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Food insecurity in Europe: Who is at risk, and how successful are social benefits in protecting against food insecurity?

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Abstract

Food insecurity in Europe has recently received increasing research and political attention. Yet, considerable gaps remain in our understanding: the demographic groups most at risk, the role of social benefit *receipt*, and whether higher-*value* social benefits protect against food insecurity among recipients all remain unknown. Multilevel models were used to examine food insecurity in 63,168 adults from 27 countries included in the European Quality of Life Survey in 2007 and 2011. Food insecurity was more prevalent among people with lower incomes, women, older people, renters, one-person and lone-parent households, those with lower education, people with disabilities, and those outside the labour market. Although food insecurity was concentrated at low incomes, income and food insecurity were imperfectly associated. The role of social benefit *receipt* was equivocal: food insecurity was not associated with pension or child benefit *receipt,* but was significantly more prevalent among out-of-work and all social benefit recipients, which may reflect eligibility rules and benefit conditionality. Furthermore, higher-*value* social benefits were not associated with lower risks of food insecurity across the different recipient groups, either because their value is insufficient, or because social benefits are unable to fully mitigate the individual and structural risk factors for food insecurity in Europe.

Introduction

Food insecurity – defined as '*the inability to acquire or consume an adequate quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so*' (Radimer *et al.*, 1992, p. 39S) – has historically been a challenge confined primarily to the developing world. Yet the 2008 global financial crisis and subsequent expansion of emergency food provision across Europe (commonly in the form of foodbanks) have reignited questions about both food insecurity (Borch and Kjærnes, 2016) and material deprivation more broadly (Saltkjel and Malmberg-Heimonen, 2017). The existence of food insecurity across welfare regimes is a visible and immediate demonstration of extreme poverty and social exclusion in Europe. Set against the backdrop of the declining adequacy of social assistance in Europe (Nelson, 2013), it also suggests that social policies have failed to adequately protect citizens' most fundamental needs. Despite the importance of food insecurity to people's quality of life, key evidence gaps remain. To remedy these omissions, this study explored the demographic risk factors of food insecurity across Europe in 2007 and 2011, then examined the roles of social benefit *receipt* and *value* on food insecurity.

Despite widespread sociological interest in social stratification and the uneven distribution of material and social resources, social inequalities relating to food are an under-researched topic. Sociological research has instead explored the social, cultural, and expressive aspects of food and eating (Beardsworth and Keil, 1996; Burnett Clark and Ray, 2012). Within predominantly neoliberal political regimes, food consumption is considered a matter of individual responsibility and private choice (Dowler and O'Connor, 2012), allowing food insecurity to be framed as an individual failing and thus remaining a peripheral policy issue (Dowler, 2014; Lambie-Mumford, 2015). Discussions about the structural and economic influences on food and consumption patterns have therefore been largely overlooked within Sociology (although they have enjoyed greater recognition within public health and nutrition research (eg: Dowler, 2001; Dowler *et al.*, 2011)).

Consistent with Blumer's (1971) thesis that sociological inquiry reflects social concern, in recent years the global recession, social welfare retrenchment, rising food prices and accompanying rapid expansion of emergency food provision have highlighted the existence – and apparent growth – of European food insecurity. In this context, understandings of the structural and economic constraints that contribute to socially-graded consumption patterns have improved, accompanied by a rise in sociologically-informed research interest on food insecurity. Researchers have taken a range of approaches, including quantitative (Alvares and Amaral, 2014; Katsikas *et al.*, 2014; Bocquier *et al.*, 2015; Garratt, 2016, 2017), mixed-methods (Nielsen, Lund and Holm, 2015; Pfeiffer, Ritter and Oestreicher, 2015; Garratt, Spencer and Ogden, 2016; Purdam, Garratt and Esmail, 2016) and qualitative research (van der Horst, Pascucci and Bol, 2014; Garthwaite, Collins and Bambra, 2015; Garthwaite, 2016).

Importantly, recent research evidence has served to challenge the neoliberal assumption that food practices primarily reflect individual choice, not social policy (Kõre, 2014; Pérez de Armiño, 2014; Silvasti and Karjalainen, 2014). Empirical studies reporting a protective role of social benefit spending on European food insecurity (Loopstra *et al.*, 2016; Davis and Baumberg Geiger, 2017) further challenge this assumption, and demonstrate that access to food in developed countries is a political concern, worthy of policy attention (Riches, 2011).

Alongside its health consequences (eg: Kirkpatrick and Tarasuk, 2008; Seligman, Laraia and Kushel, 2010; Power *et al.*, 2017), food insecurity also relates to wider experiences of poverty and material deprivation (Nolan and Whelan, 2010). Notably, the Europe 2020 strategy – which targets a 20 million reduction in the number of EU citizens living in poverty by 2020 – is measured in relation to both income poverty and material deprivation (European Commission, 2010). Such interest in material deprivation may reflect the advantages of such measures over traditional income-based

poverty measures. Income provides an indirect assessment of living (Nolan and Whelan, 2010), and income differences between countries can inhibit meaningful comparisons (Nelson, 2012). Instead, material deprivation measures directly capture living standards using scales that commonly include food insecurity alongside indicators including financial capabilities and ownership of consumer durables (Whelan and Maître, 2013). Given its prevalence across Europe, food insecurity therefore deserves research attention both in its own right, and as a sensitive measure of material deprivation.

The current study

Research from Canada and the US – where food insecurity is routinely monitored – identifies certain demographic groups as particularly vulnerable to food insecurity, yet the applicability of this evidence to Europe is unclear given differences in social policy contexts. Likewise, while recent European research suggests that higher-*value* social benefits protect against food insecurity (Loopstra *et al.*, 2016; Davis and Baumberg Geiger, 2017), these ecological studies are unable to demonstrate how macro-level social policies relate to micro-level risks of food insecurity. The current study therefore explored individual risk factors alongside the roles of social benefit *receipt* and *value* on European food insecurity.

