to non-migrants was observed [4, 5, 7]. For mental health services, unmet needs and lower treatment intensities were highest for persons with a recent migration experience, especially refugees [14, 15]. Conversely, migrants use emergency care more often than the non-migrant population in most European countries, which might be explained by a comparatively low knowledge of health system structures and an easier access of emergency care compared to other health services [7, 16]. This overuse of emergency care can lead to unnecessary healthcare costs that should be avoided [7,

17], and might impair long-term care because emergency services are structurally unable to function as substitutes for primary care providers.

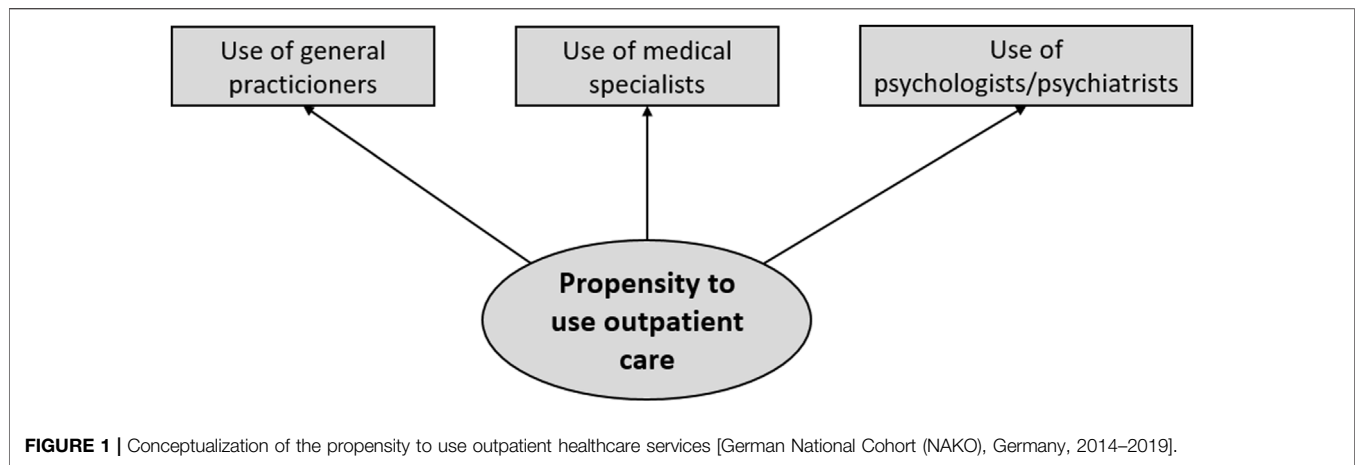
Generally, migrants are a heterogeneous group, which makes the commonly used approach of comparing migrants with the non-migrant population without acknowledging the diversity of different migrant groups, problematic [18]. One way to operationalize the diversity of migrants is to distinguish between first- and second-generation migrants because second-generation migrants use many health services similar to the non-migrant population in Germany [11, 19–21]. A distinction between different first-generation migrants based on their country or region of origin, length of stay in the host country, and reasons for migration as well as a consideration of language proficiency and residence status may be appropriate to further reflect the heterogeneity of migrants [1, 22, 23].

### Andersen Model

The Andersen Behavioral Model of Health Service Use was used to build a theoretical framework of what influences the use of health services. According to the Andersen Model, HSU is influenced by predisposing characteristics, enabling resources, and need factors [24, 25]. Migration background is considered a predisposing characteristic because people have different preferences to use health services based on their health beliefs (e.g., attitudes, knowledge), social structure (e.g., education, occupation, and ethnicity), and demographic factors (e.g., gender, age). Enabling resources are those factors that need to be present for HSU (e.g., health insurance or the presence of health facilities nearby). Need factors represent the medical conditions that are directly related to the use of health services. An equitable access to health services would be achieved, if the HSU in a population is mainly based on its needs. For migrants, unmet needs are especially relevant regarding mental healthcare, preventive services and long-term care [5].

### Aims of the Study

As unmet needs in the provision of healthcare services might have profound negative health impacts, we aim to investigate whether migrants living in Germany differ in their propensity to use health services compared to the non-migrant population. Specifically, we want to compare different migrant groups based on their country of birth and second-generation migrants with non-migrants and investigate the influence of language skills on HSU. The health services under investigation comprise the use of services by GPs, mental



health services, and different medical specialists in a period of 12 months, and are analyzed in the baseline data of a large population-based cohort study.

## METHODS

### Study Population

The data stem from the German National Cohort [NAKO Gesundheitsstudie (NAKO)], a large population-based cohort study conducted at eighteen study centers in Germany since 2014. Study participants were randomly selected from population registers, resulting in a final sample size of 204,862 participants aged 19–74 years. Sufficient knowledge of the German language was required to participate. A detailed description of the study design has been published elsewhere [26]. We used questionnaire data from both a face-to-face interview and a self-administered questionnaire conducted continuously between 2014 and 2019.

### Measures of Exposure

The assignment of a migration background was based on the definition of the National Office for Statistics [2]. This classification takes into account the nationality and country of birth of both the study participants and their parents. First-generation migrants were categorized as those born without a German nationality and with a personal migration experience to Germany, while second-generation migrants were assigned a migration status if at least one parent was born without a German nationality and had a migration experience. First-generation migrants were further grouped into different regions according to their country of birth, based on the definition of the United Nations and were categorized into the following subgroups [27]:

- Western migrants (Western Europe, Northern Europe, Southern Europe, North America)
- Eastern Europe migrants
- Turkish migrants

- Resettlers (Migrants from the former Soviet Union with German ancestors)
- Other migrants (e.g., Latin America, Africa)

