Pre- and post-arrival effects on state and development of Refugees' mental health status in Germany.

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Introduction

In the last years, the European Union countries have experienced the arrival of high number of refugees[2], particularly between 2014 and 2016 (EUROSTAT, 2023). Germany, especially, has received the highest number of asylum applications in Europe since 2012, with a peak in 2016 (EUROSTAT, 2024). This large influx of refugees is an unprecedented phenomenon in Germany's recent history, as the previous non-EU immigrants were primarily composed of labour immigrants and their families (Brücker et al., 2020). More than 3 million people were registered in the process of seeking protection in Germany at the end of 2023 (Statistisches Bundesamt, 2024). Between 2016 and 2017, the primary citizenships of first-time asylum applicants in Germany were Syrian, Iraqi, Afghan, Eritrean, and Iranian (Bundesamt für Migration und Flüchtlinge, 2019). Although some of these citizenships were already present in the previous decade, the numbers during this period were considerably higher.

Considering this historic moment, the mental health of refugees has become an important topic in literature. The mental health of refugees is affected by the traumatic events that force them to leave their country, the challenges faced during the journey, and the post-immigration stressors experienced in the host country (Biddle et al., 2019; Blackmore et al., 2020; Borho et al., 2020; Carlsson & Sonne, 2018; Hajak et al., 2021; Hynie, 2018; Kaltenbach et al., 2018; Sangalang et al., 2019).

Refugees are more exposed to traumatic events because they often decide to immigrate due to the difficult conditions in their origin country (Carlsson & Sonne, 2018). According to a series of systematic literature reviews and meta-analysis of previous studies, these conditions may include war, lack of access to essential resources like food and water, and deprivation of fundamental rights (Bogic et al., 2015; Sigvardsdotter et al., 2016; Steel et al., 2009). Moreover, traumatic events may have affected refugees already from their childhood, resulting in worse mental health compared to those refugees not exposed to such kind of events in the early years of their lives (Carlsson & Sonne, 2018).

Usually, studies do not test differences in mental health among different countries of origin because the groups are quite small, or they analyse refugees from the same area. However, two systematic reviews summarising several studies report differences based on the origin area of refugees (Blackmore et al., 2020; Bogic et al., 2015). Blackmore et al. (2020) report a higher prevalence of post-traumatic stress disorder (PTSD) among African and European refugees. Both reviews report a lower prevalence of depression among Asian and Middle Eastern refugees. Those differences may stem from diverse pre-, during--, and post-flight stressors, but it is unclear if these reflect true differences or issues with mental health measurement consistency across origins (Grochtdreis et al., 2024). Females, already in the general population, report higher levels of externalising mental health problems, and similar differences have also been found for refugees (Hollander et al., 2011; Rosenfield & Mouzon, 2013). Those differences are explained by several factors: e.g., refugee women face gender-specific trauma during their flight, reporting a higher likelihood of mental ill health, which impacts their quality of life, together with post-migration stressors affecting men and women differently (Grochtdreis et al., 2022). Among the socio-demographic characteristics, age is also an important factor for mental health: in previous studies,

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[2] In this article we are going to use the terms asylum seekers and refugees without distinction of their legal status.

older refugees report higher levels of mental ill health and poorer physical functioning compared to younger refugees (e.g. Tinghög et al., 2017).

Previous studies show that socio-economic status and health are positively related across the whole population; however, the socio-economic status of refugees in the country of origin is only partially important for their health, including mental health in the destination countries. For instance, Bauer et al. (2020), using the first wave of the GSOEP survey on refugees in Germany in 2016, found that the socio-economic gradient before migration in health satisfaction indicators among Syrian refugees was strongly attenuated after migration. Status inconsistencies and downward social mobility can impact refugees differently based on their pre-migration socio-economic status (SES). Refugees from high SES backgrounds may struggle to regain their status due to unrecognised qualifications and limited opportunities, while those from low SES backgrounds may see little change or improvement. Upon arrival, differences in pre-migration SES often diminish as refugees face similar challenges, including shared housing and restrictions on employment. Likewise, the refugees' level of education attained in the countries of origin may imply a loss of status for those more educated and adaptation difficulties for the less educated. For both subpopulations, mental health may thus result in a negative effect or a positive effect of higher levels of education, generally recognised as a positive determinant of mental health, which may be neutralised by negative conditions at arrival (WHO, 2024).

The immigration journey of refugees presents significant challenges, requiring refugees to overcome numerous obstacles. During travel, refugees may endure conditions such as physical and sexual violence, diseases, extortion and human trafficking (Brücker et al., 2016; Giacco et al., 2018; Sigvardsdotter et al., 2016). The impact of these experiences can have long-lasting effects on their health. Studies have found high percentages of PTSD, depression and anxiety in refugees in different countries (Biddle et al., 2019; Blackmore et al., 2020; Georgiadou et al., 2017; Kaltenbach et al., 2018). Overall, previous studies have shown that a higher number of traumatic events is associated with greater risks to mental health (e.g. Georgiadou et al., 2017).

In addition to the challenges that refugees face before arriving in the host country, refugees they often encounter problems and discomfort after their arrival. Indeed, after arriving in destination countries, different aspects of the lives of the refugees influence their mental health negatively (Li et al., 2016). These include the challenging economic situation, poor host language proficiency, lack of social support, discrimination and uncertainties about their situation, such as the resident status or employment status (Bogic et al., 2015; Heeren et al., 2014; Hynie, 2018; James et al., 2019).

Recent studies suggest that stress encountered by refugees in destination countries, known as postmigration stress, may exacerbate existing mental health issues (e.g., Li et al., 2016; Porter & Haslam, 2005). Some researchers even argue that postmigration stress is a stronger predictor of refugees' mental health than the traumatic experiences they faced before and during their journey (e.g., Schweitzer et al., 2011; Beiser & Hou, 2016).

One major factor upon arrival is obtaining legal status, which affects access to education and employment (Kosyakova & Brenzel, 2020). Delayed asylum decisions can increase uncertainty, fear of deportation, and poor living conditions, worsening trauma (Coffey et al., 2010; Robjant et al., 2009). Additionally, frequent interactions with authorities during the asylum process can be a stressor (Laban et al., 2004; Silove et al., 1997). Housing instability is another stressor. Refugees in temporary accommodations often experience higher stress levels due to lack of privacy, autonomy, and social integration (Porter & Haslam, 2005; Adam et al., 2019). Poor housing conditions are also linked to financial and social deprivation (Krahn et al., 2000). Limited labour market access further contributes to mental health challenges. Unemployment is a key predictor of depression among refugees (Beiser & Hou, 2016; Kim, 2016), while economic stability improves mental health outcomes (Maqul et al., 2021; Porter & Haslam, 2005). Lastly, language barriers hinder integration, employment, and healthcare access (Aljadeeah et al., 2021; Green, 2017). Refugees with limited language proficiency are more likely to experience social isolation and depression (Beiser & Hou, 2016; Kartal et al., 2018).

