



Prevalence of food insecurity among food bank users in Germany and its association with population characteristics

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ABSTRACT

The prevalence of food insecurity (FI) among food bank users in many European countries is unknown. The study aims to examine FI prevalence and associated population characteristics among this particular group of disadvantaged people in Germany. Food insecurity status was assessed among 1033 adult food bank users with a mean age of 53 years (57% female, 43% male) in Germany in 2015 using the food insecurity experience scale (FIES). About half of the participants (55.8%) were single with no children and born in Germany. Over 37% had a self-reported BMI of 30 kg/m² or above and 37.4% indicated to smoke.

Over 70% of the food bank users can be described as food insecure. Of those, about 35% were considered mildly food insecure. Almost 30% were categorized as moderately food insecure while over 7% were categorized as severely food insecure. Significant associations with food insecurity were found for gender, age, subjective health status, smoking, duration of food bank use, school education and family type. Among this socially disadvantaged population, food insecurity is highly prevalent and public health efforts should be focusing on this vulnerable population taken into account the identified population and behavioral characteristics associated with food insecurity.

1. Introduction

Food insecurity (FI) is described as the “limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways” (Anderson, 1990). The rise of food insecurity is global, also affecting high-income countries such as the UK, Canada, the U.S. or Germany (FAO, 2016).

Research has shown that the path to FI often starts with the anxiety about not having enough food, followed by dietary changes to make limited food supply last longer and ending in decreased food intake (Coates et al. 2006; Radimer et al., 1990; Radimer et al., 1992;).

Thus, individuals suffering from FI do not necessarily differ in their energy intake from food secure individuals but research indicates that their consumption of fruits, vegetables and fish is lower (Bocquier et al., 2015). In general, FI seems to be correlated with poor diet quality which can be partly explained by lower daily diet costs (Bocquier et al., 2015). Food insecure individuals also appear to have a higher risk of poor health (Pruitt et al., 2016) including higher rates of obesity among women (Burns 2004; Dinour et al., 2007; Franklin et al., 2012), diabetes

(Gucciardi et al., 2014), or mental disorders (Ramsey et al., 2012; Siefert et al., 2004; Vozoris and Tarasuk, 2003) than food secure individuals. Overall, FI is more prevalent among low income households (Coleman-Jensen et al., 2015; Martin-Fernandez et al., 2013; Vedovato et al., 2016) and people with low socio-economic status (Carter et al., 2012).

According to a new study comparing FI across 149 countries, 78.2% of people in North America can be described as food secure while 4.9% can be considered suffering from severe FI. In Europe, 74.3% of people are considered food secure while 3.5% are severely food insecure (6.3% with moderate FI and 16.0% with mild FI (Jones, 2017)). The recent report by the Food and Agriculture Organization of the United Nations (FAO), publishing FI prevalence data for many different countries using nationally representative population samples, estimated that in Germany, 4.3% of the population are moderately and severely food insecure. However, as pointed out by the authors, this estimation was based on a sample size of < 100 cases, which substantially reduces its informative value (FAO, 2016).

Foodbank data have been repeatedly used to measure FI among disadvantaged populations (Lindberg et al., 2015; Loopstra et al., 2016;

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Neter et al., 2014;). In the U.K., data by the Trussel Trusts's network of food banks reported that over 1.18 million people were given three-day emergency food supplies in the financial year 2016–2017 (Loopstra and Lalor, 2017). In Germany, the number of food banks has increased substantially over the last fifteen years, and it is estimated that 1.5 million people are currently benefiting from their food distribution (National Association of German Tafel, 2016).

Given the missing information on FI rates in Germany, the aim of this cross-sectional study was to examine FI prevalence among a large sample of food bank users. A second aim of the study was to determine the association of socio-demographic and health variables with FI.

2. Methods

2.1. Setting and participants

Food bank users in Germany can be described as a group of economically disadvantaged people with low- or no income, unemployment or low paid job, and a reliance on welfare assistance (Depa et al., 2015; Tinnemann et al., 2012). Adult food bank users were recruited at food banks in three different cities in Germany (Stuttgart, Berlin, Karlsruhe). To be included, food bank users had to be over the age of 18 years, be registered food bank users and be able to understand German, English, Russian or Arabic.