Predictably, food insecurity is concentrated among socially and economically disadvantaged groups (Gorton, Bullen and Mhurchu, 2010). Women, people with disabilities, one-person households, and households containing children also faced elevated risks (Gorton, Bullen and Mhurchu, 2010; Neter *et al.*, 2014; Nielsen, Lund and Holm, 2015). However, the risk of food insecurity for different demographic groups across Europe remains unknown, undermining the development of policy interventions. The first research question is therefore:

RQ1. What are the economic and demographic risk factors of food insecurity in Europe?

In light of evidence linking generous social benefits with reduced risks of multidimensional material deprivation (Nelson, 2012; Saltkjel and Malmberg-Heimonen, 2017), a natural question is whether social benefits protect against food insecurity, a sensitive and tangible measure of material deprivation. By increasing households' material resources, social benefits are expected to reduce the risk of food insecurity either by providing money to spend on food or by covering other costs, thereby freeing up money for food. Recent welfare reforms have reignited research interest in the role of social benefits, yet coverage, overall spending, and the value of different components vary widely between countries according to their welfare regime and demographic needs, making it difficult to clearly identify their role. Existing evidence is inconsistent: at the population level, a reduction in social benefit *receipt* was associated with an increase in food insecurity (Borjas, 2004), however, individual-level analyses in Canada reveal mixed evidence for any protective roles of social benefit *receipt* (Loopstra and Tarasuk, 2013; Olabiyi and McIntyre, 2014; Ionescu-Ittu, Glymour and Kaufman, 2015; Li, Dachner and Tarasuk, 2016). Associations between social benefit *receipt* and food insecurity therefore remain uncertain, leading to the second research question:

RQ2. Is social benefit receipt associated with lower risks of food insecurity?

Finally, it is worth examining whether higher-*value* social benefits are associated with a lower likelihood of food insecurity among recipients. It is intuitively plausible that higher-*value* social benefits that provide more substantial material resources offer greater protection against food insecurity. However, existing country-level ecological analyses of social benefit *value* (eg: Loopstra *et al.*, 2016) provide at best an indirect assessment of the potentially protective role of social benefits on individual food insecurity because they do not directly examine the role of higher-*value* benefits on recipients. The combined roles of social benefit *receipt* and *value* have never been explored in combination despite their relevance to food insecurity and material deprivation more broadly. The third research question is therefore:

RQ3. Are more generous social benefits associated with lower risks of food insecurity among recipients?

Data and methods

Data and sample

The European Quality of Life Survey (EQLS) is a repeated cross-sectional survey of adults living in private households in 35 European countries[i]. According to the availability of sampling frames, countries drew either random probability samples or random route samples. The sample comprised one adult (18+) per sampled household. Adults who were physically or mentally unable, who had language difficulties, or had been resident in the country for less than six months were ineligible to participate. Where more than one eligible adult was present in the household, the respondent was selected randomly. No proxy interviews were undertaken.

Changes in food insecurity following the 2008 global financial crisis were examined using data from 2007 and 2011. It was not possible to include data from the EQLS 2016 because social protection data are not available for all countries in 2016. The EQLS was used in preference to the European Survey of Income and Living Conditions (which also contains food insecurity questions) as the EQLS uses better-standardised interviews, so data quality may be higher.

Outcome variable

Food insecurity was captured using the indicator '*Can I just check whether your household can afford a meal with meat, chicken or fish every second day if you wanted it?*' Because protein cannot be stored in the body, regular protein consumption is essential to achieving a nutritionally adequate diet. Economising on food spending commonly entails cutting down on meat (Griffith, O'Connell and Smith, 2015). The item features widely in multidimensional material deprivation scales within a 'basic lifestyle deprivation' dimension (Nolan and Whelan, 2010), including scales defined using consensual methods (Lansley and Mack, 2015), thus demonstrating construct and face validity. As food is a flexible part of household budgets, measures relating to food affordability provide a sensitive and tangible measure of extreme deprivation and unmet nutritional needs (Dowler, 2001). By focussing on affordability, the question does not directly measure consumption, so can be answered by vegetarians. The qualifier '*if you wanted it*' also aims to minimise social desirability bias (McKay, 2005).

Food insecurity would ideally be assessed using the multidimensional instruments used in the US and Canada. These instruments are absent from European social surveys, and this limitation is reflected upon in the Discussion. Nonetheless, this single measure is associated with difficulties affording food (Davis and Baumberg Geiger, 2017) and multidimensional food insecurity (Bocquier *et al.*, 2015), demonstrating its financial basis. The demographic patterns of food insecurity identified here in descriptive (Table 1) and multivariate statistics (Table 3) replicate those obtained using multidimensional instruments, further demonstrating its suitability.

Key predictor variables

The analyses covered both the *receipt* and *value* of social benefits paid to individuals and households. These measures were explored directly, as welfare state regime typologies such as those devised by Esping-Anderson and successors provide only an indirect measure of macro-level factors (Scruggs and Allan, 2008). To explore social benefit *receipt*, respondents who stated that their household received (a) pensions, (b) child benefit, and (c) unemployment benefit, disability benefit or any other social benefits[ii] (hereafter 'out-of-work benefits') in the past 12 months were identified using indicator variables.

To explore social benefit *value*, country-level per capita spending on both total social benefits and the individual components were taken from Eurostat (2018a). Social benefits covered payments for people with disabilities, families and children, old age, housing, sickness and healthcare, social exclusion, and unemployment (see Supplementary Material for a summary). Social benefit *values*

are presented as constant standard international Euros per capita adjusted for purchasing power parities, deflated to adjust for rising food costs and normalised between 0-1 to facilitate comparisons. Ideally, the Comparative Welfare Entitlements Dataset would have been used to enable a more detailed exploration of social benefits generosity; unfortunately, undercoverage (particularly in 2011) precluded this approach[iii].