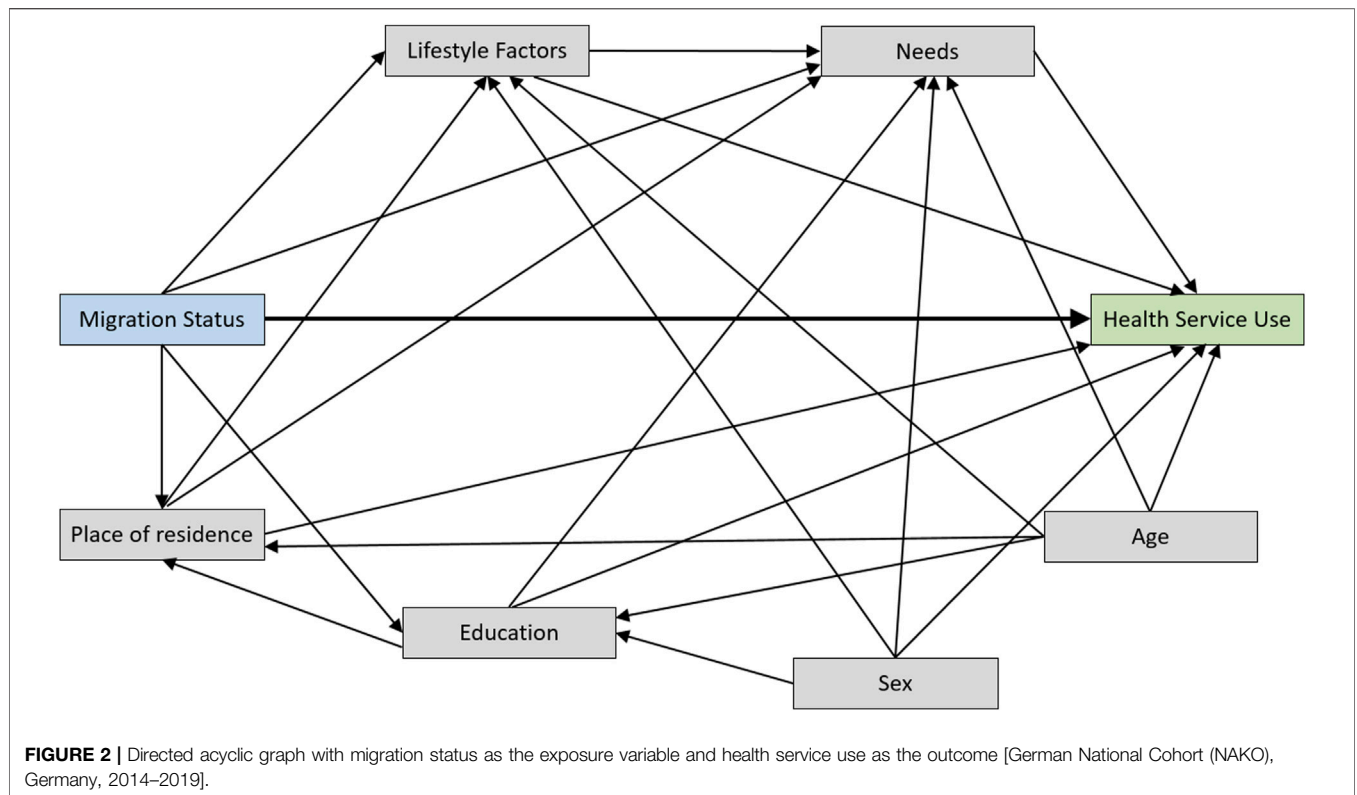
Additionally, non-native German speaking participants were asked about their German skills ranging from very good to very bad. Extensive data quality checks on the migration-related variables were carried out and reported elsewhere [22].

### Measures of Outcomes

HSU was measured by the use of services provided by different health professionals as reported by the study participants. A latent variable was proposed that was represented by the manifest variables of the use of services by GPs, medical specialists, and psychologists/psychiatrists (**Figure 1**). This latent variable, the propensity to use outpatient healthcare services, represented the outcome variable. It was evaluated by the self-reported number of visits in the past 12 months. The use of services by GPs and psychologists/psychiatrists was measured by single items, while for the medical specialists the sum of visits to internists, radiologists, neurologists, dermatologists, urologists, orthopedists, otolaryngologists, and ophthalmologists was formed.

### Measures of Covariates

As predisposing characteristics, age and sex of the participants were used. Education was categorized into low (International Standard Classification of Education (ISCED)-level 1/2), medium (ISCED-level 3/4), high (ISCED-level 5/6), and still-in-education levels based on the ISCED-97 classification [28]. Alcohol use was measured by the Alcohol Use Disorders Identification Test—Consumption (AUDIT-C), indicating the presence or absence of risky alcohol consumption. Values above 4 (men) and 3 (women) were considered a risky alcohol consumption. For the place of residence, the study center was used as a proxy. Need factors were measured by the self-reported lifetime prevalence of a medically diagnosed disease. A total of 46 diseases were assessed, and the total number of lifetime diseases was calculated for each participant. Further need factors, which we included in our analysis, were the Patient Health Questionnaire



(PHQ)-9 sum score as a measure for depression and the current self-reported general health status with the values excellent, very good, good, not good, bad.

### Directed Acyclic Graph

A directed acyclic graph (DAG) was developed to depict the assumed associations between the exposure variable (migration status), the outcome variables (HSU), and relevant covariates (Figure 2). The creation of the DAG was based on a literature search in a database for DAGs [29] and was conducted with dagitty [30]. Two DAGs with similar exposures and outcomes to the present study were found and combined with own assumptions about the underlying data-generating mechanism [31, 32]. We aimed to estimate the controlled direct effect of migration status on HSU by controlling for the effect of confounders and mediators. The minimal sufficient adjustment set (MSAS) to estimate this effect contained the following variables:

- Predisposing characteristics: Sex, Age, Education, Alcohol consumption, Place of residence (Study center)
- Need factors: Total number of diseases (lifetime), PHQ-9 sum score, General health status

### Statistical Analysis

A latent profile analysis (LPA) was conducted on participants' responses to how often they had visited GPs, medical specialists and psychologists/psychiatrists in the previous 12 months, with the aim of identifying different patterns of HSU. A three-step

procedure is most commonly used to determine the relationship between an exposure variable and the latent profiles [33]. In a first step, the number of latent profiles was determined based on model fit indices [in our case the Akaike Information Criterion (AIC) was used] and considerations about model simplicity. In a second step, we assigned people to the HSU class or pattern with the highest posterior probability of membership (modal assignment), and a putative name was derived for that class. In a third step, the exposure variable and the MSAS was included into a multinomial regression model to estimate the direct effect of migration background onto belonging to a certain latent class, and the adjusted odds ratio (aOR) with the corresponding 95% confidence interval (95% CI) was reported. In the context of HSU, a similar procedure was used by Xia et al. [34].

After the latent profile analysis, we analyzed the number of visits to GPs, medical specialists, and psychologists/psychiatrists separately in order to estimate the direct effect of migration background on these different forms of HSU. For these analyses, regression models for count data were applied with the same adjustment sets as for the latent profile analyses. The countfit function in Stata was used to compare the model fit for the different types of count regression models (Poisson regression, negative binomial regression, and the zero inflated versions of both models). For GPs and medical specialists, a negative binomial regression model provided the best model fit, while for the HSU of psychologists/psychiatrists a zero-inflated negative binomial regression model was employed because of the excess number of zeros, i.e., participants who never used the

**TABLE 1** | Sample characteristics of different migrant groups and non-migrants [German National Cohort (NAKO), Germany, 2014–2019].

