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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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Keywords:	Food insecurity, Poverty, Social benefits, Comparative research, Multilevel models
Abstract:	<p>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.</p>

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

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.

1 Introduction

2 Food insecurity – defined as ‘*the inability to acquire or consume an adequate quality or sufficient*
3 *quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so*
4 (Radimer *et al.*, 1992, p. 395) – has historically been a challenge confined primarily to the developing
5 world. Yet the 2008 global financial crisis and subsequent expansion of emergency food provision
6 across Europe (commonly in the form of foodbanks) have reignited questions about both food
7 insecurity (Borch and Kjærnes, 2016) and material deprivation more broadly (Saltkjel and Malmberg-
8 Heimonen, 2017). The existence of food insecurity across welfare regimes is a visible and immediate
9 demonstration of extreme poverty and social exclusion in Europe. Set against the backdrop of the
10 declining adequacy of social assistance in Europe (Nelson, 2013), it also suggests that social policies
11 have failed to adequately protect citizens’ most fundamental needs. Despite the importance of food
12 insecurity to people’s quality of life, key evidence gaps remain. To remedy these omissions, this
13 study explored the demographic risk factors of food insecurity across Europe in 2007 and 2011, then
14 examined the roles of social benefit *receipt* and *value* on food insecurity.

15
16 Despite widespread sociological interest in social stratification and the uneven distribution of
17 material and social resources, social inequalities relating to food are an under-researched topic.
18 Sociological research has instead explored the social, cultural, and expressive aspects of food and
19 eating (Beardsworth and Keil, 1996; Burnett Clark and Ray, 2012). Within predominantly neoliberal
20 political regimes, food consumption is considered a matter of individual responsibility and private
21 choice (Dowler and O’Connor, 2012), allowing food insecurity to be framed as an individual failing
22 and thus remaining a peripheral policy issue (Dowler, 2014; Lambie-Mumford, 2015). Discussions
23 about the structural and economic influences on food and consumption patterns have therefore
24 been largely overlooked within Sociology (although they have enjoyed greater recognition within
25 public health and nutrition research (eg: Dowler, 2001; Dowler *et al.*, 2011)).

26
27 Consistent with Blumer’s (1971) thesis that sociological inquiry reflects social concern, in recent
28 years the global recession, social welfare retrenchment, rising food prices and accompanying rapid
29 expansion of emergency food provision have highlighted the existence – and apparent growth – of
30 European food insecurity. In this context, understandings of the structural and economic constraints
31 that contribute to socially-graded consumption patterns have improved, accompanied by a rise in
32 sociologically-informed research interest on food insecurity. Researchers have taken a range of
33 approaches, including quantitative (Alvares and Amaral, 2014; Katsikas *et al.*, 2014; Bocquier *et al.*,
34 2015; Garratt, 2016, 2017), mixed-methods (Nielsen, Lund and Holm, 2015; Pfeiffer, Ritter and
35 Oestreicher, 2015; Garratt, Spencer and Ogden, 2016; Purdam, Garratt and Esmail, 2016) and
36 qualitative research (van der Horst, Pascucci and Bol, 2014; Garthwaite, Collins and Bamba, 2015;
37 Garthwaite, 2016).

38
39 Importantly, recent research evidence has served to challenge the neoliberal assumption that food
40 practices primarily reflect individual choice, not social policy (Köre, 2014; Pérez de Armiño, 2014;
41 Silvasti and Karjalainen, 2014). Empirical studies reporting a protective role of social benefit
42 spending on European food insecurity (Loopstra *et al.*, 2016; Davis and Baumberg Geiger, 2017)
43 further challenge this assumption, and demonstrate that access to food in developed countries is a
44 political concern, worthy of policy attention (Riches, 2011).