Age and age squared[iv], gender, household composition, equivalised within-country income quartile, housing tenure, employment status, education, urban-rural locality, and disability status were included as covariates. Each of these characteristics have been associated with food insecurity in previous research (Olson *et al.*, 2004; Gorton, Bullen and Mhurchu, 2010; Carter, Dubois and Tremblay, 2014; Neter *et al.*, 2014; Nielsen, Lund and Holm, 2015). These variables were included both for substantive reasons and to control for demographic differences between countries, thereby facilitating comparative analyses. Including a wide range of covariates also helps mitigate concerns over the possible impact of the dependent variable problem, where the concentration of social benefits among the most disadvantaged members of society could identify counterintuitive roles of social benefits (Vilar-Compte *et al.*, 2015). Controlling for a wide range of relevant individual characteristics thus provides the strongest possible assessment of social benefit *receipt* and *value* among equivalent client groups. The national unemployment rate and GDP per capita were likewise included to account for underlying changes in macroeconomic circumstances over time.

Methods

Multilevel models were used to permit flexible modelling of food insecurity across Europe. Such models account for the clustering of individuals within countries (which violates the assumption of independence required for simple linear regression), and are commonly used when analysing international datasets. Multilevel models partition the variance in the outcome variable between models, thereby identifying the proportion of variance that exists between individuals (level 1) and countries (level 2). This consideration is important when examining the potential impact of social policies: if the proportion of country-level variation in food insecurity is small, the scope for social policies to make an impact is necessarily limited. Conversely, a large proportion of country-level variation would identify greater potential for social policies to reduce people's risk of food insecurity.

Logistic multilevel (random intercept) models were estimated in which individuals (level 1) were nested within countries (level 2). Although the data relate to two time points, the EQLS is a repeated cross-sectional sample, not a panel sample, so it was not possible to cluster within both country and year. Instead, random effects of survey year were included at the country level, allowing changes in food insecurity prevalence over time to vary between countries. This specification is important to the time period under question, in which policy responses to the global financial crisis varied substantially between countries.

The use of multilevel models in European research has been subject to some debate, as the small number of countries can produce unreliable estimates of country effects, particularly for logistic models (Schmidt-Catran and Fairbrother, 2016). All models were therefore fitted using Markov Chain Monte Carlo estimation methods, which are more suitable in these circumstances (Bryan and Jenkins, 2016; Browne, 2017). All models were specified to have a burn-in period of 1,000 iterations and a monitoring period of 50,000 iterations. Model fit was assessed using the Deviance Information Criterion, which accounts for model complexity. All analyses were undertaken using Stata 13, MLwiN, and runmlwin software (Rasbash *et al.*, 2009; Leckie and Charlton, 2012; StataCorp, 2013).

Results

Descriptive statistics

The prevalence of food insecurity increased significantly from 9.4 per cent in 2007 to 12.2 per cent in 2011, and was substantially higher in Eastern Europe, Cyprus, and Greece (Figure 1). Overall, food insecurity rose in 23 countries and declined in only four[v]. These figures are broadly consistent with EU-SILC data from 2007 and 2011, and with UN figures from 2014 (FAO 2016).

The sample characteristics and their bivariate associations with food insecurity status replicated the demographic groups previously identified as vulnerable to food insecurity (Table 1). Food insecurity was more prevalent among pension and out-of-work benefit recipients, but was not consistently associated with child benefit *receipt* (see Supplementary Material).

Multilevel models

The first research question considered the individual economic and demographic risk factors of food insecurity in Europe. Table 2 displays these associations (Models 1-3) before adding the national unemployment rate and GDP per capita to add contextual controls (Model 4). In Models 1-3, food insecurity was significantly more prevalent in 2011 than 2007, in women, older people, those living in one-person and lone-parent households, lower-educated respondents, and those with disabilities. Predictably, economic factors were also important, with an increased risk of food insecurity at lower household incomes, those outside the labour market, and renters. These patterns were replicated after controlling for GDP and the unemployment rate (Model 4), demonstrating that the individual economic and demographic risk factors for food insecurity were robust to changing macroeconomic circumstances. Conversely, the year coefficient reduced in size and lost significance, suggesting that growing food insecurity between 2007 and 2011 reflected changing macroeconomic conditions. The significant coefficient for GDP indicates, predictably, that food insecurity was more prevalent in poorer countries. The unemployment rate was not associated with food insecurity.

Looking at the variance components, the intercept variance demonstrated significant variation in food insecurity prevalence between countries, meaning that national social policies have considerable scope to reduce food insecurity. This result also confirms the suitability of multilevel models for exploring this research question. The slope variance was also significant, indicating increasing variation between countries in food insecurity prevalence over time, which may reflect differences in policy responses to the global financial crisis. The nonsignificant intercept-slope covariance indicates no association between countries' baseline and changing prevalence of food insecurity over time. In other words, countries with a higher prevalence of food insecurity in 2007 did not see larger changes in food insecurity between 2007 and 2011.

The variance partition coefficient (VPC) captures the proportion of individual- and country-level variance. In Models 1-3, individual characteristics accounted for approximately 60 per cent of variation in food insecurity, rising to nearly 85 per cent after accounting for GDP and the unemployment rate (Model 4). These results demonstrate the relevance of macroeconomic factors, the importance of accounting for country-level characteristics, and of taking a multi-level approach more broadly.

The second research question considered whether social benefit *receipt* is associated with food insecurity, after controlling for macroeconomic factors. Table 3 shows that people receiving any social benefits were 12 per cent more likely to report food insecurity, while people receiving out-of-work benefits were 35 per cent more likely to report food insecurity than non-recipients. Food insecurity was not associated with pension or child benefit *receipt*. The increased risk of food insecurity among all recipients therefore appears to be driven by out-of-work benefit *receipt*. The economic and demographic risk factors for food insecurity identified in Table 2 each remained

significant and of similar size after accounting for social benefit *receipt* (see Supplementary Material), thus social benefit *receipt* did not counter the risk of food insecurity for certain groups.