Research on uncertainty and its link to worry primarily focuses on non-refugee populations. In psychology, uncertainty is seen as an external factor, while worry is an internal, subjective response. Uncertainty about the future is a common experience among forced migrants, as their immigration process was not thoroughly planned, and they depend on host state institutions to move forward in certain aspects of their lives (Schiltz et al., 2019). Worrying is deeply connected with uncertainty, as it is defined as being concerned about uncertain future events, which leads to feelings of anxiety (Gu et al., 2020; MacLeod et al., 1991). Previous studies on refugees showed that worry was common and that it worsened their already precarious mental health conditions (e.g., Hinton et al., 2011; Lawrence et al., 2019).

In the last decade, several studies have investigated the mental health of refugees in Germany, and the results are similar to the international research findings and found high psychological stress levels in this population (Hajak et al., 2021). Since refugee arrival is a recent phenomenon in Germany, most of the articles are cross-sectional or longitudinal over a short period of time (Ambrosetti et al., 2021; Borho et al., 2020; Kaltenbach et al., 2018; Kindermann et al., 2020; Löbel, 2020; Walther et al., 2020), focus only on young or adolescents refugees (EL-Awad et al., 2025; Hornfeck et al., 2024; Müller et al., 2019), focus on refugees from a specific origin country, or they do not employ a purely longitudinal design (Grochtdreis et al., 2024) or they compare the mental health of different groups, rather than focusing specifically on refugees (Jaschke et al., 2023).

This study aims to investigate pre-arrival and post-arrival characteristics that could affect the mental health of refugees in the long term in the same group of individuals. This analysis is performed using the IAB-BAMF-SOEP Survey of Refugees, which provides both the pre-arrival and longitudinal post-arrival information from 2016 to 2020 on refugees who arrived in Germany, allowing the construction of a longitudinal analysis of the same group of refugees. We consider a group of refugees from different origins and different backgrounds, both male and female. Moreover, the broad range of questions included in the IAB-BAMF-SOEP Survey of Refugees allows us to explore various aspects of the life of refugees. We constructed a linear regression for the pre-arrival analysis and a fixed effects model for the post-arrival information. The purpose of this technique is to compare the differences within individuals over time and then average the differences across the individuals (Allison, 2005). This allowed us to assess the effects of changes through time on the mental health of refugees during their lives in Germany.

We address two research questions:

1) Which pre-arrival characteristics are associated with the mental health of refugees at the first Interview?

2) Which changes in everyday life affect the mental health of refugees over the first five years in Germany?

In our analysis, we also considered the data from 2016 to 2020, the year of the onset of the COVID-19 pandemic in Europe. Germany's response was similar to that of other European countries, with the implementation of lockdowns and social protection packages aimed at supporting vulnerable population sections (Greer et al., 2021). At the beginning of the pandemic, some studies reported higher levels of mental distress in the general population than before; however, over time, mental health levels appeared to return to previous norms, except among vulnerable groups (Mauz et al., 2022; Robinson et al., 2022; Sun et al., 2023). Regarding the refugees, the asylum process was slowed down, and asylum seekers were issued temporary residence permits and were living in accommodation centres (Reches, 2022). Some studies found higher levels of mental distress for refugees in this period (Goßner et al., 2022; Jumaa et al., 2023).

Data and methods

The German Socio-Economic Panel (G-SOEP) is a yearly representative survey that started in 1984 and is organised by the German Institute for Economic Research (D.I.W. Berlin). It provides longitudinal data on the German population, including their employment, work, and health. The

survey works by sampling the household and tries to follow the individuals for all their lives (Goebel et al., 2019). Besides its overall population sample, the G-SOEP also includes some additional samples of population subgroups of particular interest, which would have been difficult to analyse in the main sample.

We use data from one of these subgroup samples, the German IAB-BAMF-SOEP Survey of Refugees, a specific sample of the G-SOEP (DIW Berlin, 2023). The Survey of Refugees started in 2016 and focuses on the lives of refugees and asylum seekers in Germany (D.I.W., 2023). The participants were extracted randomly from the Central Register of Foreigners held by the German Federal Office for Migration and Refugees (BAMF) (Goebel et al., 2019; Kühne et al., 2019). The first sample was extracted in 2016 and targeted households containing individuals who arrived in Germany between 2013 and 2016 and applied for asylum status. The first sample included 5047 people. Another additional sample was extracted in 2017 of 3073 people to refresh (adding people with the same condition as the first sample) and enlarge (adding people who arrived between February 2016 and December 2016) the Refugees sample (Siegers et al., 2022). The survey included people who arrived in Germany for humanitarian reasons from 2013 to 2016 and included both people who were granted and not still granted a refugee permit. 556 participants did not complete or had an invalid assessment of the mental health at the first interview.

We use the health information from the health module of the G-SOEP questionnaire. This module is assessed every two years (even years) (SOEP Group, 2020). In the case of the refugee sample, the health questionnaire was administered during the first Interview (in 2016 and 2017 for this study) and then at every second year of the surveys (2018 and 2020).

The structure of the sample and the numbers of the observations that dropped out are illustrated in Annex C in Figure 4.2. In the analysis, we exclude the missing observations for the immigration year and for respondents who did not answer the mental health score. We exclude some participants who declared to have arrived in Germany before 2013. The sample was constructed to include immigrants who arrived between 2013 and 2017. However, our data includes 13 participants from the 2017 sample who declared they had arrived in 2017, and we do not exclude them. We only considered participants aged 18 or older because the questionnaire differs for under-18-year-olds. We also limited the participants to those younger than 61 at the first interview because we wanted to consider the labour market opportunities and, thus, economic independence. For the missing values (93 values) in the pre-arrival analysis, we imputed the values through a multiple hot deck imputation using the command hotdeckvar in Stata 17.0 (Andridge & Little, 2010). For the post-arrival analysis, we let the missing information be excluded from the model except for the permit status variable, where we create a missing category. So, we employ balanced panel data, considering only 1880 individuals who completed the 2016/2017 questionnaire and participated in the 2018 and 2020 follow-up survey rounds. We included the same participants in the pre-arrival and post-arrival analyses.

Response variable

We assess the mental health status through the Mental Component Score (MCS) derived from the SF-12 questionnaire (Ware et al., 1995). The MCS is calculated from mental-health-related items of the SF-12. The SF-12 is the short and valid version of the SF-36 questionnaire that was developed to assess health status in the mental and physical fields (Ware et al., 1995). The SF-12 used in the G-SOEP is slightly different from the one created by Ware et al., with a change in the order of the questions and a substitution for one of the physical health questions (Andersen et al., 2007). In the case of the refugee sample, the SF-12 questionnaire in the health module is administered during the first interview (in 2016 and 2017 for this study) and then at every second year of the surveys (2018 and 2020). The MCS varies from 0 to 100 (0 is the worst mental health possible, and 100 is the best mental health possible). The variable MCS is calculated by the G-SOEP using explorative factor analysis (P.C.A., varimax rotation) (Grabka & SOEP Group, 2022). We conducted an attrition

analysis for our response variable, MCS; we found no indications of attrition bias for the MCS at the first interview (In Annex C, Table 4.7).