45
46 Alongside its health consequences (eg: Kirkpatrick and Tarasuk, 2008; Seligman, Laraia and Kushel,
47 2010; Power *et al.*, 2017), food insecurity also relates to wider experiences of poverty and material
48 deprivation (Nolan and Whelan, 2010). Notably, the Europe 2020 strategy – which targets a 20
49 million reduction in the number of EU citizens living in poverty by 2020 – is measured in relation to
50 both income poverty and material deprivation (European Commission, 2010). Such interest in
51 material deprivation may reflect the advantages of such measures over traditional income-based

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

7 *The current study*

8 Research from Canada and the US – where food insecurity is routinely monitored – identifies certain
9 demographic groups as particularly vulnerable to food insecurity, yet the applicability of this
10 evidence to Europe is unclear given differences in social policy contexts. Likewise, while recent
11 European research suggests that higher-*value* social benefits protect against food insecurity
12 (Loopstra *et al.*, 2016; Davis and Baumberg Geiger, 2017), these ecological studies are unable to
13 demonstrate how macro-level social policies relate to micro-level risks of food insecurity. The
14 current study therefore explored individual risk factors alongside the roles of social benefit *receipt*
15 and *value* on European food insecurity.
16

17
18 Predictably, food insecurity is concentrated among socially and economically disadvantaged groups
19 (Gorton, Bullen and Mhurchu, 2010). Women, people with disabilities, one-person households, and
20 households containing children also faced elevated risks (Gorton, Bullen and Mhurchu, 2010; Neter
21 *et al.*, 2014; Nielsen, Lund and Holm, 2015). However, the risk of food insecurity for different
22 demographic groups across Europe remains unknown, undermining the development of policy
23 interventions. The first research question is therefore:

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

25
26 In light of evidence linking generous social benefits with reduced risks of multidimensional material
27 deprivation (Nelson, 2012; Saltkjel and Malmberg-Heimonen, 2017), a natural question is whether
28 social benefits protect against food insecurity, a sensitive and tangible measure of material
29 deprivation. By increasing households' material resources, social benefits are expected to reduce the
30 risk of food insecurity either by providing money to spend on food or by covering other costs,
31 thereby freeing up money for food. Recent welfare reforms have reignited research interest in the
32 role of social benefits, yet coverage, overall spending, and the value of different components vary
33 widely between countries according to their welfare regime and demographic needs, making it
34 difficult to clearly identify their role. Existing evidence is inconsistent: at the population level, a
35 reduction in social benefit *receipt* was associated with an increase in food insecurity (Borjas, 2004),
36 however, individual-level analyses in Canada reveal mixed evidence for any protective roles of social
37 benefit *receipt* (Loopstra and Tarasuk, 2013; Olabiyi and McIntyre, 2014; Ionescu-Iltu, Glymour and
38 Kaufman, 2015; Li, Dachner and Tarasuk, 2016). Associations between social benefit *receipt* and food
39 insecurity therefore remain uncertain, leading to the second research question:

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

41
42 Finally, it is worth examining whether higher-*value* social benefits are associated with a lower
43 likelihood of food insecurity among recipients. It is intuitively plausible that higher-*value* social
44 benefits that provide more substantial material resources offer greater protection against food
45 insecurity. However, existing country-level ecological analyses of social benefit *value* (eg: Loopstra *et al.*,
46 2016) provide at best an indirect assessment of the potentially protective role of social benefits
47 on individual food insecurity because they do not directly examine the role of higher-*value* benefits
48 on recipients. The combined roles of social benefit *receipt* and *value* have never been explored in
49 combination despite their relevance to food insecurity and material deprivation more broadly. The
50 third research question is therefore:

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

For Peer Review

1 **Data and methods**

2 *Data and sample*

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

10
11 Changes in food insecurity following the 2008 global financial crisis were examined using data from
12 2007 and 2011. It was not possible to include data from the EQLS 2016 because social protection
13 data are not available for all countries in 2016. The EQLS was used in preference to the European
14 Survey of Income and Living Conditions (which also contains food insecurity questions) as the EQLS
15 uses better-standardised interviews, so data quality may be higher.

16 17 *Outcome variable*

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

30
31 Food insecurity would ideally be assessed using the multidimensional instruments used in the US
32 and Canada. These instruments are absent from European social surveys, and this limitation is
33 reflected upon in the Discussion. Nonetheless, this single measure is associated with difficulties
34 affording food (Davis and Baumberg Geiger, 2017) and multidimensional food insecurity (Bocquier *et*
35 *al.*, 2015), demonstrating its financial basis. The demographic patterns of food insecurity identified
36 here in descriptive (Table 1) and multivariate statistics (Table 3) replicate those obtained using
37 multidimensional instruments, further demonstrating its suitability.