Depending on the type of food bank established in the according location, food bank stores and food redistribution points – also called food pantries – were visited several times between May and August of 2015 during opening hours (6–8 times at the four food bank stores in Stuttgart on varying weekdays and at different times during the month; 4 times at the redistribution point in Karlsruhe at different times during the month; 2–3 times at 8 representative redistribution points in Berlin at different times during the month). Visiting food bank users were approached by trained research personnel when entering or leaving the facilities. Research personnel introduced themselves and described their interest in studying eating behavior of food bank users. Interested users were invited to participate in the study by filling out a survey on site. Detailed written information of the study procedures as well as the university contact details were provided. Food bank users who had difficulties reading or understanding the questions were offered help filling out the questionnaire. On average, it took about 15 min to complete the self-reported questionnaire.

Food bank officials gave their permission to recruit clients. Written informed consent was not obtained from food bank users to increase participation. Many people, particularly in this population group, have a general distrust of governmental agencies and academic institutions and are hesitant to give their informed consent because they perceive this act as relinquishing rather than protecting their rights (Yancey et al. 2006). Ethical approval was obtained from the University of Hohenheim ethics committee and agreed with the Helsinki Declaration.

2.2. Questionnaires

The self-administered questionnaire included sociodemographic variables including age, gender, country of birth, school education (no graduation, graduation at 10th grade or earlier, and graduation at 12th/13th grade) and household composition (single with no children, single-parent, couple with children, couple without children, other). Questions on self-rated health status using a 5-point Likert scale from “very good” to “very bad” (How do you rate your current health?), smoking (Do you currently smoke? Yes, no), as well as on food bank visiting patterns (For how long have you been visiting a food bank? < 3 months to 3–6 months, 7–12 months, over 12 months; How often do you usually visit a food bank? > 4 times/month, 4 times/months, 2–3 times/month, 1 time or less/month) were also administered. Questions regarding health status were adapted from the DEGS (German health interview and examination survey for adults; Scheidt-

Table 1

Question of the FIES and affirmatively answered questions by the study sample (n = 1033).

FIES Questions: During the last 12 months, was there a time when...	n	%
1. ... you were worried you would run out of food because of a lack of money?	480	46.5
2. ... you were unable to eat healthy and nutritious food because of a lack of money?	510	49.4
3. ... you ate only a few kinds of foods because of a lack of money?	622	60.2
4. ... you had to skip a meal because there was not enough money to get food?	312	30.2
5. ... you ate less than you thought you should because of a lack of money?	408	39.5
6. ... your household ran out of food because of a lack of money?	182	17.6
7. ... you were hungry but did not eat because there was not enough money for food?	208	20.1
... you went without eating for a whole day because of a lack of money?	117	11.3

Survey conducted between May and August of 2015 among food bank users in Germany.

Nave et al., 2012) which is a valid German survey. Height and weight were self-reported. The questionnaire has also been used in previous research studies among food bank users (Depa et al., 2015; Tinnemann et al., 2012).

FI was measured using the Food Insecurity Experience Scale (FIES) provided by the FAO (Ballard et al., 2013). The FIES captures the access dimension of food security including aspects from monetary restraint and availability to dietary quality. It also allows interpreting obtained data on different levels of severity. Using an experience-based metric for the severity of the food insecurity condition, the metric is calculated from data on people's direct responses to questions about their access to food of adequate quality and quantity over the last 12 months taking into account the definition of food security as “secure access at all times to sufficient food” (Maxwell and Smith, 1992). The FIES consists of eight questions (see Table 1) and is based on the U.S. Household Food Security Survey Module (US HFSSM) and also took other experience-based food insecurity scales into consideration (e.g. Household Food Insecurity Access Scale - HFIAS and the Escala, Latinoamericana y Caribena de Seguridad Alimentaria -ELCSA) (FAO, 2016). Answer options included “yes, no, refused, don't know”. The FIES is a relatively new measuring instrument, but has been used numerous times assessing FI in many different countries (Frongillo et al., 2017; Jones, 2017).

The questionnaire was provided in German, English, Russian and Arabic. All questionnaires were translated by native speakers using the existing versions of the FIES survey module and the guidelines for translation of the FIES provided by the FAO considering the intended target population. The adopted questionnaires were then validated using a small sample of food bank users in Stuttgart (n = 14) by asking them to rephrase the questions in their own words as if asking a friend (validation method: paraphrasing). One major change to the original questionnaire was the elimination of the words “or other resources (than lack of money)” because some food bank users did not know what was meant by it (they thought they were being asked about stealing food).