Table 4.1 reports the MCS means and confidence intervals at 95% level, divided for sex and the three interviews. For the male population, the MCS mean increases, improving mental health, through the years, passing from 49.48 at the first interview to 50.67 at the third interview, even if these differences are not significant as the confidence intervals overlap. For the female population, changes over time in the MCS mean score are bigger. In the first and second interviews, the average MCS is lower than their male correspondent measurements, with a mean of 46.40 for the first and 47.79 for the second interviews. There was a jump of more than 2 points between the second and the third Interview when the mean increased to 50.0. The first and second Interview scores are significantly different from the third Interview scores.

Table 4.1 MCS means and 95% confidence intervals for sex and the interviews.

	Interview	Mean	[95% confidence interval]
Male	First	49.48	[48.84, 50.12]
	Second	50.16	[49.55, 50.77]
	Third	50.67	[50.11, 51.23]
Female	First	46.40	[45.51, 47.28]
	Second	47.79	[46.89, 48.68]
	Third	50.01	[49.21, 50.81]

Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Figure 4.3 of Annex C reports the plot for the MCS divided into years.

In Annex C Table 4.8, we report the averages for the natives, migrants, and refugees for the three interviews, divided by sex. In this table, we include all refugees who participated in the survey that year (the yearly Refugees sample), contrary to the sample used in this article (the longitudinal Refugees sample), which includes only Refugees who participated in all three waves with the health questionnaire. The average for the yearly Refugees samples never significantly differs from the longitudinal Refugees sample. Instead, natives always have higher MCS means than the one of our longitudinal Refugees sample, except for the females in the last interview, when the refugees' MCS mean is higher than the natives.

Independent variables

Our analysis has two steps: the pre-arrival information OLS regression and the post-arrival fixed-effect regression. Since the type of analysis constructed for the post-arrival information is a fixed effects regression, we cannot use the time-constant pre-arrival variables in the post-arrival analysis.

Pre-arrival variables

We obtained the pre-arrival information from the starting questionnaire for refugees that was administered at the first Interview (2016/2017). The pre-arrival information focuses on events before arrival in Germany, reporting the situation in the origin country and the travel conditions. Table 4.2 reports the percentages by sex for categorical pre-arrival variables collected in the first Interview. The table also reports the missing values we impute in the analysis with the multiple hot deck imputation. The sample is composed of 1254 males and 626 females.

Origin Country We divide the refugees into the five most frequent countries of birth: Syria, Iraq, Afghanistan, Eritrea, and Iran, as well as a sixth "other" category for the smaller groups.

Survey Year The variable provides the year that the respondent answered the first interview, 2016 or 2017.

Year Moved to Germany The sample comprises people who immigrated to Germany between 2013 and 2017.

SES in Origin Country Question regarding the self-assessed economic level in the origin country. The possible answers are: "Well below average", "Below average", "Average", "Above average", and "Well above average". We group "Well below average" with "Below average" and "Well above average" with "Above average", considering just three categories for our analysis. We impute 43 missing values.

Level of Education in Origin Country Question about the self-assessed level of education in the origin country. We consider the following categories for the analysis: "Primary", "Secondary", and "University". We impute 2 missing observations.

Traumas during the Journey We use a question about the traumatic experiences during the journey to Germany that gives several possible answers:" Financial fraud or financial exploitation", "Sexual harassment", "Physical attacks", "Shipwreck", "Robbery", "Blackmail", "Imprisonment", "No, none of the above". It is possible to choose not to answer this question. We create the variable with four categories: "None", "One", "More than one", and "Choose not to answer". We impute 23 values that were missing.

Debit for the journey We use the question: "How did you finance the cost of the trip or escape?". Among the possible answers, there was "Credit arrangement/ loans". It is possible to choose not to answer this question. Based on this information, we create the variable Debit for the journey with the possible categories "Yes", "No", and "Choose not to answer". We impute 12 missing values.

The first country to immigrate to We use the question, "Was Germany the first country you moved to or was it another country?". The possible answers are "Germany" or "Another country".

Table 4.2 Percentages for pre-arrival categorical variables by sex, collected at the first Interview (Obs. 1880).

	Male	Female	Total
n	1254	626	1880
Categorical variables	**%**	**%**	**%**
Origin Country			
Syria	63.96	63.90	63.94
Iraq	11.64	10.86	11.38
Afghanistan	9.65	8.63	9.31
Eritrea	4.63	4.31	4.52
Iran	2.07	3.35	2.50
Other	8.05	8.95	8.35
Survey Year			
2016	63.16	53.35	59.89
2017	36.84	46.65	40.11
Year Moved to Germany			
2013	4.31	4.63	4.41
2014	18.02	15.81	17.29
2015	65.15	56.39	62.23
2016	12.12	21.88	15.37
2017	0.40	1.28	0.69
SES in Origin Country			
Above average	31.67	24.48	29.25

	Male	Female	Total
n	1254	626	1880
Categorical variables	**%**	**%**	**%**
Average	44.21	48.78	45.75
Below average	21.67	24.13	22.49
Missing	*2.46*	*2.60*	*2.51*
Education level in Origin Country			
Primary	38.95	43.06	40.33
Secondary	40.09	41.67	40.62
University	20.88	15.10	18.94
Missing	*0.09*	*0.17*	*0.12*
Traumas during the Journey			
None	29.03	32.11	30.05
One	17.62	12.30	35.48
More than one	22.09	14.70	19.63
Choose not to answer	30.06	39.62	33.24
Missing	*1.20*	*1.28*	*1.22*
Debit for the journey			
No	62.76	54.79	60.11
Yes	6.46	5.11	6.01
Choose not to answer	30.06	39.62	33.24
Missing	*0.72*	*0.48*	*0.64*
The first country to immigrate to			
Germany	60.61	60.42	60.55
Other country	39.39	39.58	39.45

Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Table 4.3 reports the mean, standard deviation and maximum and minimum for the continuous pre-arrival variables. The table also reports the missing values we imputed in the analysis with the multiple hot deck imputation.

Age at first interview We select the refugees who are at least 18 and at most 60 at the first Interview.

No. of reasons for leaving the country The original question is: "What were the main reasons that made you then leave this country?". The possible multiple choice answerers were: "Fear of violent conflict or war"," Fear of forced subscription to military or armed organisations"," Persecution"," Discrimination (ethnic, religious, etc.)", "Poor personal living conditions", "The country's general economic situation", "I wanted to move to where my family members were", "My family sent me", "Because family members had left this country", "Because friends/acquaintances had left this country", and "Other reasons". The participant could answer by ticking all the ten categories listed. We consider the number of reasons that every refugee has to leave their origin country. Thus, we treat this information as a continuous variable.

Days to travel to Germany We use the question: "How many days did it take to travel from your origin country to Germany?". In the analysis, we consider the number of days of travel. There are 39 missing observations that we impute.

No. of reasons to move to Germany The original question is: "What were the reasons for you to move to Germany and not to another country?". The question has 14 multiple-choice answers: "Because family members live here", "Because friends or acquaintances live here", "Because a lot of other people from my country of origin live here", "Because of the economic situation in Germany", "Because human rights are respected in Germany", "Because of the German education system", "Because of the state and social welfare provided", "Because of feeling welcome in

Germany", "Because of the German asylum procedure", "It was a coincidence", and "Other reasons". We use this information as a numerical count for all the answers selected.