38 39 *Key predictor variables*

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

47
48 To explore social benefit *value*, country-level per capita spending on both total social benefits and
49 the individual components were taken from Eurostat (2018a). Social benefits covered payments for
50 people with disabilities, families and children, old age, housing, sickness and healthcare, social
51 exclusion, and unemployment (see Supplementary Material for a summary). Social benefit *values*

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

6
7 Age and age squared^{iv}, gender, household composition, equivalised within-country income quartile,
8 housing tenure, employment status, education, urban-rural locality, and disability status were
9 included as covariates. Each of these characteristics have been associated with food insecurity in
10 previous research (Olson *et al.*, 2004; Gorton, Bullen and Mhurchu, 2010; Carter, Dubois and
11 Tremblay, 2014; Neter *et al.*, 2014; Nielsen, Lund and Holm, 2015). These variables were included
12 both for substantive reasons and to control for demographic differences between countries, thereby
13 facilitating comparative analyses. Including a wide range of covariates also helps mitigate concerns
14 over the possible impact of the dependent variable problem, where the concentration of social
15 benefits among the most disadvantaged members of society could identify counterintuitive roles of
16 social benefits (Vilar-Compte *et al.*, 2015). Controlling for a wide range of relevant individual
17 characteristics thus provides the strongest possible assessment of social benefit *receipt* and *value*
18 among equivalent client groups. The national unemployment rate and GDP per capita were likewise
19 included to account for underlying changes in macroeconomic circumstances over time.

20 21 *Methods*

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

32
33 Logistic multilevel (random intercept) models were estimated in which individuals (level 1) were
34 nested within countries (level 2). Although the data relate to two time points, the EQLS is a repeated
35 cross-sectional sample, not a panel sample, so it was not possible to cluster within both country and
36 year. Instead, random effects of survey year were included at the country level, allowing changes in
37 food insecurity prevalence over time to vary between countries. This specification is important to
38 the time period under question, in which policy responses to the global financial crisis varied
39 substantially between countries.

40
41 The use of multilevel models in European research has been subject to some debate, as the small
42 number of countries can produce unreliable estimates of country effects, particularly for logistic
43 models (Schmidt-Catran and Fairbrother, 2016). All models were therefore fitted using Markov
44 Chain Monte Carlo estimation methods, which are more suitable in these circumstances (Bryan and
45 Jenkins, 2016; Browne, 2017). All models were specified to have a burn-in period of 1,000 iterations
46 and a monitoring period of 50,000 iterations. Model fit was assessed using the Deviance Information
47 Criterion, which accounts for model complexity. All analyses were undertaken using Stata 13,
48 MLwiN, and runmlwin software (Rasbash *et al.*, 2009; Leckie and Charlton, 2012; StataCorp, 2013).

1 Results

2 *Descriptive statistics*

3 The prevalence of food insecurity increased significantly from 9.4 per cent in 2007 to 12.2 per cent in
4 2011, and was substantially higher in Eastern Europe, Cyprus, and Greece (Figure 1). Overall, food
5 insecurity rose in 23 countries and declined in only four^v. These figures are broadly consistent with
6 EU-SILC data from 2007 and 2011, and with UN figures from 2014 (FAO 2016).

7

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

12

13 *Multilevel models*

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

27

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

37

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

44

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

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

3
4 The variance components replicate the substantive patterns seen in Table 2, where food insecurity
5 varied significantly between countries (intercept variance) and over time (slope variance), but there
6 was no association between countries' baseline and changing prevalence of food insecurity over
7 time. Accounting for benefit *receipt* made very little difference to the intercept and slope variances,
8 and to the VPC figure, suggesting that benefit *receipt* has limited relevance to the country-level
9 prevalence of food insecurity.

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

23
24 The previously identified economic and demographic risk factors for food insecurity were broadly
25 replicated in these models (see Supplementary Material). However, some differences were apparent
26 when examining out-of-work benefits, where the greater prevalence of food insecurity among
27 women, lone-parent families, and people with less education lost statistical significance after
28 accounting for the *value* of out-of-work benefits, while an elevated risk of food insecurity emerged
29 for students. The reasons for these changes among out-of-work benefit recipients only are not
30 immediately clear, but suggest the existence of specific vulnerabilities among this client group that
31 warrant further detailed investigation.