The variance components replicate the substantive patterns seen in Table 2, where food insecurity varied significantly between countries (intercept variance) and over time (slope variance), but there was no association between countries' baseline and changing prevalence of food insecurity over time. Accounting for benefit *receipt* made very little difference to the intercept and slope variances, and to the VPC figure, suggesting that benefit *receipt* has limited relevance to the country-level prevalence of food insecurity.

Finally, by examining the *value* of relevant social benefits among different recipient groups, the third research question considered whether more generous social benefits protect against food insecurity among recipients (Table 4). Among all recipients, food insecurity was not associated with total social benefit *value* (Model 9), nor the *value* of individual components (Model 10), although higher-*value* family spending was unexpectedly associated with a greater likelihood of food insecurity. Looking at the separate recipient groups, higher-*value* family spending was associated with greater food insecurity among child benefit recipients (Model 12). Old age spending was associated with nonsignificantly lower risks of food insecurity among pension recipients (Model 11), while higher spending on unemployment (Model 13) and disabilities (Model 14) was associated with nonsignificantly higher risks of food insecurity among out-of-work benefit recipients. Overall, these results did not reveal the anticipated association between higher-*value* social benefit spending and lower prevalence of food insecurity among benefit recipients.

The previously identified economic and demographic risk factors for food insecurity were broadly replicated in these models (see Supplementary Material). However, some differences were apparent when examining out-of-work benefits, where the greater prevalence of food insecurity among women, lone-parent families, and people with less education lost statistical significance after accounting for the *value* of out-of-work benefits, while an elevated risk of food insecurity emerged for students. The reasons for these changes among out-of-work benefit recipients only are not immediately clear, but suggest the existence of specific vulnerabilities among this client group that warrant further detailed investigation.

In each of the models included in Table 4, the country-level (intercept) variance denoted significant variation in food insecurity prevalence between countries, demonstrating that variation in social benefit generosity did not eliminate country-level differences in the prevalence of food insecurity across Europe. The slope variance was significant when examining *receipt* of pensions, child benefit, and all benefits, but not out-of-work benefits. Countries thus generally displayed increasing variation in food insecurity prevalence over time, which may reflect diversifying social policies over this period. Across all models, the nonsignificant intercept-slope covariance again suggests no association between countries' baseline and changing prevalence of food insecurity over time.

The VPC values identify between 60 and 70 per cent of variance in food insecurity between benefit recipients as reflecting individual factors. As social benefit *values* are operationalised at the country level, this finding suggests either that variation in social benefit generosity has only limited relevance to the prevalence of food insecurity, or that individual differences between recipients (which may reflect eligibility rules and benefit coverage) are more relevant to food insecurity.

Discussion

Food insecurity is symptomatic of extreme material deprivation and social exclusion, and captures the uneven distribution of material and social resources across European populations. The question of food insecurity has recently received increasing research attention across Europe, yet the groups most at risk and the role of social protection *receipt* and *value* are unknown. Using data from 27 countries, this study first explored the demographic risk factors of food insecurity in Europe in 2007 and 2011, then examined the roles of social benefit *receipt* and *value* on food insecurity.

Key findings and implications

The first research question examined the economic and demographic risk factors of food insecurity in Europe. Food insecurity was more prevalent among economically disadvantaged groups (whether measured by income, housing tenure, education, or employment status), women, older people, one-person households, lone-parent households, and people with disabilities. These associations all remained after accounting for underlying macroeconomic circumstances. These patterns replicate those identified in the US and Canada alongside emerging European evidence (Alvares and Amaral, 2014; Bocquier *et al.*, 2015), and suggest that despite considerable economic and social differences between settings, the large body of US and Canadian research evidence on food insecurity has relevance to Europe.

The second research question considered whether social benefit *receipt* is associated with lower risks of food insecurity. Equivocal associations between social benefit *receipt* and food insecurity were identified. Perhaps unexpectedly, food insecurity was significantly more prevalent among out-of-work benefit recipients and all social benefit recipients, but was not associated with pension or child benefit *receipt*. The immediate interpretation is that the *value* of social benefits are insufficient to protect recipients from food insecurity. This finding may alternatively reflect differential benefit coverage, where pensions and child benefit are commonly universally received by relevant groups. Conversely, out-of-work benefits are typically targeted, such that recipients may be particularly disadvantaged (Vilar-Compte *et al.*, 2015). Likewise, those not receiving social benefits may be especially disadvantaged if their status reflects delays in receiving payments or welfare conditionality, experiences that are associated both with food insecurity severity (Prayogo *et al.*, 2017) and foodbank use (Loopstra *et al.*, 2018).

The third research question asked whether higher-*value* social benefits are associated with lower risks of food insecurity among recipients. Higher-*value* social benefits were unexpectedly not associated with lower risks of food insecurity among all recipients, and higher-*value* spending on relevant components was not associated with lower risks of food insecurity for the different recipient groups. The underlying reasons are not immediately clear, especially in light of recent European research reporting protective roles of higher-*value* social benefits on food insecurity (Loopstra *et al.*, 2016; Reeves, Loopstra and Stuckler, 2017). This discrepancy may instead reflect differences in methodological approaches, where past research has comprised country-level ecological analyses that did not control for individual characteristics, meaning that higher-*value* social benefits may confer lower risks of food insecurity through mechanisms other than by directly increasing the material resources available to benefit recipients. In contrast, the use of multilevel models in the current study enabled a more direct and tightly-controlled assessment of the association between social benefit *value* and food insecurity among recipients.