Table 4.3 Descriptive statistics for the pre-arrival continuous variables, collected in the first Interview (Obs. 1880).

Continuous variables	Mean (sd)	Min	Max	Missing
Age at first interview	33.87 (9.75)	18	60	0
No. of reasons for leaving the origin country	3.25 (1.93)	0	11	11
Days to travel to Germany	48.77 (158.67)	1	3655	39
No. of reasons to move to Germany	3.23 (1.94)	0	10	10

Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Post-arrival variables

Table 4.4 reports the post-arrival information from the first, second and third interviews. The questions focus on the respondents' life circumstances throughout the years in Germany.

Employment status We use the question: "Are you currently employed? Which one of the following applies best to your status? ". For those who were unemployed, we also took into consideration the answer to the question: "Have you actively looked for work within the last four weeks?". We group the answers into: "Employed", "Not employed - Searching for a job", and "Not employed - Not searching for a job".

Legal status We use the question: "What residence permit do you currently have?". We divide the answer into: "Protection status granted", "In Proceedings", "Temporary Suspension of Deportation", and "Missing". The Protection status granted also includes a small group that has another type of permit.

Marital Status We use the question:" What is your marital status? ". We divide the answer into: "Single, never married", "Married", and "Divorced or Widowed". We combined Divorced and Widowed because the two categories have small frequencies.

Worried about being unable to stay in Germany In the individual questionnaire, the question is: "Are you worried that you will be unable to stay in Germany?".

Worried about own Finances The question is: "Do you worry about your own economic situation?".

Worried about Hostility to Foreigners The question is: "Do you worry about anti-foreigner sentiment and xenophobia in Germany?".

Worried about being unable to return to Origin Country We use the question: "Are you worried that you will be unable to return to your country of origin?".

Worried about the outcome of the asylum procedure We use the question: "Are you worried about the result of your asylum application?".

The possible answers for the four worry questions are three: "No worry", "Major concerns", and "Some worries", and we group the latter two answers. The categories that we consider in this analysis are for all four variables: "No" and "Yes".

Type of Accommodation We use the question: "In what type of accommodation are you currently living? ". The possible answers are: "Shared accommodation" and "Private flat-house / Other accommodation".

Take part in a BAMF course The BAMF organises several courses on integration and the German language. The questionnaire has several questions about participation in these courses. We group the answers into "Yes" for those who had taken part in one of these courses and "No" for those who had not.

German Proficiency Participants have to self-assess their level of German for written, oral and reading abilities. For each question, there are five response options: not at all, not very well, averagely, well, very well. We treat each variable as numerical and use the arithmetical mean of the three items.

Table 4.4 Descriptive statistics for the post-arrival continuous variables, at the first, second and third interviews (Obs. 1880).

	Interview				
	1	**2**	**3**	**Total**	**p-value**
n	**1880**	**1880**	**1880**	**5640**	
Employment status					<0.001
Employed	10.11	28.4	38.78	25.76	
Not employed - Searching for a job	85.16	68.24	55.64	69.68	
Not employed – Not searching for a job	4.73	3.35	5.59	4.56	
Legal status					<0.001
In Proceedings	23.03	10.11	4.10	12.41	
Protection status granted	72.87	84.47	89.20	82.19	
Temporary Suspension of Deportation	3.35	4.57	5.80	4.57	
Missing	*0.74*	*0.85*	*0.90*	*0.83*	
Marital Status					0.001
Single, never married	26.49	24.73	23.72	24.98	
Married	69.10	68.67	68.78	68.85	
Divorced or Widowed	4.00	6.54	7.34	5.99	
Missing	0.32	0.05	0.16	0.18	
Worried about being unable to stay in Germany					<0.001
No	44.73	37.02	49.10	43.62	
Yes	54.04	62.39	50.74	55.73	
Missing	*1.22*	*0.59*	*0.16*	*0.66*	
Worried about own Finances					<0.001
No	23.94	26.44	33.99	28.12	
Yes	75.59	73.30	65.74	71.54	
Missing	*0.48*	*0.27*	*0.27*	*0.34*	
Worried About Hostility To Foreigners					<0.001
No	75.21	67.98	71.76	71.65	
Yes	23.88	31.49	28.09	27.82	
Missing	*0.90*	*0.53*	*0.16*	*0.53*	
Worried about being unable to return to Origin Country					<0.001
No	51.33	56.01	65.64	57.66	

	Interview				
	1	**2**	**3**	**Total**	**p-value**
Yes	46.60	41.54	33.83	40.66	
Missing	*2.07*	*2.45*	*0.53*	*1.68*	
Worried about the outcome of the asylum procedure					<0.001
No	54.68	53.67	65.90	65.90	
Yes	43.99	45.80	33.78	33.78	
Missing	1.33	0.53	0.32	0.32	
Type of Accommodation					<0.001
Shared accommodation	31.7	15.27	9.36	18.78	
Private flat/ house/ Other acc.	67.71	84.1	90.64	80.82	
Missing	*0.59*	*0.64*	*0.00*	*0.41*	
Take part in a BAMF course					<0.001
No	56.97	88.35	66.28	70.53	
Yes	43.03	11.65	33.72	29.47	
	mean (sd)	**mean (sd)**	**mean (sd)**	**mean (sd)**	
German proficiency	2.66 (0.95)	3.21 (0.92)	3.40 (0.90)	3.09 (0.98)	<0.001

Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Methods

Our analysis comprises two steps: an analysis of the mental health (MCS) and the association with the pre-arrival information collected at the first Interview (2016/2017) and a longitudinal analysis of the mental health using the information collected at the first, second, and third interviews (2016/2017, 2018 and 2020).

We construct the pre-arrival analysis using a stepwise regression approach, using ordinary least-squared linear (OLS) regressions since MCS is a continuous variable. In the first model (OLS1), we include the basic socio-demographic variables: age and gender. In the second model (OLS2), we add the variables regarding the conditions in the origin country. In the third model (OLS3), we add information about travel debts and whether Germany was the first country of immigration. In the fourth and last model (OLS4), we add the survey year, the day to travel to Germany and the reasons for moving to Germany. Since we use the hotdeck imputation method, we could not calculate the statistics to evaluate the goodness of fit of the models.

For the longitudinal analysis, we use a fixed-effect regression. We included variables regarding employment status, migrant permit status, marital status, worries, and other aspects of everyday life. Our analysis allows us to observe the change within the participants between 2016 and 2020. This method allows our analysis to focus on controlling for the unobserved variables. Finally, we also plot the average marginal effects of responses of the fixed effect model for the interaction between the values of the variable Interview and the four variables measuring different types of worry. For all the analysis, we used Stata 17.