2.3. Statistical analysis

Severity levels of FI were calculated by the FAO (Nord, 2015) based on their statistical guidelines and depended on the number of questions a participant answered affirmatively. A person who negated all eight questions was judged as food secure while someone who answered one up to three questions with “yes” was defined as mildly food insecure. Four up to seven affirmed questions indicated that a participant is moderately food insecure. To be categorized as severely food insecure, a person had to affirm all eight questions. Questionnaires (n = 212)

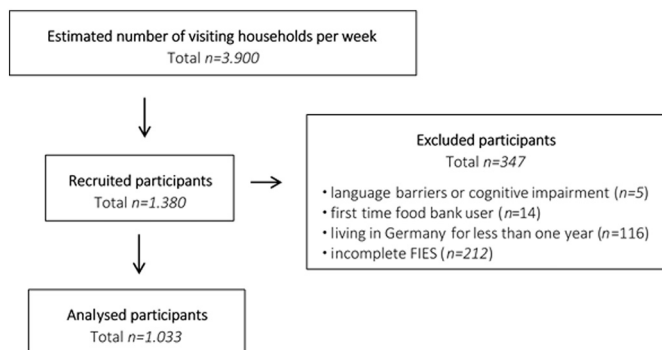


Fig. 1. Recruited and excluded cases of food bank users in Germany.

with either one answer missing or with the answer options “don't know” and “refused” were not entered into the analyses. Participants living in Germany for less than one year (we did not want to know about food insecurity prior to their arrival in Germany, $n = 116$), being first time food bank visitors ($n = 14$) and having language barriers or cognitive impairment ($n = 5$) were also excluded from the analyses. Therefore, for the prevalence calculation, data of 1033 individuals out of 1380 cases were used (see Fig. 1). Cronbach's alpha coefficient was 0.878 (based on 1033 participants), showing a very good internal reliability of the FIES.

Levels of food insecurity and participants' characteristics were examined by descriptive statistics, tables showing mean + SD and relative frequencies. Correlations between the FI levels and sociodemographic or health variables were assessed by calculating Cramer's V or Kendal's Tau b for each variable as a whole as well as across the single categories of the different variables (including Bonferroni corrections for multiple comparisons). IBM SPSS Statistics 24 was used for the analyses. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Study sample

Fig. 1 presents the recruited and excluded cases of food bank users. With 1.380 recruited participants and an estimated 3.900 visiting households per week over all recruitment locations, the participation rate was estimated to be around 35%. Table 2 presents food bank users' demographic, health status information, and food bank use patterns. More than half of the participants were women (57%) and more than half were born in Germany (55.8%). Over one third of the participants had a school education that can be described as at or above the university entrance level (37.7%). Over 50% were single with no children. The prevalence of overweight and obesity was 68.4%. The majority of the participants rated their health as moderate or bad (65.9%). Also, the majority of the participants were weekly food bank users (68.0%) and visited food banks for more than one year (70.3%).

3.2. FIES

The prevalence of FI status among the sample of food bank users was 70.2%. The prevalence of food insecurity status among food bank users divided by levels of food insecurity is presented in Fig. 2. About 34.8% were categorized as mildly food insecure, 27.8% as moderately food insecure and 7.6% as severely food insecure.

When looking at each question of the FIES (Table 1), it was shown that the majority with 60.2% of the food bank users indicated to only have eaten a few kinds of foods during the last 12 months because of a lack of money. Almost half of the sample (49.5%) reported to have been unable to eat healthy and nutritious foods because of a lack of money. Some even went without eating for a whole day because of a lack of

Table 2
Food bank users' socio-demographic and health characteristics.

Variable	Participants
Age in years ($n = 1033$, mean \pm SD)	53.1 \pm 14.8
Gender ($n = 1033$)	
Female	589 (57.0%)
Male	444 (43.0%)
Country of birth ($n = 1032$)	
Germany	576 (55.8%)
Other	456 (44.2%)
Highest completed education ($n = 985$)	
No graduation	49 (5.0%)
Graduation at 10th grade or earlier	565 (57.3%)
Graduation at 12th/13th grade (university entrance)	371 (37.7%)
Household composition ($n = 1002$)	
Single, no children	559 (55.8%)
Couple, no children	142 (14.2%)
Couple, children	135 (13.5%)
Single-parent	82 (8.2%)
Other (e.g. shared living)	84 (8.4%)
Body Mass Index (kg/m ² , $n = 887$)	
Underweight or normal weight (BMI < 24.9)	280 (31.6%)
Overweight (BMI 25–29.9)	277 (31.2%)
Obesity (BMI \geq 30)	330 (37.2%)
Smoking status ($n = 1028$)	
No	644 (62.6%)
Yes	384 (37.4%)
Self-rated health status ($n = 1026$)	
Good/very good	350 (34.1%)
Moderate	464 (45.2%)
Bad/very bad	212 (20.7%)
Food bank visits ($n = 1023$)	
< 4 \times /month	327 (32.0%)
4 \times /month or more	696 (68.0%)
Duration of food bank use ($n = 1029$)	
12 months or less	306 (29.7%)
> 12 months	723 (70.3%)