Sample characteristic <sup>a</sup>	Western migrants ( <i>n</i> = 5,342; 2.61%)	Eastern Europe migrants ( <i>n</i> = 6,992; 3.41%)	Other migrants <sup>b</sup> ( <i>n</i> = 5,486; 2.68%)	Turkish migrants ( <i>n</i> = 3,161; 1.54%)	Resettlers ( <i>n</i> = 3,582; 1.75%)	Second generation migrants ( <i>n</i> = 10,451; 5.10%)	No migration background ( <i>n</i> = 169,626; 82.80%)
Demographics							
Female	2,609 (49%)	4,099 (59%)	2,453 (45%)	1,352 (43%)	2,017 (56%)	5,176 (50%)	85,554 (50%)
Age, years [Mean (SD)]	50.8 (12.1)	51.0 (12.4)	46.4 (11.8)	44.7 (11.0)	46.9 (12.6)	47.9 (13.5)	50.2 (12.7)
Education							
Low	515 (11%)	232 (4%)	559 (12%)	575 (22%)	175 (5%)	237 (2%)	2,914 (2%)
Medium	1,547 (32%)	2,521 (39%)	1,358 (28%)	1,125 (43%)	1,304 (40%)	3,643 (37%)	64,896 (41%)
High	2,687 (56%)	3,561 (56%)	2,666 (56%)	831 (31%)	1,707 (52%)	5,404 (55%)	87,613 (55%)
Still in education	70 (1%)	82 (1%)	207 (4%)	115 (4%)	83 (3%)	459 (5%)	3,267 (2%)
Missing	523 (10%)	596 (9%)	696 (13%)	515 (16%)	313 (9%)	708 (7%)	10,936 (6%)
Lifestyle factors							
Risky alcohol consumption	1,503 (32%)	1,657 (26%)	786 (19%)	331 (13%)	687 (22%)	3,455 (34%)	60,825 (37%)
Missing	617 (12%)	656 (9%)	1,278 (23%)	572 (18%)	397 (11%)	354 (3%)	5,459 (3%)
Need factors							
General health status							
Not good/Bad	1,934 (40%)	1,834 (29%)	1,503 (34%)	749 (28%)	805 (25%)	3,691 (36%)	55,000 (33%)
Good	2,343 (48%)	3,710 (58%)	2,291 (52%)	1,457 (54%)	1,932 (59%)	5,309 (52%)	91,724 (56%)
Very good/Excellent	559 (12%)	886 (14%)	615 (14%)	475 (18%)	520 (16%)	1,146 (11%)	18,122 (11%)
Missing	506 (9%)	562 (8%)	1,077 (20%)	480 (15%)	325 (9%)	305 (3%)	4,780 (3%)
Lifetime diseases [Mean (SD)]							
PHQ-9 sum score <sup>c</sup>	4.3 (4.1)	4.3 (4.0)	4.8 (4.6)	5.8 (5.1)	4.7 (4.0)	4.3 (4.0)	3.8 (3.7)
Missing	865 (16%)	1,033 (15%)	1,757 (32%)	733 (23%)	677 (19%)	571 (5%)	9,580 (6%)

<sup>a</sup>Reported as *n* (%) unless specified otherwise.

<sup>b</sup>Other migrants comprise migrants with origins other than Western countries, Eastern Europe, Turkey, and resettlers from the Former Soviet Union.

<sup>c</sup>Patient Health Questionnaire.

services of psychologists/psychiatrists. For the negative binomial regression models, we report the adjusted rate ratios (aRR) with the corresponding 95% CI. The inflation part of the model for the excess number of zeros is reported by the aOR with the corresponding 95% CI. In additional negative binomial regression analyses, we compared how language skills from non-native German speaking participants were associated with the HSU of GPs, medical specialists and psychologists/psychotherapists. The analyses were conducted as complete case analyses as the missingness of variables mainly occurred in the outcome variables. Along the adjusted effect estimates, we provide unadjusted effect measures. All analyses were performed in Stata (Version 17).

## RESULTS

Of 204,862 study participants, 222 (0.1%) did not provide sufficient information for the assignment of a migration status and were removed from the analysis. The remaining study population consisted of 35,014 migrants (17.1%) and 169,626 non-migrants (82.9%) (Table 1). The majority of migrants had an own migration experience (24,563; 12.0%),

while 10,451 (5.1%) participants were second-generation migrants. In total, we found migrants from 162 countries to be included into the NAKO. In the 18 study centers, the proportion of migrants ranged from 5% in a study center in Northeastern Germany to 31% in a study center in Western Germany. The study centers in Eastern Germany showed lower proportions of migrants compared to the rest of the country, with the exception of the study centers in Berlin. Most of the non-native German speaking participants reported very good (*n* = 4,957; 27.7%) or good (*n* = 7,163; 40.0%) language skills, whereas medium (*n* = 4,750; 26.5%), bad (*n* = 1,024; 5.7%) or very bad (*n* = 0; 0.0%) language skills were reported less frequently.

In total, 148,545 (72.6%) participants completed the HSU module, which included the outcome variables for our analyses. While non-migrants (75.5% completion) and migrants of the second migration (75.1% completion) completed the questionnaire in a similar manner, migrants of the first generation showed lower completion proportions. Migrants from Western (57.8%) and Eastern European (57.7%) countries completed the module more often than migrants from other regions (Resettlers 50.4%, Turkish migrants 49.0%, Other migrants 37.9%).



**TABLE 2 |** Results of the latent profile analysis based on outpatient health service use in a period of 12 months [German National Cohort (NAKO), Germany, 2014–2019].

		Mean frequency of visits in the past 12 months (SD)
Low users ( <i>n</i> = 108,492; 73.0%)	General practitioner	1.7 (1.3)
	Psychologist/psychiatrist	0.0 (0.0)
	Medical specialists	2.2 (2.0)
Medium users ( <i>n</i> = 34,644; 23.3%)	General practitioner	3.6 (2.3)
	Psychologist/psychiatrist	3.2 (8.6)
	Medical specialists	7.6 (5.7)
High users (especially GPs) ( <i>n</i> = 5,409; 3.6%)	General practitioner	13.5 (11.3)
	Psychologist/psychiatrist	3.5 (9.7)
	Medical specialists	10.9 (12.6)

**TABLE 3 |** Multinomial regression results for the latent class outcomes based on the outpatient health service use in a period of 12 months with migration background as the exposure variable [German National Cohort (NAKO), Germany, 2014–2019].

	Medium users <sup>a</sup>				High users (especially GPs) <sup>a</sup>			
	Unadjusted analysis		Adjusted analysis		Unadjusted analysis		Adjusted analysis	
	OR	95% CI	Adjusted OR <sup>b</sup>	95% CI	OR	95% CI	Adjusted OR <sup>b</sup>	95% CI
<b>Second generation migrants</b>	1.04	0.99–1.10	1.03	0.97–1.10	1.00	0.88–1.13	0.94	0.82–1.08
<b>Western migrants</b>	1.09	1.01–1.19	1.09	0.99–1.20	1.06	0.88–1.28	1.13	0.91–1.40
<b>Eastern European migrants</b>	1.06	0.98–1.14	1.01	0.92–1.09	1.23	1.05–1.43	1.16	0.97–1.38
<b>Resettlers</b>	0.97	0.87–1.09	1.06	0.93–1.20	0.91	0.70–1.18	0.92	0.69–1.23
<b>Turkish migrants</b>	1.15	1.03–1.29	1.00	0.88–1.15	1.44	1.14–1.82	1.15	0.88–1.50
<b>Other migrants</b>	1.03	0.93–1.14	1.04	0.92–1.16	0.89	0.70–1.14	0.97	0.74–1.28

(*n* = 138,101).

<sup>a</sup>Reference category: Low users.

<sup>b</sup>Odds ratios are adjusted for age, sex, education, alcohol consumption, number of lifetime diseases, general health status, PHQ-9 sum score, and study center. Reference category: Non-migrants.