Results

Table 4.5 reports the stepwise linear regressions based on the pre-arrival information of the Refugees collected in the first Interview (2016/2017). The variable age is not significant for any of

the models. The variable female is significant for all four models, indicating a significant lower mental health score for the female refugees than the males. For the variable origin country, we used the most represented group, Syria, as the reference category. While the Iraq category is not significant for any model, the Afghanistan and Iran categories are significant for all models, reporting a lower MCS than the Syrians. The Eritreans, instead, report a significantly higher MCS than the Syrians for all the models. The Other group is significant only for models OLS3 and OLS4, reporting a lower MCS than the Syrians. For the SES in the Origin Country, the reference category is Below Average. Only the coefficient for the category Above Average is significant and indicates a higher level of MCS compared to the reference category, while the category Average does not significantly differ from the category Below Average. The coefficient is significant and negative for the number of reasons for leaving the country. None of the coefficients for the variable Education levels in the Origin Country is significant. The coefficient for the No. of traumatic events during the journey is significant and negative, indicating that those who had more traumatic experiences have a lower MCS score. Having contracted debts during the journey not associated with the Refugees' MCS in any of the models considered. All the other variables, the Survey Year, Days to travel to Germany, and No. of reasons to move to Germany are not significant for MCS for any of the stepwise models.

Table 4.5 Coefficients and standard errors of the stepwise linear regressions of MCS (First Interview, 2016/2017) for pre-arrival information (Obs. 1880)

	(OLS1)	(OLS2)	(OLS3)	(OLS4)
Age at first interview	-0.03 (0.03)	-0.04 (0.03)	-0.04 (0.03)	-0.04 (0.03)
	-3.09* **	**-3.32*** **	**-3.48*** **	**-3.66*** **
Female	**(0.56)**	**(0.56)**	**(0.56)**	**(0.57)**
Origin Country (Ref. Syria)				
Iraq		0.44 (0.85)	0.49 (0.86)	0.49 (0.86)
		-3.45* **	**-3.29*** **	**-3.30*** **
Afghanistan		**(0.94)**	**(0.95)**	**(0.96)**
		4.50* **	**4.63*** **	**4.94*** **
Eritrea		**(1.32)**	**(1.33)**	**(1.35)**
		-5.32 **	**-5.33** **	**-5.58** **
Iran		**(1.70)**	**(1.70)**	**(1.71)**
Other		-1.78 (0.98)	-1.96* (0.98)	-1.98* (0.99)
SES in Origin Country (Ref. Below average)				
Average		0.78 (0.68)	0.83 (0.69)	0.92 (0.69)
			1.57*	**1.67***
Above average		1.35 (0.77)	**(0.77)**	**(0.78)**
No. of reasons for leaving the Origin Country		**-0.67*** **	**-0.62*** **	**-0.61*** **
		(0.14)	**(0.14)**	**(0.16)**
Education level in Origin Country (Ref. Primary)				
Secondary		0.12 (0.59)	0.15 (0.59)	0.21 (0.60)
University		-1.16 (0.76)	-1.16 (0.76)	-1.11 (0.76)
Traumas during the journey (Ref. None)				
One			-0.23 (0.81)	-0.18 (0.81)

	(OLS1)	(OLS2)	(OLS3)	(OLS4)
More than one			**-2.99*** (0.77)**	**-2.85*** (0.77)**
Choose not to answer			3.89 (8.00)	2.84 (8.64)
Debit for the journey (Ref. No)				
Yes			-1.10 (1.12)	-0.99 (1.12)
Choose not to answer			-1.20 (8.17)	-0.99 (8.20)
The first country to immigrate to (Ref. Germany)				
Another country			0.26 (0.55)	0.35 (0.55)
Survey Year (Ref. 2016)				
2017				0.56 (0.61)
Days to travel to Germany				-0.00 (0.00)
No. of reasons to move to Germany				-0.04 (0.16)
Year Moved to Germany (Ref. 2015)				
2013				0.54 (1.33)
2014				-0.25 (0.76)
2016				1.02 (0.78)
2017				5.17 (3.23)

* p<0.05; ** p<0.01; *** p<0.001
Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Table 4.6 presents the results of the fixed effects regression for the first (2016/2017), second (2018) and third (2020) interviews on the MCS. The fixed effects models analyse within-individual changes over the period considered, and the coefficients represent the average change in the MCS health associated with a shift in the independent variable.

Both being employed or not being employed but actively searching for a job are associated with higher MCS than the reference category. There is no significant difference in the legal status. For the marital status, when the participants are single and never married, their MCS is significantly higher than when they are married. The variable worried about the outcome of the asylum procedure is not significant. For the other four worries variables, when the participants are worried, their MCS is lower than when they are not. The change in type of accommodation does not significantly change the MCS. Higher German proficiency is associated with higher MCS.

Table 4.6 Coefficients and standard errors of the fixed effects regression of First, Second and Third Interview MCS (Observations 5446, Individuals 1880).

	Coefficient (standard error)
Employment Status (Ref. Not employed- Not searching for a job)	
Employed	**3.13** (0.96)**
Not employed- Searching for a job	**2.44** (0.86)**
Legal status (Ref. Refugee permit granted)	

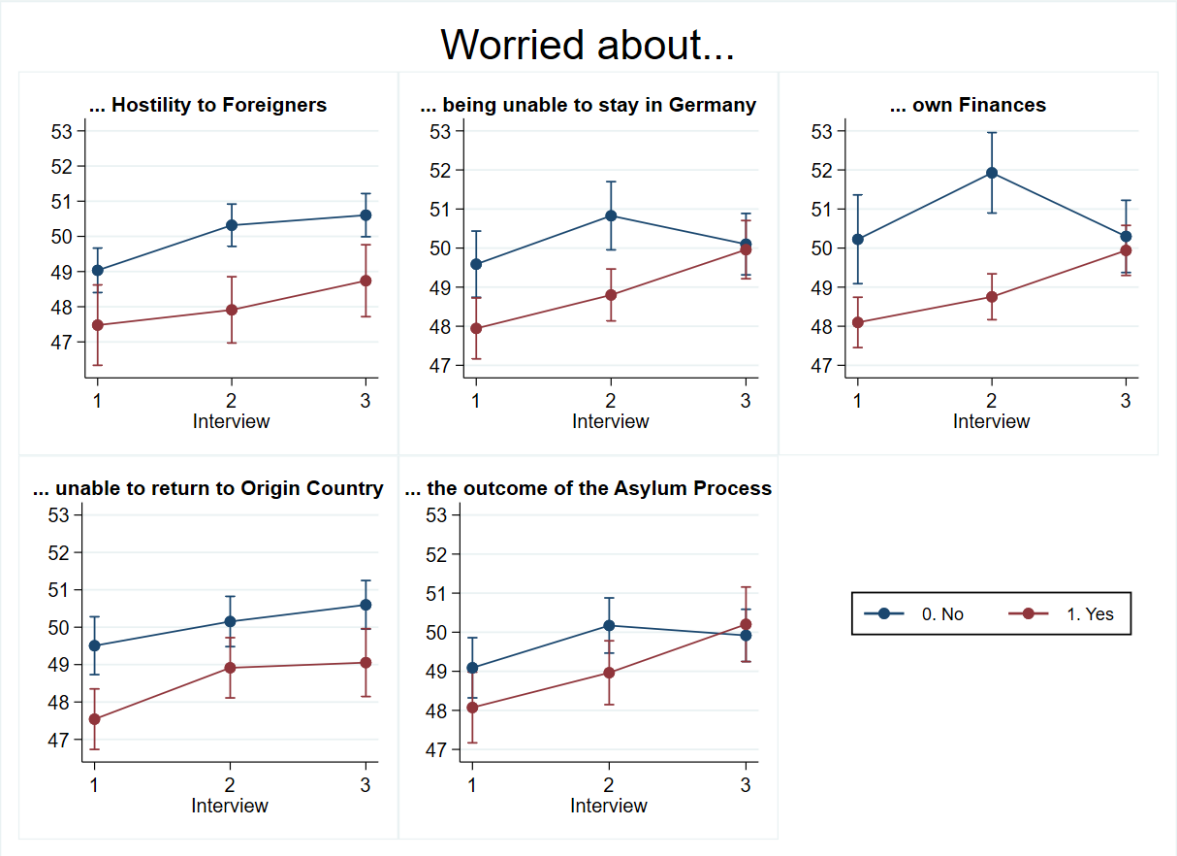
	Coefficient (standard error)
In proceedings	-0.16 (0.64)
Tolerated stay	0.5 (1.03)
Missing	2.39 (1.83)
Marital Status (Ref. Married)	
Single, never married	2.16 (1.15)
Divorced or Widowed	0.64 (1.18)
Worried not to stay in Germany (Ref. No)	
Yes	**-1.18** (0.40)**
Worried about own Finances (Ref. No)	
Yes	**-1.85*** (0.40)**
Worried about Hostility To Foreigners (Ref. No)	
Yes	**-1.70*** (0.41)**
Worried about the outcome of the Asylum Procedure (Ref. No)	
Yes	-0.73 (0.44)
Worried about being able to return to Origin Country (Ref. No)	
Yes	**-1.69*** (0.36)**
Type of Accommodation (Ref. Shared accommodation)	
Private flat / house/Other acc.	0.98 (0.56)
Take part in a BAMPF course (Ref. No)	
Yes	0.56 (0.35)
German proficiency	**0.69** (0.25)**