Survey conducted between May and August of 2015 among food bank users in Germany.

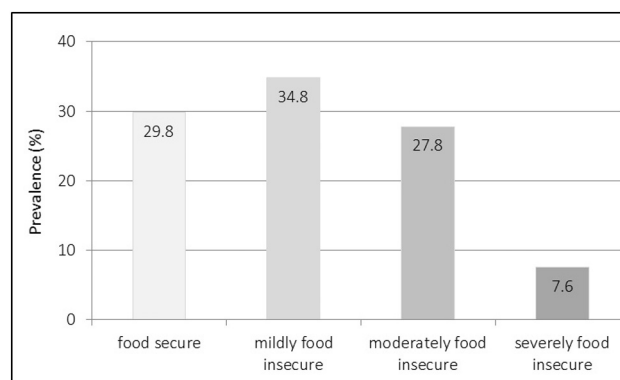


Fig. 2. Prevalence of food insecurity status among food bank users in Germany ($n = 1033$).

money (11.3%).

3.3. Association of FI with sociodemographic and health characteristics of food bank users

When looking at bivariate associations (Table 3), significant differences ($V = 0.108$, $p = 0.008$) were seen for gender with more men being categorized as severely food insecure (10.4% vs 5.4%, $p < 0.05$) while more women were categorized as mildly (36.7% vs 32.4%, n.s.) or moderately food insecure (29.4% vs 25.5%, n.s.). In addition, food insecurity declined with increasing age ($r_t = -0.224$, $p < 0.000$). Regarding the health characteristics, both self-rated health status and smoking were significantly related to FI. FI decreased with better self-rated health status ($r_t = 0.129$, $p < 0.000$), particularly in the severely

Table 3
Prevalence of FI severity levels by sociodemographic characteristics, health characteristics and food bank visiting patterns (n = 1033).