**TABLE 4 |** Count regression model results for outpatient health service use in a period of 12 months with migration background as the exposure variable [German National Cohort (NAKO), Germany, 2014–2019].

	General practitioner ( <i>n</i> = 138,048)		Medical specialists ( <i>n</i> = 138,046)		Psychologists/ psychiatrists (zero-inflation part of the model) ( <i>n</i> = 137,813)		Psychologists/ psychiatrists (count part of the model) ( <i>n</i> = 137,813)	
	Adjusted RR <sup>a</sup>	95% CI	Adjusted RR <sup>a</sup>	95% CI	Adjusted OR <sup>b</sup>	95% CI	Adjusted RR <sup>a</sup>	95% CI
Second-generation migrants	0.99	0.97–1.01	1.01	0.99–1.03	1.00	0.90–1.11	1.07	0.95–1.20
Western migrants	1.04	1.00–1.07	1.00	0.97–1.04	1.09	0.92–1.29	1.03	0.87–1.23
Eastern European migrants	1.04	1.01–1.07	1.06	1.02–1.09	1.00	0.86–1.17	0.71	0.60–0.84
Resettlers	1.05	1.00–1.09	1.06	1.01–1.11	0.74	0.58–0.94	0.62	0.47–0.81
Turkish migrants	1.03	0.98–1.08	1.12	1.07–1.19	0.96	0.74–1.24	0.59	0.46–0.74
Other migrants	0.98	0.94–1.02	1.09	1.04–1.14	0.84	0.67–1.06	0.63	0.50–0.79

<sup>a</sup>Adjusted rate ratios are adjusted for age, sex, education, alcohol consumption, number of lifetime diseases, general health status, PHQ-9 sum score, and study center. Reference category: Non-migrants.

<sup>b</sup>Adjusted odds ratios with the reference categories never-users and non-migrants. Odds ratios are adjusted for age, sex, education, alcohol consumption, number of lifetime diseases, general health status, PHQ-9 sum score, and study center.

In the first step of the LPA, 3 classes showed a good balance between model fit and sample sizes that allowed an investigation of migrant subgroups. In the assignment step of the LPA, the majority of the participants (108,492; 73.0%) reported a comparatively low use of GPs and medical specialists and no use of psychologists/psychiatrists. 34,644 (23.3%) participants had a medium HSU, while a small group of participants (5,409; 3.6%) reported a high HSU, especially of GPs (Table 2; Supplementary Figure S1). On

average, the participants used services by GPs 2.6 times, medical specialists 3.8 times, and psychologists/psychiatrists 0.9 times in the previous 12 months. In the last step of the LPA, the low users were defined as the reference category in a multinomial regression model. After adjustment, all migrant groups were classified to each of the latent user groups with similar probabilities as the non-migrant population, i.e., all CIs for the aOR covered 1 (Table 3).



In separate analyses of the HSU of the different health professionals (**Table 4; Supplementary Table S1**), second-generation migrants and migrants from Western countries showed no difference in the use of services by GPs, medical specialists, and psychologists/psychiatrists in comparison to non-migrants. In contrast, first-generation migrants from Eastern Europe (GPs: aRR = 1.04; 95% CI 1.01–1.07; Medical specialists: aRR = 1.06; 95% CI 1.02–1.09) and resettlers (GPs: aRR = 1.05; 95% CI 1.00–1.09; Medical specialists: aRR = 1.06; 95% CI 1.01–1.11) reported a slightly higher use of services by both, GPs and medical specialists. A higher use of services by medical specialists was also reported by Turkish migrants (aRR = 1.12; 95% CI 1.07–1.19) and by a diverse group of migrants from other countries (aRR = 1.09; 95% CI 1.04–1.14). In the analysis of the use of services by psychologists/psychiatrists, only resettlers were less likely to generally be users of these services (aOR = 0.74; 95% CI 0.58–0.94; zero-inflation part of the model), while the frequency of use (count part of the model) was lower among migrants from Eastern Europe (aRR = 0.71; 95% CI 0.60–0.84), Turkey (aRR = 0.59; 95% CI 0.46–0.74), resettlers (aRR = 0.62; 95% CI 0.47–0.81), and other migrants (aRR = 0.63; 95% CI 0.50–0.79). Among non-native German speaking participants, language skills were associated with the use of psychologists/psychotherapists and less with the use of GPs and medical specialists (e.g., bad language skills vs. very good language skills: GPs: aRR = 0.95; 95% CI 0.81–1.11; Medical specialists: aRR = 0.83; 95% CI 0.70–0.99; Psychologists/psychotherapists: aRR = 0.29; 95% CI 0.11–0.74; **Supplementary Table S2**).

## DISCUSSION

In this study, we aimed to compare the propensity to use health services between non-migrants and different migrant groups in the NAKO, a large population-based cohort study in Germany. We conducted two separate analyses. At first a LPA, where we could identify three different groups of health services users [low users, medium users, and high users (especially GPs)]. Thereafter, we analyzed the HSU of GPs, medical specialists, and psychologists/psychiatrists separately. In the LPA, we found no differences between the migrant groups and non-migrants. However, the separate analyses revealed a comparable to slightly higher use of services by GPs and medical specialists, and a lower use of those by psychologists/psychiatrists for different migrant groups. The most pronounced differences were found for Eastern European migrants, resettlers, Turkish migrants, and other migrants, while second-generation migrants and Western migrants used the outpatient services similar to the non-migrants.

Our results show that a general propensity to use health services could not be captured by our measures of the use of outpatient services. Markedly, the HSU was highly dependent on the specific health professional under consideration. In the LPA analysis, the slightly higher to comparable use of GPs and medical specialists among migrants was averaged out with the lower use of psychologists/psychiatrists. Therefore, the separate analyses revealed more details about the differences of HSU between

migrants and non-migrants compared to the clustering-based approach in the LPA. Clustering methods such as LPA were used in several recent research papers on HSU. In a French cohort study, the use of services by GPs, medical specialists, alternative care, and emergency care was the basis for the classification [35], while Xia et al. examined the HSU of Australian truck drivers by clustering them based on their use of services by GPs, medical specialists, mental HSU, physical therapy, and surgeries [34]. These studies aimed to identify homogeneous user groups based on the actual HSU of the study population. In contrast, the QUALICOPC (Quality and Costs of Primary Care in Europe) study, a survey conducted in 34 European countries, aimed to determine the propensity to use health services through a questionnaire that asked participants about the importance of seeing a doctor for several severe hypothetical medical conditions and the expected benefit from a visit to a general practitioner for minor complaints [36]. Here, first-generation migrants reported a higher subjective importance for a doctoral visit when having severe symptoms, while a higher indicated importance was positively correlated with an actual higher HSU.