* p<0.05; ** p<0.01; *** p<0.001
Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Figure 4.1 presents the plots of the predictive margins of MCS over the Interview and the worries variables. The values are in Annex C Table 4.9. These predictive margins regard those who change status between being or not being worried in the period considered.

The upper-left panel in Figure 4.1 shows that refugees worried about hostility toward foreigners have lower MCS than those who are not worried. The difference in MCS between the worried and non-worried is significant for the second and third interviews. The upper-middle panel illustrates that refugees worried about being unable to stay in Germany have a significantly lower MCS than the non-worried for the first two interviews. By the third interview in 2020, the two scores are very close, with overlapping confidence intervals. The upper-right panel shows the predictive margins for refugees worried about their own Finances. For the first and the second interviews, those with no worries have significantly higher MCS scores. The scores for the third interview are not significantly different. The lower-left panel shows that the refugees worried about being unable to return to the Origin Country have a significantly lower MCS than the non-worried, but only for the first interview. For the second and the third, even if the scores for the non-worried are higher, the differences are not significant. Lastly, the lower-middle panel shows the marginal effects for the variable worried about the results of the asylum process. The coefficients are never significantly different between those who worry and those who do not.

Figure 4.1 Predictive margins of the MSC based on the Interview time and different worries variables output in the Fixed effects regression.



Source: Authors elaboration on German IAB-BAMF-SOEP Survey of Refugees

Discussion

Our study investigates the mental health status of refugees who arrived in Germany between 2013 and 2016. We considered both pre-arrival and post-arrival factors that could affect mental health. While several studies examined the mental health of refugees in Germany (Hajak et al., 2021), our research is distinctive in its approach. It not only assesses the pre-arrival factors that are associated with the refugees' mental health at the first interview, but it also follows the same group of individuals over time, analysing how changes in their lives affect mental health.

Our first research question was: *Which pre-arrival characteristics are associated with the mental health of refugees at the first Interview?* We find interesting results that confirm and expand upon the existing literature. Research has already associated some factors with worse mental health, such as being female and experiencing traumas before arriving in the destination country (Eytan et al., 2004; Shannon et al., 2015; Steel et al., 2009). Our pre-arrival analysis also indicates significantly lower mental health for female refugees compared to males. Furthermore, the descriptive statistics show lower mental health scores for the females at the first interview. However, at the last interview, female mental health has considerably improved. Several explanations are possible. The majority of refugees arriving in Europe are male (EUROSTAT, 2024). Female refugees may be driven to migrate by more challenging conditions in their country of origin, making them a negatively selected group among the refugees, and their journey could be more difficult (Freedman, 2016; Renner & Schmid, 2023). Additionally, living in Germany, a more gender-egalitarian society compared to the countries of origin of the main groups of refugees, might benefit females and contribute to their improved mental health. The fixed effect regression implemented in our longitudinal analysis does not allow us to study this improvement in female mental health. Future

research should specifically explore this gender difference in refugee mental health. The linear regression also shows that those who had multiple traumatic experiences during travel are associated with worse mental health. Previous research found that multiple traumatic experiences are associated with PTSD and depression, suggesting that it is not just the experience of the traumatic event itself but also the cumulative impact of such experiences that affects mental health (Alpak et al., 2015; Mahmood et al., 2019; Rawers et al., 2024). Refugees with above-average socio-economic status in their origin country show better mental health than those from below average. Therefore, even if there is a difference in socio-economic status between pre- and post-migration, coming from a privileged position still has a positive effect post-migration (Bauer et al., 2020). We observe differences based on the number of reasons for leaving the country. To our knowledge, this factor is often not included in analyses because studies investigating the mental health of refugees usually focus on individuals coming from the same origin area. Few studies highlight differences based on reasons for leaving the country and the origin country itself, and they also use data from the IAB-BAMF-SOEP Survey of Refugees (Grochtdreis et al., 2022, 2024; Walther et al., 2020). Reviews also report different percentages of mental illness for refugees coming from different origin countries (Blackmore et al., 2020; Bogic et al., 2015). Researchers and healthcare institutions should consider these differences, which could be due to different experiences or cultural differences. While Syrians and Iranians are often grouped together as Middle Eastern, our study demonstrates significant differences between them, illustrating the heterogeneity of this macro-group. A particularly interesting result of our analysis was the very highly significant coefficient for Eritreans with respect to Syrians. One Swiss qualitative study reported a high percentage of PTSD for Eritrean refugees but also a high resilience score (Chernet et al., 2021). Their high mental health score could also be attributed to cultural tendencies to report less discomfort or distress in an uncomfortable and difficult mental state. Age was not significantly associated with mental health, which differs from other results in the literature. However, our sample comprises refugees aged between 18 and 61 in 2016 and 2017, thus, we exclude the difficulties typically associated with younger refugees (Tinghög et al., 2017). We did not find significant differences based on the variables analysed regarding the reason for choosing Germany as the destination country. A robustness check controlling for choosing Germany due to family and community ties in the origin country also yielded no significant results. Similarly, no significant differences were found for the year of arrival and the year of the survey. This suggests that the sample is homogenous, and refugees who arrived in these years share a similar background.