Variable	N		Food secure (no “yes”)		Mildly food insecure (1–3 times “yes”)		Moderately food insecure (4–7 times “yes”)		Severely food insecure (8 times “yes”)		Correlations, <i>p</i> value
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Age											
≤ 40 Years	234	51	21.8 _a	72	30.8	87	37.2 _a	24	10.3 _a	$r_{\tau} = -0.224$	
41–50 Years	206	41	19.9 _a	70	34.0	73	35.4 _a	22	10.7 _a	$p < 0.000$	
51–65 Years	368	110	29.9 _a	127	34.5	105	28.5 _a	26	7.1 _{a,b}		
≥ 66 Years	225	106	47.1 _b	91	40.4	22	9.8 _b	6	2.7 _b		
Gender											
Female	589	167	28.4	216	36.7	174	29.5	32	5.4 _a	$V = 0.108$	
Male	444	141	31.8	144	32.4	113	25.5	46	10.4 _b	$p = 0.008$	
Country of birth											
Germany	576	164	28.5	179	31.1 _a	181	31.4 _a	52	9.0 _a	$V = 0.124$	
Other	456	144	31.6	180	39.5 _b	106	23.2 _b	26	5.7 _b	$p = 0.001$	
Highest completed education											
No graduation	49	13	26.5	19	38.8	10	20.4 _{a,b}	7	14.3	$r_{\tau} = -0.105$	
Graduation at 10th grade or earlier	565	154	27.3	181	32.0	185	32.7 _b	45	8.0	$p = 0.004$	
Graduation at 12th/13th grade (university entrance)	371	127	34.2	144	38.8	78	21.0 _a	22	5.9		
Household composition											
Single, no children	559	156	27.9 _a	193	34.5	159	28.4	51	9.1	$V = 0.098$	
Couple, no children	142	59	41.5 _b	50	35.2	26	18.3	7	4.9	$p = 0.004$	
Couple, children	135	40	29.6 _{a,b}	51	37.8	38	28.1	6	4.4		
Single-parent	82	15	18.3 _a	35	42.7	26	31.7	6	7.3		
Other (e.g. shared living)	84	30	35.7 _{a,b}	22	26.2	29	34.5	3	3.6		
Body mass index											
Underweight or normal weight	280	81	28.9	87	31.1	87	31.1	25	8.9	$V = -0.019$	
Overweight	277	84	30.3	105	37.9	68	24.5	20	7.2	$p = 0.520$	
Obesity	330	95	28.8	119	36.1	90	27.3	26	7.9		
Smoking status											
No	644	212	32.9 _a	251	39.0 _a	154	23.9 _a	27	4.2 _a	$V = 0.219$	
Yes	384	94	24.5 _b	108	28.1 _b	131	34.1 _b	51	13.3 _b	$p < 0.000$	
Self-rated health status											
Good/very good	350	128	36.6 _a	112	32.0	92	26.3	18	5.1 _a	$r_{\tau} = 0.129$	
Moderate	464	144	31.0 _a	164	35.3	128	27.6	28	6.0 _a	$p < 0.000$	
Bad/very bad	212	35	16.5 _b	82	38.7	66	31.1	29	13.7 _b		
Food bank visits											
< 4 × /Month	327	103	31.5	107	32.7	90	27.5	27	8.3	$r_{\tau} = 0.001$	
4 × /Month or more	696	204	29.3	252	36.2	192	27.6	48	6.9	$p = 0.971$	
Duration of food bank use											
< 1 Year	306	78	25.5 _a	98	32.0	97	31.7	33	10.8 _a	$r_{\tau} = -0.093$	
≥ 1 Year	723	229	31.7 _b	261	36.1	189	26.1	44	6.1 _b	$p = 0.001$	

Different letters indicate statistically significant differences ($p < 0.05$, Bonferroni) per column within the variable category. Survey conducted between May and August of 2015 among food bank users in Germany.

food insecure category. Smokers across all food insecurity severity levels appeared to be more often food insecure than non-smokers ($V = 0.219$, $p < 0.000$). No significant associations for BMI were found.

Being born in Germany was associated with moderate (31.4 vs. 23.2%) and severe FI (9.0 vs. 5.7%) compared to being born in another country ($V = 0.124$, $p = 0.001$). Higher school education was negatively associated with FI ($r_{\tau} = -0.105$, $p = 0.004$). FI level also differed by family status ($V = 0.103$, $p = 0.014$). Singles (living without children) seemed to be affected by FI more often than couples without children (severe FI: 9.1% vs 4.9%, moderate FI: 28.4 vs 18.3) while being a single parent appeared to increase FI. Only 18.3% of single parents did not experience FI during the last 12 months (couples with children: 29.6%, couples without children: 41.5%).

At last, looking at the duration of using a food bank, users visiting food banks for < 12 months were less often food secure (25.5%) and nearly twice as often severely food insecure (10.8%) compared to users visiting food banks for > 12 months (31.7% and 6.1%, overall $r_{\tau} = -0.093$, $p = 0.001$).

4. Discussion

United Nations survey data suggested that 4.3% of the population in Germany are food insecure (FAO, 2016). Our findings indicate that a larger percentage of people in Germany are likely to be food insecure given that the sample in the United Nations survey was small and included all income level households. Both people receiving benefits as well as people visiting food banks suffer more often from FI - e.g. in UK (Power et al., 2017) than the general population. Since 6 million people in Germany are receiving social benefits (Federal Ministry of Labour and Social Affairs, 2017) and at least 15 million people are considered eligible to visit a food bank (National Association of German Tafel, 2016), given our prevalence results, the percentage of food insecure individuals in the German population can be expected to be higher than 4%.

Thus, as also discussed elsewhere (Power et al., 2017), our data supports the body of evidence that the majority of the people using food banks can be considered food insecure. The results add to the limited evidence that FI is also highly prevalent in affluent European countries (Neter et al., 2014, Power et al., 2017). A comparison with FI

prevalence rates of food bank users in other countries showed lower rates among food bank users in Germany compared to food bank users in the Netherlands (Neter et al., 2014), France (Castetbon et al., 2016), the U.S. or Canada (Tarasuk and Beaton, 1999; Robaina and Martin, 2013; Leung et al., 2015). Both Dutch and French food banks provide food parcels that supplement the participants' diet while German food banks allow food bank users to choose available, mainly fresh foods. In addition, both studies (Castetbon et al., 2016; Neter et al., 2014) included a higher proportion of households with children, including single parent households (in the Dutch study) compared to our sample. These factors could have contributed to the difference in prevalence rates.