The limited role for social benefits (both their *receipt* and *value*) in protecting against food insecurity has two potential interpretations. First, the *value* of social benefits available in Europe during this period was too low for respondents to afford a nutritionally adequate diet, and second, that social benefits are unable to fully mitigate the individual risk factors for food insecurity, regardless of their *value*. Attesting to the first possibility, the elevated risk of food insecurity for unemployed people –

after accounting for social benefit *receipt* and *value* – suggests that out-of-work benefits do not full compensate for loss of wages. Indeed, Loopstra *et al.* (2016) reported that when social benefits were below $10,000 per capita, rising unemployment and falling wages led to increased food insecurity in Europe. In this scenario, benefits such as food stamps (which are widespread in the US and Canada) may be valuable in providing more targeted support for food provisioning. Alternatively, individual and structural risk factors could outweigh any protective role of higher-*value* social benefits if food insecurity is determined by wider factors than material resources alone. US evidence linking food insecurity with adverse life experiences and trauma demonstrates that material resources alone may be insufficient to protect vulnerable groups from food insecurity (Chilton *et al.*, 2015). Instead, wider-ranging social policies across domains including education, employment and mental health may be needed.

Income and food insecurity

Replicating past research, the strongest correlate of food insecurity was household income quartile, and this association held for 22 of 27 countries[vi]. The income variable was calculated within each country, so represents a relative measure of low income. The relevance of relative low incomes to food insecurity across countries with different absolute income levels demonstrates that food insecurity is not a simple consequence of incomes below subsistence level or extreme poverty. Consistent with past evidence for imperfect associations between low incomes and both food insecurity (Rose, 1999; Olabiyi and McIntyre, 2014) and material deprivation (Bradshaw and Finch, 2003), there was moderate correspondence between income and food insecurity: 23 per cent of the lowest income quartile reported food insecurity, while 37 per cent of food insecure respondents were in the lowest income quartile. This asymmetric correspondence is unsurprising: the inability to afford adequate food necessarily reflects constrained resources, while food insecurity is not inevitable for people with limited resources.

Several dynamics could account for the greater sensitivity of food insecurity than income. In light of the clear policy objective to reduce food insecurity through sufficient incomes, these dynamics are worth considering. Substantively, food is a more flexible part of household budgets than other spending commitments such as housing and transport (Dowler, 2001), thus the risk of food insecurity is not limited to the lowest-income groups. If made widely available, benefits such as food stamps that are specifically targeted to food provisioning could be valuable in reducing food insecurity for both the lowest-income groups and those further up the income spectrum.

Furthermore, the skills, knowledge, physical capacity and time investments entailed in food provisioning will influence the strength of relationships between income and food insecurity (Borch and Kjærnes, 2016; Beagan, Chapman and Power, 2018). Indeed, the elevated risk of food insecurity among lone-parent households and people with disabilities identified here and in previous research could reflect more constrained opportunities to protect food consumption among these groups (O'Connell *et al.*, 2018). Policies that widen the availability of affordable childcare and social care provision for people with disabilities could prove valuable in mitigating the greater risk of food insecurity in these groups.

The availability of wider supplementary resources may also be relevant: low-income households who are able to draw on informal support, sale or exchange of goods, savings, and illegal activity may be comparatively protected from food insecurity (Elam, Ritchie and Hulasi, 2000). Furthermore, evidence that both food insecurity and material deprivation are more closely associated with persistent than current poverty (Whelan, Layte and Maitre, 2003; Iceland and Bauman, 2007) demonstrates the importance of income dynamics that are not easily captured in survey data. When designing social benefits, accounting for the persistence of poverty and offering additional support for persistent poverty could be valuable in protecting against food insecurity.

Future research directions

The important but variable role of income on food insecurity across Europe means that future research exploring the role of supplementary resources would be valuable. Little is known about the availability and value of such resources, which are also likely to vary according to factors including family structure, housing wealth, and social norms around kinship support. For example, the low prevalence of food insecurity among 'other' family types suggests that multigenerational families might enjoy extended familial support through activities such as intra-familial sharing or in-kind support that protect against food insecurity. In some countries – particularly the former Soviet states – family obligations have historically taken precedence over state and voluntary welfare, but familial support is now diminishing (for a discussion on Estonia, see Kõre (2014)), potentially strengthening the need for social policy reforms.

Additional risk factors for food insecurity also merit further attention. It was not possible to control for immigration or citizenship status and the sample excluded migrants with less than six months' residence. These characteristics may however be influential in light of the influx of Middle Eastern and African refugees to Europe during the survey period. Likewise, it was not possible to account for the costs of childcare and social care for older people, thereby over-stating the disposable incomes of certain family types. The consistently elevated risk of food insecurity among lone-parent families and older people supports this possibility. Further characteristics worth exploring in future research include persistent poverty (Whelan, Layte and Maitre, 2003), and adverse life events and financial strain (Prayogo *et al.*, 2017).

At the macro level, further consideration is needed of welfare conditionality and its impact on the relationship between social benefit *receipt* and food insecurity. As noted, associations between social benefit *receipt* and food insecurity can be difficult to interpret as respondents not receiving social benefits may have been affected by conditionality rules in which social assistance receipt is contingent upon activities such as job search behaviour. Ecological evidence linking benefit sanctions to greater UK foodbank use (Loopstra *et al.*, 2018) suggests that conditionality increases the risk of food insecurity and could thus complicate the association between social benefit *receipt* and food insecurity explored here. In comparative analyses, greater conditionality is anticipated to weaken any associations between social benefit *receipt* and food insecurity. This possibility merits further dedicated research attention.

Strengths and limitations

The current study has two particular key strengths. First, it offers the first examination of the demographic risk factors for European food insecurity, while simultaneously identifying between-country variation in these risk factors. Such insights are valuable when designing policies aimed at reducing food insecurity among European populations. Using multi-level models made it possible to partition the variance in food insecurity between individual- and country-level determinants. A large proportion of country-level variation gives greater scope for social policies to reduce the risk of food insecurity, while a small proportion conversely identifies more limited potential for impactful social policies. After accounting for GDP and the unemployment rate, between 16 and 40 per cent of variation in food insecurity reflected country-level factors. The importance of country-level factors identified here demonstrates the potential for economic and policy-relevant factors to reduce food insecurity, including provision of in-kind support such as food vouchers; market factors such as the costs of housing, food, and other commodities; and social factors including social networks and family obligations.