Our second research question was: *Which changes in everyday life affect the mental health of refugees over the first five years in Germany?* We explored this research question using a fixed effect regression with the MCS at the three interviews as the response variable. From the results, the mental health status of the refugees while they are working or searching for a job is better than when they are not working and not searching for a job. This relation could be both ways: not having a job could affect mental health, and having worse mental health could affect the drive to get a job (Bogic et al., 2015; Dietrich et al., 2023). Moreover, these refugees may not have the right to work in Germany. In the fixed effects regression, we do not find significant differences due to the legal status of the refugees, as was found in other studies (Bogic et al., 2015; Steel et al., 2009). Even if we have a small percentage of participants who do not have a legal permit to stay in Germany, most of them already have it in the first interview or obtained it in the following years. In the model, we consider five variables related to being worried about the actual situation and future. Except for being worried about the permit status, all the other worries are significant, and the refugees have lower MCS than when they are worried. Being worried about the origin country and people left behind has often been found to be negatively associated with mental health among refugees (Hinton et al., 2011; Walther et al., 2020). However, we find that also the worries included in our analysis are significant, possibly because these concerns are linked to life uncertainty. The experiences of refugees are deeply shaped by uncertainty before, during and after the travel, and this may continue to affect them even after settling in the host country (Schiltz et al., 2019). For the predictive

margins, we observe significant changes during the time of worries, but the coefficients for being worried about staying in Germany and own Finances are not significant for the third interview in 2020. This could be an effect of the COVID-19 pandemic and the fact that travelling to other countries become more difficult, and the German government implemented several economic support measures. Lastly, we also consider proficiency in German longitudinally, and we find that people who improve their German language also have an improvement in their mental health. This result is similar to other findings in research that observed the positive effect of language proficiency acquisition on mental health (Kartal et al., 2019; Montemitro et al., 2021).

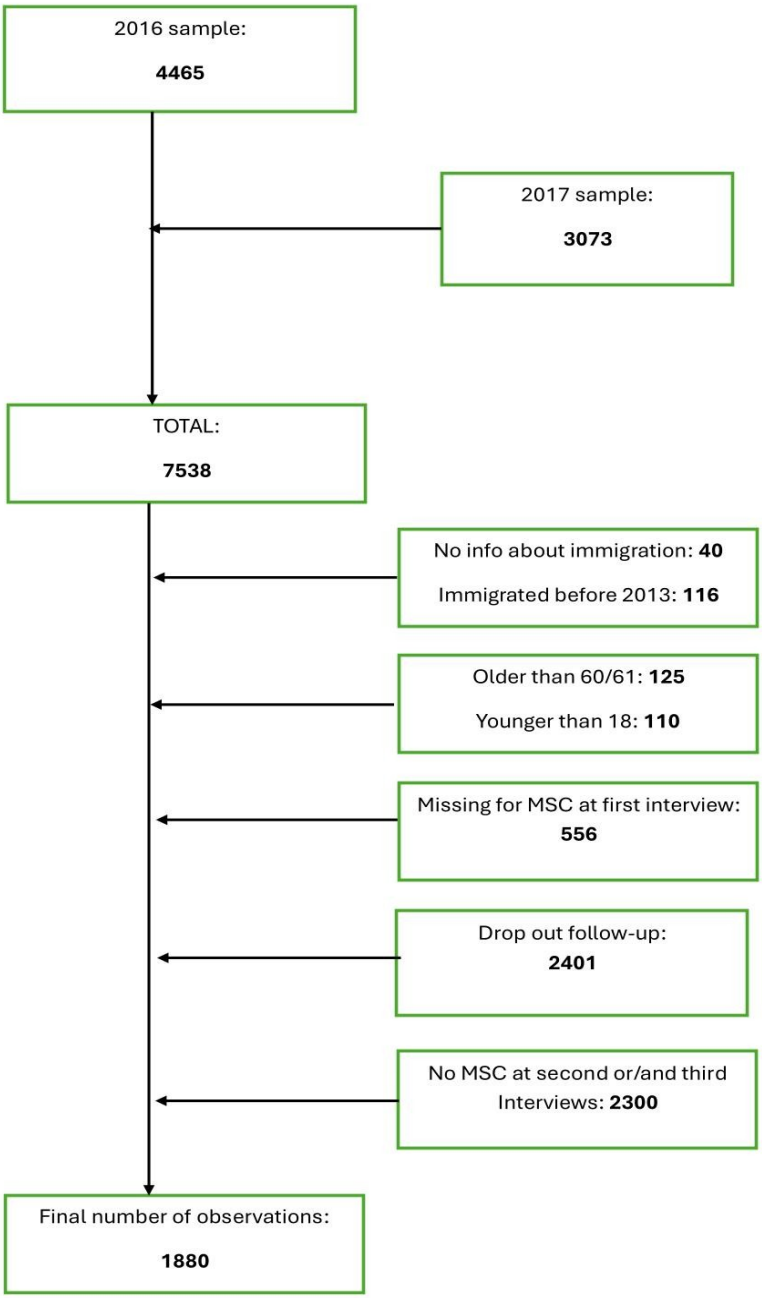
Several articles about refugees' health use the IAM-BAMF-SOEP Survey of Refugees. Notably, (Grochtdreis et al., 2024) analysed the mental and physical health-related quality of life of refugees using the same waves as our study. However, the article differs in its approach. Grochtdreis chose to include the additional sample of refugees added after 2017 and utilised individuals with incomplete longitudinal data, participating maybe in just one or two waves of the study. In contrast, our study focuses exclusively on a specific group that participated in the survey for at least three waves. Furthermore, our analytical approach diverges. We employ an OLS regression and a fixed effect regression, whereas Grochtdreis and colleagues decided on a mixed effects regression. This approach has the advantage of including both cross-selection and longitudinal variables but does not distinguish between within- and between-person variance. Instead, the fixed effect regression isolates the within-person changes over time.

Our study has several limitations. Some of these issues are due to the data. The sample is constructed from the German Central Register of Foreigners, and it collects information for all refugees and foreigners settling in the country (Kroh et al., 2016). We could have a non-response bias since those who are leaving Germany did not answer all the interviews and because those who are in more precarious situations could be more difficult to reach and less inclined to answer the survey. Among those who participated in interview 1, one-third dropped out of the panel survey during the time considered and could not be included in our analysis. In addition, one-third of the participants were excluded from our analysis because their measurement of the MCS was not valid (Figure 4.2). Even if we conducted some attrition analysis on the MCS, we could have some specific subgroups from our analysis. Another problem is that the survey does not always have the same questions for each wave, and we could not investigate some interesting characteristics in the longitudinal analysis. This article also has several strengths. We observe the same individuals for several years, and this allows us to assess the pre-arrival and post-arrival characteristics of the same group of refugees. We use data from a structured sample, and we assess their mental health through an official scale. We observe a heterogeneous group of refugees, allowing us to observe the differences in the mental health of refugees.

This study investigated the effect of pre-arrival stressors and post-arrival stressors on the mental health of refugees. The mental health of refugees affects their lives in the long period. Our article investigated not only the pre-arrival stressors' effects on mental health but also the effect of the changes during their life in Germany. Our research confirms that per-arrival factors and trauma affect the mental health of refugees but also highlights that the uncertainty in everyday life also affects the mental health of refugees in the host country. This underlines that healthcare professionals and researchers should focus on the concerns and preoccupations of refugees, not only on the difficult situations that they have lived in in the past.