A potential explanation for the lower prevalence rate in our study compared to the studies in the U.S. and Canada could be the difference in social welfare systems across the countries. Another important factor to consider is the difference in measurement instruments used. When looking at associated factors, increasing age appears to be related to food security with fewer older people being affected by FI, which has also been reported elsewhere (Robaina and Martin, 2013). It is possible that, with age, people get better at organizing and managing their daily expenses or lack thereof, which can positively influence their food intake.

Gender differences were also detected. More women were mildly food insecure, which could be because women often prioritize and focus on their family and children's diet while neglecting their own (McIntyre et al., 2007). Single parents, which were more often women (86.6%), were very often affected by FI, a fact also found in other studies (Martin-Fernandez et al., 2013; Nnakwe, 2008). Interestingly, more men were observed to be severely food insecure, which might have been because men tend to have less dietary and health knowledge and fewer cooking skills (Hartmann et al., 2013; Westenhoefer, 2005).

In this study, education appeared to slightly protect from FI, maybe due to better food preparation and financial skills necessary to manage the household food supply with less money but results from other studies examining e.g. emergency assistance users are controversial (Basiotis et al., 1987; Olson et al., 2004). Thus, more research in this area would help to gain insight into the relationship between education and FI among food bank users.

Smoking was associated with FI. While the direction of this relationship cannot be determined in this study, some studies point towards the possibility that smoking limits available financial resources to be spent on food (Widome et al., 2015). However, it is of course also possible that being food insecure increases the likelihood of smoking since it might be used as a coping strategy against financial stress and concerns regarding the purchase of food (Armour et al., 2008; Siahpush et al., 2003). But there are compelling arguments that the relationship between smoking and financial stress is likely not entirely unidirectional (Widome et al., 2015). As found in previous research, self-rated health status was also associated with a higher FI prevalence (Ramsey et al., 2012).

In contrast to the literature, the longer people were visiting food banks, the less likely they seemed to be food insecure. One potential reason that needs to be examined further could be that food banks help to support a life with little money by offering foods since food banks are often used as a coping strategy after having exhausted other forms of support (Lambie-Mumford et al.; 2014; Loopstra and Tarasuk, 2012).

Several limitations need to be stated. The study was cross-sectional and therefore failed to reveal cause-effect-relationships. In addition, in an effort to reach German and non-German users, the questionnaires were provided in four languages. However, the questionnaire was not available e.g. in Turkish, which possibly leads to an under-representation of a widely prevalent group of food bank users in Germany. In general, a representative sample of food bank users in Germany was not obtained, which could have caused a selection bias.

A further limitation is the use of self-reports for the variables height and weight (Merrill and Richardson, 2009). It is possible that results

among food insecure individuals are skewed since they, especially women, overestimate their weight and height when using self-reports compared to food secure households (Lyons et al., 2008).

At last, different other potential risk factors, e.g. general health (Ramsey et al., 2012; Siefert et al., 2004; Vozoris and Tarasuk, 2003), and protective factors, e.g. self-efficacy of eating healthy (Neter et al., 2014), can influence food insecurity but were not investigated in this study and therefore limit the observed associations between FI and several risk factors.

However, this study is its first in Germany and one of only a few studies examining FI in European countries (Castetbon et al., 2016; Neter et al., 2014; Power et al., 2017). Another strength of this study is the large number of participants from three different German cities.

In conclusion, FI appears to be highly prevalent among food bank users in Germany. The result add to the literature that even high-income countries with a good social welfare system cannot fully or adequately prevent low income people to become food insecure. The study could also identify age and smoking status as the two factors with the strongest association. Besides more research on underlying determinants of FI, causes for differences in prevalence rates across countries need to be investigated. In addition, public health entities should consider the potential of using food banks as a mean to improve nutrition and alleviate FI (Byker Shanks, 2017; Bazerghi et al. 2016) while paying particular attention to health-related characteristics of this population (e.g. considering the high smoking rate and its relationship with FI; Perkett et al., 2017).

Conflict of interest

The authors declare no conflict of interest.

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