HSU due to mental health conditions is considered one of the most important priorities in the health provision for migrants [5, 37], as a migration background has been associated with a higher structural vulnerability to mental health problems [38, 39]. The discrepancy in the use of services by psychologists/psychiatrists between first- and second-generation migrants in our study can partly be explained by linguistic barriers as we found that language skills were more strongly associated with the use of services by psychologists/psychotherapists than with the use of services by GPs and medical specialists. In another study, we found that linguistic barriers and reasons related to shame were frequent causes for first-generation migrants not to seek health services related to sexual health [21]. In a recent literature review about the mental health needs of migrants, language problems were also mentioned as a key barrier to a need-based HSU [40]. Our results imply that the proportion of never-users of mental healthcare services was only higher among resettlers, while the frequency of use was substantially lower for all migrant groups except second-generation migrants and Western migrants. Aside from the aforementioned language barriers, another reason might be a lower satisfaction with the HSU, a tendency we found in a recent study as well [21].

The literature about the use of services by GPs and medical specialists among migrants in Europe provides mixed results. Both a higher and lower use of services by each type of physicians was observed in a recent European systematic review [7], while in Germany a generally lower use of services by medical specialists and a slightly higher use of GPs among migrants was found [4]. In a Norwegian register-based study, migrants used services by GPs with a lower proportion, but the users frequented their GPs more often [41]. It might be assumed that these never-users were also less likely to participate in the NAKO, which could explain the higher use of both GPs and medical specialists among the different migrant groups we investigated.

Strengths of our study were the population-based sampling design, the large sample size, which allowed the study of HSU

in migrant subgroups based on their origin, and the availability of a variety of need factors and predisposing characteristics that influence HSU. However, certain limitations in our study need to be discussed. Firstly, although a population representative sampling scheme was applied in the NAKO, the response proportion was only 17% [26] and the characteristics of the study population might differ substantially from the general population, especially in the migrant group, because an inclusion criterion for the NAKO was a sufficient knowledge of the German language. Thereby, migrants with little knowledge of German as well as migrants with an irregular residence status were not part of the study. Thus, only few migrants in our study described their German language skills as bad and it can be assumed that the language skills among migrants in the general population are substantially worse than in the NAKO. Additionally, both migrants and non-migrants had comparably high levels of education, limiting the generalizability to the general German population. Secondly, the HSU module was not part of the mandatory modules in the NAKO, and only 72.6% of the participants completed it. Missingness also varied by migration status, with some migrant groups having completion proportions below 50%. Additionally, we aimed to estimate the direct effect of migration status on HSU that was not mediated through different needs, lifestyle factors, and sociodemographic characteristics. Therefore, we constructed a DAG to justify our adjustment set of variables in the regression analyses. As the true underlying data-generating mechanism is unknown to us, we might have missed further confounders and mediators. In addition to a potential selection and confounding bias, measurement bias may have occurred as well as we relied on the self-reported information about HSU and need factors. Need factors were conceptualized by the total number of lifetime diagnosed diseases, whereas the measures of HSU were based on the previous 12 months. These different time frames may have captured the need factors inaccurately, although a study by Thode et al. showed that their results did not differ substantially by including either the number of lifetime diseases or the number of diseases in the past 12 months [42]. In addition, the need factors and indicators for HSU were self-reported and not further validated.

## Conclusion

First-generation migrants from Eastern Europe, Turkey, and resettlers from the former Soviet Union all reported a comparable to slightly higher use of services by GPs and medical specialists, and a substantially lower use of those offered by psychologists/psychiatrists compared to non-migrants. In contrast, first-generation migrants from Western countries and second-generation migrants showed no differences in their HSU compared to non-migrants. These results suggest that there are unmet needs among first-generation migrants regarding the use of mental health services in Germany, which should be addressed by promoting easier access and a reduction

of barriers. Due to the negative health impacts of unmet needs in the provision of healthcare services, efforts should be undertaken to tackle these barriers. These might, e.g., comprise the use of interpreters or digital tools to reduce the dependence on language skills, training of cultural competencies among healthcare workers, and the promotion of health literacy among migrants. Overall, addressing the disparities in HSU, particularly in mental healthcare, is crucial for ensuring equitable healthcare access and improving the overall wellbeing of migrant populations.

## ETHICS STATEMENT

The studies involving humans were approved by Lokale Ethikkommissionen der Studienzentren. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

CW and HB developed the research questions. CW and SL prepared the data for analyses. CW and SL conducted the data analyses. All authors except CW, SL, and JK were involved in data collection of the NAKO. CW drafted the manuscript. HB supervised the data analysis, contributed to writing and reviewed the drafts. All authors contributed to the article and approved the submitted version.

## FUNDING

The German National Cohort (NAKO) is funded by the German Federal Ministry of Education and Research (BMBF) (funding code 01ER1301A/B/C and 01ER1511D) and the participating federal states and supported by the Helmholtz Association as well as by the participating universities and institutes of the Leibniz Association. We acknowledge financial support from the Open Access Publication Fund of UKE - Universitätsklinikum Hamburg-Eppendorf and DFG – German Research Foundation.

## CONFLICT OF INTEREST

The authors declare that they do not have any conflicts of interest.

## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.ssph-journal.org/articles/10.3389/ijph.2024.1606377/full#supplementary-material>