Annex

Figure 4.2 Structure of the sample used for the analysis.



Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Table 4.7 Attrition analysis on dropouts after the first interview.

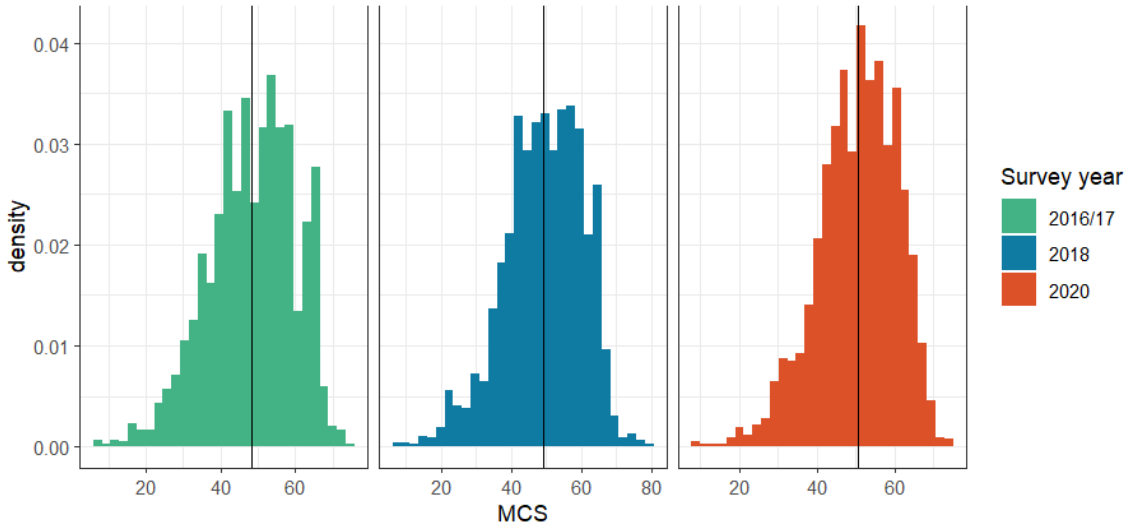
	Coefficient (standard error)
Age	**-0.02*** (0.00)**
Female	**0.38*** (0.06)**
MCS	-0.00 (0.00)

Survey Year (Ref. 2016)	
2017	0.05 (0.06)
Origin Country (Ref. Syria)	
Iraq	**0.51*** (0.09)**
Afghanistan	**0.60*** (0.09)**
Eritrea	-0.03 (0.14)
Iran	**0.45* (0.17)**
Europe and Russian Fed	**1.92*** (0.28)**
Other	**0.88*** (0.10)**
Year Moved to Germany (Ref. 2013)	
2014	-0.17 (0.14)
2015	-0.0377
2016	-0.0555
2017	-0.02 (0.35)
Observations	6581
AIC	7601.59
BIC	7703.47

* p<0.05; ** p<0.01; *** p<0.001

Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Figure 4.3 MCS distribution for the survey year.



Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

Table 4.9 shows MCS means and 95% confidence intervals for the participants of the G-SOEP, divided for natives, immigrants and refugees, and the interviews and sex. Participants are at least 18 and under 60 years old at the time of the survey.

Table 4.8 MCS means and 95% confidence intervals for the participants of the G-SOEP, by natives, immigrants and refugees, and the interviews and sex.

		Observations	MCS Mean	[95% confidence interval]
	MALE			
1	Natives*	6363	51.98	[51.76; 52.21]
1	Migrants	1607	53.17	[52.74; 53.60]
1	Refugees	4055	49.08	[48.72; 49.44]

2	Natives*	7229	52.24	[51.03; 51.46]
2	Migrants	1207	52.39	[51.91; 52.88]
2	Refugees	2419	49.71	[49.26; 50.16]
3	Natives*	6913	50.80	[50.58; 51.02]
3	Migrants	2062	50.70	[50.30; 51.11]
3	Refugees	2743	50.26	[49.88; 50.64]
	FEMALE			
1	Natives*	7955	49.58	[49.35; 49.80]
1	Migrants	1807	51.40	[50.97; 51.83]
1	Refugees	2639	46.40	[45.95; 46.83]
2	Natives*	8791	49.21	[49.00; 49.42]
2	Migrants	1429	50.64	[50.14; 51.13]
2	Refugees	1586	48.19	[47.63; 48.74]
3	Natives*	8088	48.39	[48.17; 48.62]
3	Migrants	1929	49.32	[48.88; 49.75]
3	Refugees	1544	49.54	[49.04; 50.04]

* Natives also include immigrants who arrived before 2000 and immigrant descendants
Source: Authors' elaboration on G-SOEP survey

Table 4.10 presents the values of the marginal effects and their 95% confidence intervals for the worries in the fixed effect regression. Calculated through a fixed effects model with the same variables as the one in Table 4.6, but also including the interaction of Interview variable and the worry variable in consideration.

Table 4.9 Marginal effects and their 95% confidence intervals for the worries in the fixed effect regression.

	Margin	**[95% conf. interval]**
Interview# Worried about being unable to stay in Germany		
1# No	49.59	[48.74; 50.43]
1# Yes	47.94	[47.16; 48.72]
2# No	50.83	[49.95; 51.70]
2# Yes	48.80	[48.14; 49.46]
3# No	50.10	[49.31; 50.89]
3# Yes	49.96	[49.22; 50.7]
Interview# Worried about Hostility to Foreigners		
1# No	49.03	[48.40; 49.67]
1# Yes	47.48	[46.33; 48.62]
2# No	50.32	[49.72; 50.92]
2# Yes	47.91	[46.97; 48.85]
3# No	50.60	[49.99; 51.22]
3# Yes	48.74	[47.72; 49.76]
Interview# Worried about own Finances		

	Margin	[95% conf. intervall]
1# No	50.22	[49.09; 51.36]
1# Yes	48.10	[47.45; 48.74]
2# No	51.93	[50.90; 52.96]
2# Yes	48.75	[48.17; 49.34]
3# No	50.30	[49.37; 51.22]
3# Yes	49.94	[49.30; 50.58]
Interview# Worried about being unable to return to Origin Country		
1# No	49.51	[48.73; 50.28]
1# Yes	47.54	[46.73; 48.35]
2# No	50.15	[49.48; 50.82]
2# Yes	48.91	[48.11; 49.72]
3# No	50.60	[49.95; 51.25]
3# Yes	49.05	[48.15; 49.96]
Interview# Worried about outcome of the asylum procedure		
1# No	49.09	[48.32; 49.86]
1# Yes	48.07	[47.17; 48.98]
2# No	50.17	[49.47; 50.88]
2# Yes	48.96	[48.15; 49.78]
3# No	49.92	[49.25; 50.59]
3# Yes	50.20	[49.25; 51.16]

Source: Authors' elaboration on German IAB-BAMF-SOEP Survey of Refugees

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