32
33 In each of the models included in Table 4, the country-level (intercept) variance denoted significant
34 variation in food insecurity prevalence between countries, demonstrating that variation in social
35 benefit generosity did not eliminate country-level differences in the prevalence of food insecurity
36 across Europe. The slope variance was significant when examining *receipt* of pensions, child benefit,
37 and all benefits, but not out-of-work benefits. Countries thus generally displayed increasing variation
38 in food insecurity prevalence over time, which may reflect diversifying social policies over this
39 period. Across all models, the nonsignificant intercept-slope covariance again suggests no
40 association between countries' baseline and changing prevalence of food insecurity over time.

41
42 The VPC values identify between 60 and 70 per cent of variance in food insecurity between benefit
43 recipients as reflecting individual factors. As social benefit *values* are operationalised at the country
44 level, this finding suggests either that variation in social benefit generosity has only limited relevance
45 to the prevalence of food insecurity, or that individual differences between recipients (which may
46 reflect eligibility rules and benefit coverage) are more relevant to food insecurity.

47
48

1 Discussion

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

8 9 *Key findings and implications*

10 The first research question examined the economic and demographic risk factors of food insecurity
11 in Europe. Food insecurity was more prevalent among economically disadvantaged groups (whether
12 measured by income, housing tenure, education, or employment status), women, older people, one-
13 person households, lone-parent households, and people with disabilities. These associations all
14 remained after accounting for underlying macroeconomic circumstances. These patterns replicate
15 those identified in the US and Canada alongside emerging European evidence (Alvares and Amaral,
16 2014; Bocquier *et al.*, 2015), and suggest that despite considerable economic and social differences
17 between settings, the large body of US and Canadian research evidence on food insecurity has
18 relevance to Europe.

19
20 The second research question considered whether social benefit *receipt* is associated with lower
21 risks of food insecurity. Equivocal associations between social benefit *receipt* and food insecurity
22 were identified. Perhaps unexpectedly, food insecurity was significantly more prevalent among out-
23 of-work benefit recipients and all social benefit recipients, but was not associated with pension or
24 child benefit *receipt*. The immediate interpretation is that the *value* of social benefits are insufficient
25 to protect recipients from food insecurity. This finding may alternatively reflect differential benefit
26 coverage, where pensions and child benefit are commonly universally received by relevant groups.
27 Conversely, out-of-work benefits are typically targeted, such that recipients may be particularly
28 disadvantaged (Vilar-Compte *et al.*, 2015). Likewise, those not receiving social benefits may be
29 especially disadvantaged if their status reflects delays in receiving payments or welfare
30 conditionality, experiences that are associated both with food insecurity severity (Prayogo *et al.*,
31 2017) and foodbank use (Loopstra *et al.*, 2018).

32
33 The third research question asked whether higher-*value* social benefits are associated with lower
34 risks of food insecurity among recipients. Higher-*value* social benefits were unexpectedly not
35 associated with lower risks of food insecurity among all recipients, and higher-*value* spending on
36 relevant components was not associated with lower risks of food insecurity for the different
37 recipient groups. The underlying reasons are not immediately clear, especially in light of recent
38 European research reporting protective roles of higher-*value* social benefits on food insecurity
39 (Loopstra *et al.*, 2016; Reeves, Loopstra and Stuckler, 2017). This discrepancy may instead reflect
40 differences in methodological approaches, where past research has comprised country-level
41 ecological analyses that did not control for individual characteristics, meaning that higher-*value*
42 social benefits may confer lower risks of food insecurity through mechanisms other than by directly
43 increasing the material resources available to benefit recipients. In contrast, the use of multilevel
44 models in the current study enabled a more direct and tightly-controlled assessment of the
45 association between social benefit *value* and food insecurity among recipients.

46
47 The limited role for social benefits (both their *receipt* and *value*) in protecting against food insecurity
48 has two potential interpretations. First, the *value* of social benefits available in Europe during this
49 period was too low for respondents to afford a nutritionally adequate diet, and second, that social
50 benefits are unable to fully mitigate the individual risk factors for food insecurity, regardless of their
51 *value*. Attesting to the first possibility, the elevated risk of food insecurity for unemployed people –