## REFERENCES

1. Rechel B, Mladovsky P, Ingleby D, Mackenbach JP, McKee M. Migration and Health in an Increasingly Diverse Europe. *Lancet* (2013) 381:1235–45. doi:10.1016/S0140-6736(12)62086-8
2. Statistisches Bundesamt. *Migration und Integration. Bevölkerung nach Migrationshintergrund und Geschlecht*. Wiesbaden, Germany: Statistisches Bundesamt (2022). Available From: <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Tabellen/listemigrationshintergrund-geschlecht.html> (Accessed February 16, 2023).
3. Norredam M, Nielsen SS, Krasnik A. Migrants' Utilization of Somatic Healthcare Services in Europe—a Systematic Review. *Eur J Public Health* (2010) 20:555–63. doi:10.1093/eurpub/ckp195
4. Klein J, von dem Knesebeck O. Inequalities in Health Care Utilization Among Migrants and Non-Migrants in Germany: A Systematic Review. *Int J Equity Health* (2018) 17:160–10. doi:10.1186/s12939-018-0876-z
5. Lebano A, Hamed S, Bradby H, Gil-Salmerón A, Durá-Ferrandis E, Garcés-Ferrer J, et al. Migrants' and Refugees' Health Status and Healthcare in Europe: A Scoping Literature Review. *BMC Public Health* (2020) 20:1039. doi:10.1186/s12889-020-08749-8
6. Uiters E, Devillé W, Foets M, Spreeuwenberg P, Groenewegen PP. Differences Between Immigrant and Non-Immigrant Groups in the Use of Primary Medical Care: A Systematic Review. *BMC Health Serv Res* (2009) 9:76. doi:10.1186/1472-6963-9-76
7. Graetz V, Rechel B, Groot W, Norredam M, Pavlova M. Utilization of Health Care Services by Migrants in Europe—A Systematic Literature Review. *Br Med Bull* (2017) 121:5–18. doi:10.1093/bmb/ldw057
8. Malmusi D, Drbohlav D, Džúrová D, Palència L, Borrell C. Inequalities in Healthcare Access by Type of Visa in a Context of Restrictive Health Insurance Policy: The Case of Ukrainians in Czechia. *Int J Public Health* (2014) 59:715–9. doi:10.1007/s00038-014-0592-4
9. Nielsen SS, Hempler NF, Waldorff FB, Kreiner S, Krasnik A. Is There Equity in Use of Healthcare Services Among Immigrants, Their Descendants, and Ethnic Danes? *Scand J Public Health* (2012) 40:260–70. doi:10.1177/1403494812443602
10. Neergaard MA, Jensen AB, Olesen F, Vedsted P. Access to Outreach Specialist Palliative Care Teams Among Cancer Patients in Denmark. *J Palliat Med* (2013) 16:951–7. doi:10.1089/jpm.2012.0265
11. Glaesmer H, Wittig U, Braehler E, Martin A, Mewes R, Rief W. Health Care Utilization Among First and Second Generation Immigrants and Native-Born Germans: A Population-Based Study in Germany. *Int J Public Health* (2011) 56:541–8. doi:10.1007/s00038-010-0205-9
12. Sanz B, Regidor E, Galindo S, Pascual C, Lostao L, Diaz JM, et al. Pattern of Health Services Use by Immigrants From Different Regions of the World Residing in Spain. *Int J Public Health* (2011) 56:567–76. doi:10.1007/s00038-011-0237-9
13. De Luca G, Ponzo M, Andrés AR. Health Care Utilization by Immigrants in Italy. *Int J Health Care Finance Econ* (2013) 13:1–31. doi:10.1007/s10754-012-9119-9
14. Taylor-East R, Rossi A, Caruana J, Grech A. The Mental Health Services for Detained Asylum Seekers in Malta. *Bjpsych Int* (2016) 13:32–5. doi:10.1192/s2056474000001070
15. Kieseppä V, Torniaainen-Holm M, Jokela M, Suvisaari J, Gissler M, Markkula N, et al. Immigrants' Mental Health Service Use Compared to That of Native Finns: A Register Study. *Soc Psychiatry Psychiatr Epidemiol* (2020) 55:487–96. doi:10.1007/s00127-019-01774-y
16. Carrasco-Garrido P, Jiménez-García R, Barrera VH, de Andrés AL, de Miguel AG. Significant Differences in the Use of Healthcare Resources of Native-Born and Foreign Born in Spain. *BMC Public Health* (2009) 9:201. doi:10.1186/1471-2458-9-201
17. Buja A, Fusco M, Furlan P, Bertonecello C, Baldovin T, Casale P, et al. Characteristics, Processes, Management and Outcome of Accesses to Accident and Emergency Departments by Citizenship. *Int J Public Health* (2014) 59:167–74. doi:10.1007/s00038-013-0483-0
18. Lindert J, Schouler-Ocak M, Heinz A, Priebe S. Mental Health, Health Care Utilisation of Migrants in Europe. *Eur Psychiatry* (2008) 23:14–20. doi:10.1016/S0924-9338(08)70057-9
19. Führer A, Tiller D, Brzoska P, Korn M, Gröger C, Wienke A. Health-Related Disparities Among Migrant Children at School Entry in Germany. How Does the Definition of Migration Status Matter? *IJERPH* (2019) 17:212. doi:10.3390/ijerph17010212
20. Grochtdreis T, König H-H, Dams J. Health Care Services Utilization of Persons With Direct, Indirect and Without Migration Background in Germany: A Longitudinal Study Based on the German Socio-Economic Panel (SOEP). *Int J Environ Res Public Health* (2021) 18:11640. doi:10.3390/ijerph182111640
21. Wiessner C, von dem Knesebeck O, Gerlich MG, Briken P, Becher H. Migration and Sexual Health Services Use – Results From the German Health and Sexuality Survey (GeSiD). *Sex Res Soc Pol* (2022) 19:1383–94. doi:10.1007/s13178-022-00691-1
22. Wiessner C, Keil T, Krist L, Zeeb H, Dragano N, Schmidt B, et al. Personen mit Migrationshintergrund in der NAKO Gesundheitsstudie – Soziodemografische Merkmale und Vergleiche mit der Autochthonen Deutschen Bevölkerung. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* (2020) 63:279–89. doi:10.1007/s00103-020-03097-9
23. Kajikhina K, Koschollek C, Sarma N, Bug M, Wengler A, Bozorgmehr K, et al. Recommendations for Collecting and Analysing Migration-Related Determinants in Public Health Research. *J Health Monit* (2023) 8:52–72. doi:10.25646/11144
24. Andersen RM. Revisiting the Behavioral Model and Access to Medical Care: Does It Matter? *J Health Soc Behav* (1995) 36:1–10. doi:10.2307/2137284
25. Andersen RM. National Health Surveys and the Behavioral Model of Health Services Use. *Med Care* (2008) 46:647–53. doi:10.1097/MLR.0b013e31817a835d
26. Peters A, Greiser KH, Göttlicher S, Ahrens W, Albrecht M, Bamberg F, et al. Framework and Baseline Examination of the German National Cohort (NAKO). *Eur J Epidemiol* (2022) 37:1107–24. doi:10.1007/s10654-022-00890-5
27. United Nations. *Standard Country or Area Codes for Statistical use(M49)* (2019). Available From: <https://unstats.un.org/unsd/methodology/m49/> (Accessed February 16, 2023).
28. UNESCO. *International Standard Classification of Education ISCED 1997* (1997).
29. Causaldiagrams. *Information and Examples* (2023). Available From: <https://causaldiagrams.org/> (Accessed June 30, 2023).
30. Textor J, van der Zander B, Gilthorpe MS, Liškievics M, Ellison GT. Robust Causal Inference Using Directed Acyclic Graphs: The R Package 'Dagitty'. *Int J Epidemiol* (2016) 45:1887–94. doi:10.1093/ije/dyw341
31. Traeger AC, Hübscher M, Henschke N, Williams CM, Maher CG, Moseley GL, et al. Emotional Distress Drives Health Services Overuse in Patients With Acute Low Back Pain: A Longitudinal Observational Study. *Eur Spine J* (2016) 25:2767–73. doi:10.1007/s00586-016-4461-0
32. Campbell C, Douglas A, Williams L, Cezard G, Brewster DH, Buchanan D, et al. Are There Ethnic and Religious Variations in Uptake of Bowel Cancer Screening? A Retrospective Cohort Study Among 1.7 Million People in Scotland. *BMJ Open* (2020) 10:e037011. doi:10.1136/bmjopen-2020-037011
33. Vermut JK. Latent Class Modeling With Covariates: Two Improved Three-Step Approaches. *Polit Anal* (2010) 18:450–69. doi:10.1093/pan/mpq025
34. Xia T, Iles R, Ross I, Newnam S, Lubman DI, Collie A, et al. Patterns of Health Service Use Following Work-Related Injury and Illness in Australian Truck Drivers: A Latent Class Analysis. *Am J Ind Med* (2020) 63:180–7. doi:10.1002/ajim.23072
35. Lefèvre T, Rondet C, Parizot I, Chauvin P. Applying Multivariate Clustering Techniques to Health Data: The 4 Types of Healthcare Utilization in the Paris Metropolitan Area. *PLOS ONE* (2014) 9:e115064. doi:10.1371/journal.pone.0115064
36. van Loenen T, van den Berg MJ, Faber MJ, Westert GP. Propensity to Seek Healthcare in Different Healthcare Systems: Analysis of Patient Data in 34 Countries. *BMC Health Serv Res* (2015) 15:465. doi:10.1186/s12913-015-1119-2
37. Abubakar I, Aldridge RW, Devakumar D, Orcutt M, Burns R, Barreto ML, et al. The UCL–Lancet Commission on Migration and Health: The Health of a World on the Move. *The Lancet* (2018) 392:2606–54. doi:10.1016/S0140-6736(18)32114-7