Second, the study directly examined the associations between social benefits and food insecurity using data on both the *value* and *receipt* of this provision. Some previous research relies on indicators of welfare state regime, which do not directly explore social benefit spending (Davis and

Baumberg Geiger, 2017), while more detailed analyses appear to rest on the assumption that social benefits exerts protective effects via benefit *receipt*, without testing this mechanism using individual-level data (Loopstra *et al.*, 2016). By considering the associations between food insecurity and the *value* and *receipt* of social benefits, the current study provides the first direct assessment of the combined micro- and macro-level roles of social benefits on food insecurity.

The study's main limitation is the reliance upon a single measure of the affordability of meat or fish to assess food insecurity. Food insecurity would ideally be determined using the multidimensional instruments used in the US and Canada, which capture a wide range of food concerns and restrictions, and their duration. Such measures are absent from European datasets, and their inclusion in future surveys should receive serious consideration. Statistically, the measure used here is probably less sensitive to marginal food insecurity – such as compromises over food quality which precede more significant changes in purchasing (O'Connell *et al.*, 2018) – than multidimensional measures, so estimates may consequently under-state the scale of food insecurity. Nonetheless, economising on food typically includes reducing meat consumption (Griffith, O'Connell and Smith, 2015), and the current measure is included in material deprivation indicators in Europe (Carney and Maître, 2012; Eurostat, 2018b). It is also correlated with multidimensional food insecurity (Bocquier *et al.*, 2015), and affordability (Davis and Baumberg Geiger, 2017), demonstrating its financial basis. Furthermore, the correlates of food insecurity identified here replicate those obtained using detailed multidimensional indicators used by the UN, and to monitor food insecurity in the US and Canada. Such correspondence provides initial evidence that the current analyses did adequately identify people experiencing food insecurity, although further work comparing the correspondence between single and multidimensional measures would nonetheless be valuable.

Conclusions

This study provided the first empirical identification of the demographic groups most at risk of food insecurity in Europe in 2007 and 2011; these groups are broadly consistent with those identified in the US and Canada. It established an equivocal role of social benefit *receipt:* people receiving out-of-work benefits and any social benefits were significantly more likely to report food insecurity, which may reflect benefit conditionality. Furthermore, higher-*value* social benefits were not associated with lower risks of food insecurity across the different recipient groups. Social benefits therefore appeared unable to fully mitigate the individual risk factors for food insecurity, perhaps because their value is too low, or because wider individual and structural risk factors outweigh an otherwise protective role. The topic of food insecurity has received limited research attention in Sociology, yet it signals the existence of severe material deprivation, health inequalities, and social stratification across Europe.

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[i] Analyses were restricted to 27 countries. Iceland, Kosovo, Montenegro and Serbia were not included in the EQLS in 2007; Norway was not included in 2011. Social benefit data was not available for Croatia and Macedonia, and GDP was not available for Turkey.
[ii] It is not possible to disaggregate unemployment benefit, disability benefit, and any other social benefit receipt.
[iii] Cyprus, Luxembourg, and Malta are not included. No data on pension generosity are available in 2011, and data on unemployment and sickness benefit generosity is incomplete in 2011.
[iv] Age and age squared are both mean centred at 50 years
[v] Food insecurity rose in Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, and the UK. Food insecurity declined in Austria, Belgium, Bulgaria, and Romania.
[vi] Income was not significantly associated with food insecurity in Estonia, Finland, Malta, the Netherlands, and Sweden.

Tables

Table 1: Prevalence of food insecurity in relation to household characteristics in Europe, 2007[i]

	All respondents		Food insecure respondents		Difference between groups	
	n	Column proportion (%)	*n*	Row proportion (%)	Chi-squared test statistic	p-value
Age					t(28998)	
Mean		48.9 years		53.7 years	=-13.9	p<.000
Gender						
Men	12,452	42.9	995	8.0		
Women	16,548	57.1	1,913	11.6	100.4	p<.000
Household composition						
One person	6,129	21.1	910	14.8		
Couple, no children	8,232	28.4	641	7.8		
Couple with children	6,105	21.1	406	6.7		
Lone parent with children	978	3.4	134	13.7		
Other[ii], no children	5,975	20.6	618	10.3		
Other, with children	1,581	5.5	199	12.6	307.6	p<.000
Income						
Lowest quartile	4,897	16.9	1,068	21.8		
Quartile 2	4,953	17.1	662	13.4		
Quartile 3	5,034	17.4	384	7.6		
Highest quartile	5,028	17.3	165	3.3		
Unknown	9,088	31.3	629	6.9	1,200	p<.000
Housing tenure						
Owner	21,456	74.0	2,126	9.9		
Private renter	3,627	12.5	312	8.6		
Social renter	2,723	9.4	309	11.3		
Other tenure	1,194	4.1	161	13.5	29.6	p<.000
Education[iii]						
No education	618	2.1	116	18.8		
Primary	3,180	11.0	417	13.1		
Lower secondary	5,459	18.8	727	13.3		
Upper secondary	11,557	39.9	1,247	10.8		
Postsecondary	2,533	8.7	175	6.9		
Tertiary (first level)	5,284	18.2	217	4.1		
Tertiary (advanced level)	369	1.3	9	2.4	415.0	p<.000
Employment status						
Employed	14,475	49.9	905	6.3		
Unemployed	1,323	4.6	279	21.1		
Unable to work	713	2.5	139	19.5		
Retired	8,438	29.1	1,276	15.1		
Homemaker	2,314	8.0	173	7.5		
Student	1,305	4.5	90	6.9		
Other	432	1.5	46	10.6	752.7	p<.000
Urban-rural location						
Urban	13,834	47.7	1,390	10.0		
Rural	15,166	52.3	1,518	10.0	0.0	p=0.913
Disability status						
No disability	22,414	77.3	1,825	8.1		
Has a disability	6,586	22.7	1,083	16.4	388.8	p<.000
Total	**29,000**	**100.0**	**2,908**	**10.0**		

Table 2: Multilevel logistic regression models predicting food insecurity from individual economic and demographic characteristics

	Model 1	Model 2	Model 3	Model 4
Regression coefficients (exponentiated coefficients, standard errors)				
Intercept	0.062***	0.048***	0.007***	0.029***
	(0.017)	(0.012)	(0.002)	(0.009)
2007	1.000	1.000	1.000	1.000
	(.)	(.)	(.)	(.)
2011	1.521***	1.497***	1.494***	1.215
	(0.174)	(0.160)	(0.164)	(0.154)
Male		1.000	1.000	1.000
		(.)	(.)	(.)
Female		1.308***	1.115***	1.115***
		(0.036)	(0.034)	(0.034)
Age		1.014***	1.002	1.002
		(0.001)	(0.001)	(0.001)
Age squared		1.000*	1.000***	1.000***
		(0.000)	(0.000)	(0.000)
One person household			1.622***	1.619***
			(0.068)	(0.067)
Couple, no children			1.000	1.000
			(.)	(.)
Couple with children			0.990	0.988
			(0.053)	(0.052)
Lone parent household			1.560***	1.559***
			(0.128)	(0.128)
Other, no children			1.081	1.078
			(0.048)	(0.047)
Other, with children			1.106	1.102
			(0.073)	(0.072)
Highest income quartile			1.000	1.000
			(.)	(.)
Quartile 2			2.046***	2.047***
			(0.131)	(0.131)
Quartile 3			3.165***	3.168***
			(0.199)	(0.195)
Lowest income quartile			5.683***	5.690***
			(0.353)	(0.348)
Missing income			2.594***	2.600***
			(0.159)	(0.156)
Homeowner			1.000	1.000
			(.)	(.)
Private renter			1.686***	1.684***
			(0.084)	(0.084)
Social renter			1.688***	1.687***
			(0.088)	(0.088)
Other tenure			1.326***	1.327***
			(0.086)	(0.088)
No education			3.933***	4.166***
			(0.856)	(1.079)
Primary			2.433***	2.584***
			(0.487)	(0.636)
Lower secondary			2.368***	2.513***
			(0.468)	(0.613)
Upper secondary			1.748**	1.859*
			(0.344)	(0.452)
Postsecondary			1.624*	1.724*
			(0.332)	(0.430)
Tertiary (first level)			1.162	1.233
			(0.232)	(0.303)

Tertiary (advanced level)			1.000	1.000
			(.)	(.)
Employed			1.000	1.000
			(.)	(.)
Unemployed			2.097***	2.094***
			(0.109)	(0.108)
Unable to work			1.681***	1.679***
			(0.132)	(0.134)
Retired			1.245***	1.245***
			(0.067)	(0.067)
Homemaker			1.190**	1.188**
			(0.076)	(0.076)
Student			0.935	0.933
			(0.089)	(0.088)
Other			1.280*	1.280*
			(0.145)	(0.145)
Urban location			1.000	1.000
			(.)	(.)
Rural location			0.969	0.968
			(0.029)	(0.029)
No disability			1.000	1.000
			(.)	(.)
Has a disability			1.538***	1.539***
			(0.051)	(0.052)
GDP per capita				1.000***
				(0.000)
Unemployment rate				1.036
				(0.020)
Variance components (level 2)				
Intercept variance	6.309***	6.390***	8.506***	1.938**
	(3.510)	(3.574)	(5.383)	(0.408)
Slope variance	1.317**	1.328**	1.351**	1.282**
	(0.120)	(0.123)	(0.132)	(0.106)
Intercept–slope covariance	0.765	0.759	0.787	0.871
	(0.134)	(0.133)	(0.148)	(0.087)
Variance partition coefficient (%)	39.8	41.2	43.6	16.7
Goodness of fit				
DIC	37,947.14	37,471.12	33,833.29	33,833.2
n				63,168

* p<.05, ** p<.01, *** p<.001. DIC = Deviance Information Criterion

[†] Level 1 variance is a function of the mean in logistic models so is not estimated

Table 3: Multilevel logistic regression models predicting food insecurity from social benefit receipt, adjusted for underlying economic conditions and individual economic and demographic characteristics

	Model 5	Model 6	Model 7	Model 8
Regression coefficients (exponentiated coefficients, standard errors)				
Intercept	0.033***	0.034***	0.029***	0.036***
	(0.011)	(0.015)	(0.010)	(0.019)
2007	1.000	1.000	1.000	1.000
	(.)	(.)	(.)	(.)
2011	1.215	1.231	1.268*	1.254
	(0.165)	(0.181)	(0.153)	(0.169)
GDP per capita	1.000***	1.000***	1.000***	1.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment rate	1.032	1.027	1.023	1.022
	(0.025)	(0.028)	(0.021)	(0.025)
Receives any benefits	1.120**			
	(0.045)			
Receives pension		0.932		
		(0.044)		
Receives child benefit			1.084	
			(0.051)	
Receives out-of-work benefit				1.354***
				(0.057)
Variance components (level 2)				
Intercept variance	1.922**	1.967**	1.937**	2.000**
	(0.394)	(0.430)	(0.407)	(0.464)
Slope variance	1.286**	1.291**	1.281**	1.291**
	(0.107)	(0.112)	(0.105)	(0.112)
Intercept–slope covariance	0.877	0.870	0.873	0.865
	(0.087)	(0.089)	(0.087)	(0.091)
Variance partition coefficient (%)	16.6	17.1	16.7	17.4
Goodness of fit				
DIC	33,827	33,833	33,832	33,785
n				63,168

* p<.05, ** p<.01, *** p<.001. DIC = Deviance Information Criterion

† Level 1 variance is a function of the mean in logistic models so is not estimated

All models adjusted for age, age squared, sex, household composition, income, housing tenure, education, employment status, rural-urban location and disability status.