38. Missinne S, Bracke P. Depressive Symptoms Among Immigrants and Ethnic Minorities: A Population Based Study in 23 European Countries. *Soc Psychiatry Psychiatr Epidemiol* (2012) 47:97–109. doi:10.1007/s00127-010-0321-0
39. Close C, Kouvonen A, Bosqui T, Patel K, O'Reilly D, Donnelly M. The Mental Health and Wellbeing of First Generation Migrants: A Systematic-Narrative Review of Reviews. *Globalization and Health* (2016) 12:47. doi:10.1186/s12992-016-0187-3
40. Rousseau C, Frounfelker RL. Mental Health Needs and Services for Migrants: An Overview for Primary Care Providers. *J Trav Med* (2019) 26:tay150. doi:10.1093/jtm/tay150
41. Diaz E, Calderón-Larrañaga A, Prado-Torres A, Poblador-Plou B, Gimeno-Feliu L-A. How Do Immigrants Use Primary Health Care Services? A Register-Based Study in Norway. *Eur J Public Health* (2015) 25:72–8. doi:10.1093/eurpub/cku123
42. Thode N, Bergmann E, Kamtsiuris P, Kurth B-M. Predictors for Ambulatory Medical Care Utilization in Germany. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* (2005) 48:296–306. doi:10.1007/s00103-004-1004-3

Copyright © 2024 Wiessner, Licaj, Klein, Bohn, Brand, Castell, Führer, Harth, Heier, Heise, Holleczeck, Jaskulski, Jochem, Koch-Gallenkamp, Krist, Leitzmann, Lieb, Meinke-Franze, Mikolajczyk, Moreno Velásquez, Obi, Pischon, Schipf, Thierry, Willich, Zeeb and Becher. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

## 7.4 List of Talks and Posters related to the Thesis

### Talks related to Thesis:

- 2023**                    *‘Health service use among migrants in the German National Cohort (NAKO) – The role of birth region and language skills’* at the 18<sup>th</sup> Conference of the German Epidemiologic Society in Würzburg, Germany
- 2021**                    *‘Sexual health service use: A comparison of first and second generation migrants with the autochthonous German population in the German Health and Sexuality Survey (GeSiD)’* at the 16<sup>th</sup> Conference of the German Epidemiologic Society (online)
- 2020**                    *‘Methodology of the First German National Sex Survey – Gesundheit und Sexualität in Deutschland (GeSiD)’* at the 15<sup>th</sup> Conference of the German Epidemiologic Society (online)

### Posters related to Thesis:

- 2022**                    *‘Migration and Sexual Health Service Use – Results from the German Health and Sexuality Survey (GeSiD)’* at the 48<sup>th</sup> Conference of the International Academy of Sex Research in Reykjavik, Iceland

## 7.5 Further scientific publications during the PhD

Albrecht M, Pagenkemper M, Wiessner C, Spohn M, Lütgehetmann M, Jacobsen H, et al. Infant immunity against viral infections is advanced by the placenta-dependent vertical transfer of maternal antibodies. *Vaccine* 2022;40:1563–71. <https://doi.org/10.1016/j.vaccine.2020.12.049>.

Belau MH, Wiessner C, Becher H, von Rügen U, Briken P. Frequent Cannabis Use Moderates the Relationship Between Sexual Dysfunction and Depression Among Female German Adults. *J Sex Med* 2022;19:940–9. <https://doi.org/10.1016/j.jsxm.2022.03.610>.

Briken P, Dekker A, Cerwenka S, Pietras L, Wiessner C, von Rügen U, et al. Die GeSiD-Studie „Gesundheit und Sexualität in Deutschland“ – eine kurze Einführung. *Bundesgesundheitsblatt-Gesundheitsforschung-Gesundheitsschutz* 2021:1–5. <https://doi.org/10.1007/s00103-021-03433-7>.

Briken P, Matthiesen S, Pietras L, Wiessner C, Klein V, Reed GM, et al. Estimating the Prevalence of Sexual Dysfunction Using the New ICD-11 Guidelines. *Dtsch Arztebl Int* 2020;117:653–8. <https://doi.org/10.3238/arztebl.2020.0653>.

Briken P, Wiessner C, Štulhofer A, Klein V, Fuß J, Reed GM, et al. Who feels affected by “out of control” sexual behavior? Prevalence and correlates of indicators for ICD-11 Compulsive Sexual Behavior Disorder in the German Health and Sexuality Survey (GeSiD). *J Behav Addict* 2022;11:900–11. <https://doi.org/10.1556/2006.2022.00060>.

Bunte K, Wiessner C, Bahat G, Erdogan T, Cruz-Jentoft AJ, Zapf A. Association of periodontitis with handgrip strength and skeletal muscle mass in middle-aged US adults from NHANES 2013-2014. *Aging Clin Exp Res* 2023;35:1909–16. <https://doi.org/10.1007/s40520-023-02471-2>.

Cerwenka S, Wiessner C, Mercer CH, Matthiesen S, Pietras L, von Rügen U, et al. Factors associated with non-use of condoms among heterosexually-active single people in Germany: Results from the first representative, population-based German health and sexuality survey (GeSiD). *Int J STD AIDS* 2022;33:766–72. <https://doi.org/10.1177/09564624221100309>.

Döring N, Walter R, Mercer CH, Wiessner C, Matthiesen S, Briken P. Men Who Pay For Sex: Prevalence and Sexual Health. *Dtsch Arztebl Int* 2022;119:201–7. <https://doi.org/10.3238/arztebl.m2022.0107>.

Fiedler J, Pruskil S, Wiessner C, Zimmermann T, Scherer M. Remote interpreting in primary care settings: a feasibility trial in Germany. *BMC Health Serv Res* 2022;22:99. <https://doi.org/10.1186/s12913-021-07372-6>.

Ghandili S, Alihodzic D, Wiessner C, Bokemeyer C, Weisel K, Leyboldt LB. VTd-PACE and VTd-PACE-like regimens are effective salvage therapies in difficult-to-treat relapsed/refractory multiple myeloma: a single-center experience. *Ann Hematol* 2023;102:117–24. <https://doi.org/10.1007/s00277-022-05027-y>.

Ghandili S, Schönlein M, Wiessner C, Becher H, Lütgehetmann M, Brehm TT, et al. Lymphocytopenia and Anti-CD38 Directed Treatment Impact the Serological SARS-CoV-2

Response after Prime Boost Vaccination in Patients with Multiple Myeloma. *J Clin Med* 2021;10:5499. <https://doi.org/10.3390/jcm10235499>.