Table 4: Multilevel logistic regression models predicting food insecurity from the value of social benefits among recipients, adjusted for underlying economic conditions and individual economic and demographic characteristics

	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
	All recipients	All recipients	Pension recipients	Child benefit recipients	Out-of-work benefit recipients	Out-of-work benefit recipients
Regression coefficients (exponentiated coefficients, standard errors)						
Intercept	0.023***	0.028***	0.012***	0.022***	0.076***	0.059***
	(0.008)	(0.013)	(0.007)	(0.018)	(0.054)	(0.042)
2007	1.000	1.000	1.000	1.000	1.000	1.000
	(.)	(.)	(.)	(.)	(.)	(.)
2011	1.220	1.130	1.228	1.095	1.305*	1.301
	(0.164)	(0.151)	(0.200)	(0.184)	(0.171)	(0.179)
GDP per capita	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Unemployment rate	1.020	1.033	1.015	1.020	1.026	1.025
	(0.022)	(0.027)	(0.031)	(0.030)	(0.025)	(0.025)
Total spending	1.018					
	(0.817)					
Disability spending		0.332				1.786
		(0.508)				(1.997)
Family spending		261.632**		11.972*		
		(506.430)		(11.914)		
Housing spending		0.663				
		(0.578)				
Old age spending		0.709	0.603			
		(0.572)	(0.402)			
Healthcare spending		0.189				
		(0.220)				
Social exclusion spending		3.235				
		(2.591)				
Unemployment spending		0.556			1.162	
		(0.405)			(0.776)	
Variance components (level 2)						
Intercept variance	2.048**	1.610**	1.988**	1.552*	1.814*	1.846*
	(0.475)	(0.277)	(0.500)	(0.277)	(0.426)	(0.445)
Slope variance	1.235**	1.258**	1.282*	1.373*	1.177	1.177
	(0.092)	(0.110)	(0.129)	(0.176)	(0.105)	(0.102)
Intercept–slope covariance	0.904	0.851	0.879	0.968	0.882	0.877
	(0.090)	(0.078)	(0.108)	(0.109)	(0.103)	(0.103)
Variance partition coefficient (%)	33.4	34.8	38.7	32.1	40.1	31.0
DIC	24,797	24,796.9	16,103.7	7,050.7	6,358.2	6,357.6
n	42,732	42,732	26,236	14,461	8,806	8,806

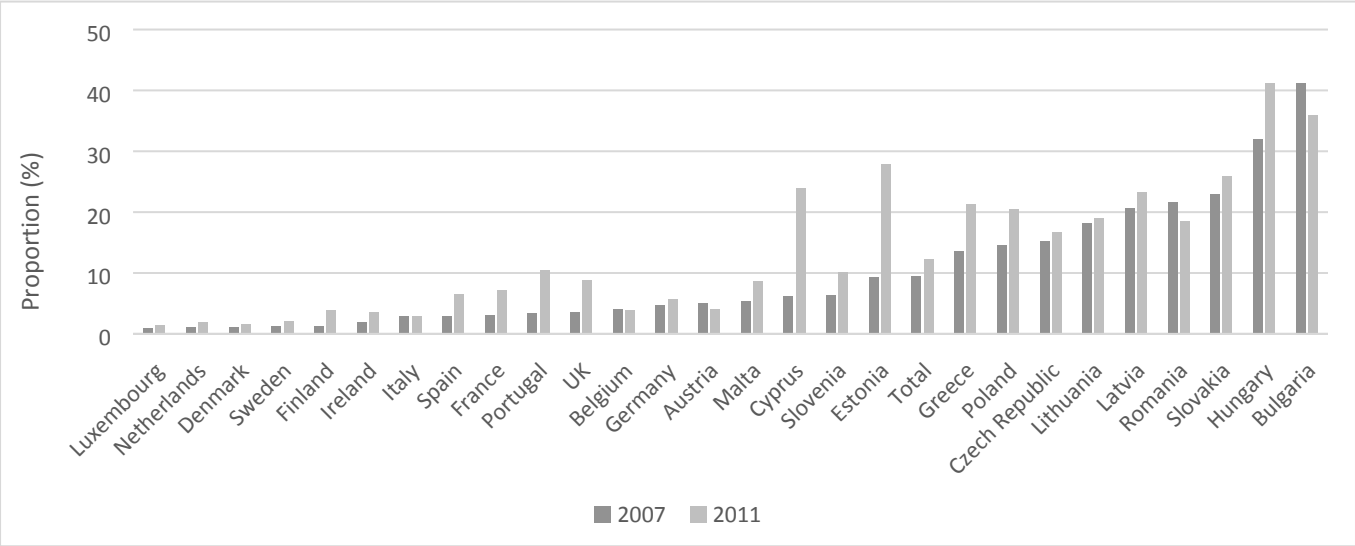
* p<.05, ** p<.01, *** p<.001. DIC = Deviance Information Criterion

† Level 1 variance is a function of the mean in logistic models so is not estimated

All models adjusted for age, age squared, sex, household composition, income, housing tenure, education, employment status, rural-urban location, and disability status.

Figures

Figure 1: Prevalence of food insecurity in Europe, 2007 and 2011



[i] Equivalent figures for 2011 are available as supplementary analyses

[ii] 'Other' family types includes households containing multigenerational families, adult siblings, or unrelated adults living together.

[iii] Education is captured using the Harmonised International Standard Classification of Education categories.