Goletzke J, Pagenkemper M, Wiessner C, Rüber F, Arck P, Hecher K, et al. Longitudinal adrenal gland measurements and growth trajectories as risk markers for late preterm delivery. *BMC Pregnancy Childbirth* 2020;20:570. <https://doi.org/10.1186/s12884-020-03255-6>.

Härter V, Barkmann C, Wiessner C, Rupprecht M, Reinshagen K, Trah J. Effects of Educational Video on Pre-operative Anxiety in Children - A Randomized Controlled Trial. *Front Pediatr* 2021;9:640236. <https://doi.org/10.3389/fped.2021.640236>.

Kainz E, Stuff K, Kahl U, Wiessner C, Yu Y, von Breunig F, et al. Impact of postanesthesia care unit delirium on self-reported cognitive function and perceived health status: a prospective observational cohort study. *Qual Life Res* 2022;31:2397–410. <https://doi.org/10.1007/s11136-022-03087-1>.

Koch M, Kroencke S, Li J, Wiessner C, Nashan B. Structured introduction of retroperitoneoscopic donor nephrectomy provides a high level of safety and reduces the physical burden for the donor compared to an anterior mini incision: A cohort study. *Int J Surg* 2019;69:139–45. <https://doi.org/10.1016/j.ijssu.2019.07.038>.

Koops TU, Wiessner C, Briken P. Sexual activities and experiences in women who underwent genital cosmetic surgery: a cross-sectional study using data from the German Health and Sexuality Survey (GeSiD). *Int J Impot Res* 2023;35:741–7. <https://doi.org/10.1038/s41443-022-00621-0>.

Koops TU, Wiessner C, Ehrenthal JC, Briken P. Assessing Psychodynamic Conflicts and Level of Personality Functioning in Women Diagnosed With Vaginismus and Dyspareunia. *Front Psychol* 2021;12:687369. <https://doi.org/10.3389/fpsyg.2021.687369>.

Kürbitz LI, Wiessner C, Schoon W, Briken P, Schöttle D, Schröder J. Gender differences in the association of psychological distress and sexual compulsivity before and during the COVID-19 pandemic. *J Behav Addict* 2022;11:533–43. <https://doi.org/10.1556/2006.2022.00046>.

Ludwig J, Brunner F, Wiessner C, Briken P, Gerlich MG, von dem Knesebeck O. Public attitudes towards sexual behavior—Results of the German Health and Sexuality Survey (GeSiD). *PLOS ONE* 2023;18:e0282187.

Matthiesen S, Wiessner C, Böhm M. Schule oder Elternhaus – wo kann, darf und sollte Sexualaufklärung stattfinden? *Zeitschrift für Soziologie der Erziehung und Sozialisation* 3/2022 2022. <https://doi.org/10.3262/ZSE2203294>.

Matthiesen S, Pietras L, Bode H, Cholmakow-Bodechtel C, Cerwenka S, Pfister M, Wiessner C et al. Methodology of the German National Sex Survey - GeSiD (German Health and Sexuality Survey). *Journal of Sex Research* 2021;58:1008–18. <https://doi.org/10.1080/00224499.2021.1875188>



Matthiesen S, von Räden U, Dekker A, Briken P, Cerwenka S, Fedorowicz C, Wiessner C et al. [How good is the knowledge about sexually transmitted infections in Germany? : Results of the first nationwide representative German health and sexuality survey (GeSiD)]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2021;64:1355–63. <https://doi.org/10.1007/s00103-021-03319-8>.

Pietras L, Wiessner C, Briken P. How Inclusion of Other in the Self Relates to Couple's Sexuality and Functioning - Results from the German Health and Sexuality Survey (GeSiD). J Sex Res 2022;59:493–503. <https://doi.org/10.1080/00224499.2021.1998307>.

Štulhofer A, Wiessner C, Koletić G, Pietras L, Briken P. Religiosity, Perceived Effects of Pornography Use on Personal Sex Life, and Moral Incongruence: Insights from the German Health and Sexuality Survey (GeSiD). J Sex Res 2022;59:720–30. <https://doi.org/10.1080/00224499.2021.1916422>.

Tozdan S, Brunner F, Pietras L, Wiessner C, Briken P. Sexual aggression against males: Differences between acts by males and females - Results from the German Health and Sexuality Survey (GeSiD). Child Abuse Negl 2021;117:105071. <https://doi.org/10.1016/j.chiabu.2021.105071>.

Vanella P, Wiessner C, Holz A, Krause G, Moehl A, Wiegel S, et al. Pitfalls and solutions in case fatality risk estimation – A multi-country analysis on the effects of demographics, surveillance, time lags between case reports and deaths and healthcare system capacity on COVID-19 CFR estimate. Vienna Yearbook of Population Research. 2022;20:167 - 193.

Vonneilich N, Becher H, Bohn B, Brandes B, Castell S, Deckert A, Wiessner C et al. Associations of Migration, Socioeconomic Position and Social Relations With Depressive Symptoms - Analyses of the German National Cohort Baseline Data. Int J Public Health 2023;68:1606097. <https://doi.org/10.3389/ijph.2023.1606097>.

Wiessner C, Pietras L, Cerwenka S, Briken P. Sexuelle Gesundheit von Personen mit Migrationshintergrund in Deutschland. Public Health Forum 2024; 32:46-48. <https://doi.org/10.1515/pubhef-2023-0144>.

Yüzen D, Graf I, Tallarek A-C, Hollwitz B, Wiessner C, Schleussner E, et al. Increased late preterm birth risk and altered uterine blood flow upon exposure to heat stress. EBioMedicine 2023;93:104651. <https://doi.org/10.1016/j.ebiom.2023.104651>.

Zapf A, Wiessner C, König IR. Regression Analyses and Their Particularities in Observational Studies—Part 32 of a Series on Evaluation of Scientific Publications. Dtsch Arztebl Int 2024;arztebl.m2023.0278. <https://doi.org/10.3238/arztebl.m2023.0278>.



## **8 Acknowledgements**

Acknowledgements not shown due to data protection.

## **9 Curriculum Vitae**

Curriculum Vitae not shown due to data protection



## 10 Eidesstattliche Versicherung

Ich versichere ausdrücklich, dass ich die Arbeit selbständig und ohne fremde Hilfe verfasst, andere als die von mir angegebenen Quellen und Hilfsmittel nicht benutzt und die aus den benutzten Werken wörtlich oder inhaltlich entnommenen Stellen einzeln nach Ausgabe (Auflage und Jahr des Erscheinens), Band und Seite des benutzten Werkes kenntlich gemacht habe.

Ferner versichere ich, dass ich die Dissertation bisher nicht einem Fachvertreter an einer anderen Hochschule zur Überprüfung vorgelegt oder mich anderweitig um Zulassung zur Promotion beworben habe.

Ich erkläre mich einverstanden, dass meine Dissertation vom Dekanat der Medizinischen Fakultät mit einer gängigen Software zur Erkennung von Plagiaten überprüft werden kann.

Unterschrift: .....  .....