1 after accounting for social benefit *receipt* and *value* – suggests that out-of-work benefits do not full
2 compensate for loss of wages. Indeed, Loopstra *et al.* (2016) reported that when social benefits
3 were below \$10,000 per capita, rising unemployment and falling wages led to increased food
4 insecurity in Europe. In this scenario, benefits such as food stamps (which are widespread in the US
5 and Canada) may be valuable in providing more targeted support for food provisioning.
6 Alternatively, individual and structural risk factors could outweigh any protective role of higher-
7 *value* social benefits if food insecurity is determined by wider factors than material resources alone.
8 US evidence linking food insecurity with adverse life experiences and trauma demonstrates that
9 material resources alone may be insufficient to protect vulnerable groups from food insecurity
10 (Chilton *et al.*, 2015). Instead, wider-ranging social policies across domains including education,
11 employment and mental health may be needed.
12

13 *Income and food insecurity*

14 Replicating past research, the strongest correlate of food insecurity was household income quartile,
15 and this association held for 22 of 27 countries^{vi}. The income variable was calculated within each
16 country, so represents a relative measure of low income. The relevance of relative low incomes to
17 food insecurity across countries with different absolute income levels demonstrates that food
18 insecurity is not a simple consequence of incomes below subsistence level or extreme poverty.
19 Consistent with past evidence for imperfect associations between low incomes and both food
20 insecurity (Rose, 1999; Olabiyi and McIntyre, 2014) and material deprivation (Bradshaw and Finch,
21 2003), there was moderate correspondence between income and food insecurity: 23 per cent of the
22 lowest income quartile reported food insecurity, while 37 per cent of food insecure respondents
23 were in the lowest income quartile. This asymmetric correspondence is unsurprising: the inability to
24 afford adequate food necessarily reflects constrained resources, while food insecurity is not
25 inevitable for people with limited resources.
26

27 Several dynamics could account for the greater sensitivity of food insecurity than income. In light of
28 the clear policy objective to reduce food insecurity through sufficient incomes, these dynamics are
29 worth considering. Substantively, food is a more flexible part of household budgets than other
30 spending commitments such as housing and transport (Dowler, 2001), thus the risk of food
31 insecurity is not limited to the lowest-income groups. If made widely available, benefits such as food
32 stamps that are specifically targeted to food provisioning could be valuable in reducing food
33 insecurity for both the lowest-income groups and those further up the income spectrum.
34

35 Furthermore, the skills, knowledge, physical capacity and time investments entailed in food
36 provisioning will influence the strength of relationships between income and food insecurity (Borch
37 and Kjærnes, 2016; Beagan, Chapman and Power, 2018). Indeed, the elevated risk of food insecurity
38 among lone-parent households and people with disabilities identified here and in previous research
39 could reflect more constrained opportunities to protect food consumption among these groups
40 (O'Connell *et al.*, 2018). Policies that widen the availability of affordable childcare and social care
41 provision for people with disabilities could prove valuable in mitigating the greater risk of food
42 insecurity in these groups.
43

44 The availability of wider supplementary resources may also be relevant: low-income households
45 who are able to draw on informal support, sale or exchange of goods, savings, and illegal activity
46 may be comparatively protected from food insecurity (Elam, Ritchie and Hulasi, 2000). Furthermore,
47 evidence that both food insecurity and material deprivation are more closely associated with
48 persistent than current poverty (Whelan, Layte and Maitre, 2003; Iceland and Bauman, 2007)
49 demonstrates the importance of income dynamics that are not easily captured in survey data. When
50 designing social benefits, accounting for the persistence of poverty and offering additional support
51 for persistent poverty could be valuable in protecting against food insecurity.
52

1 *Future research directions*

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

12
13 Additional risk factors for food insecurity also merit further attention. It was not possible to control
14 for immigration or citizenship status and the sample excluded migrants with less than six months'
15 residence. These characteristics may however be influential in light of the influx of Middle Eastern
16 and African refugees to Europe during the survey period. Likewise, it was not possible to account for
17 the costs of childcare and social care for older people, thereby over-stating the disposable incomes
18 of certain family types. The consistently elevated risk of food insecurity among lone-parent families
19 and older people supports this possibility. Further characteristics worth exploring in future research
20 include persistent poverty (Whelan, Layte and Maitre, 2003), and adverse life events and financial
21 strain (Prayogo *et al.*, 2017).

22
23 At the macro level, further consideration is needed of welfare conditionality and its impact on the
24 relationship between social benefit *receipt* and food insecurity. As noted, associations between
25 social benefit *receipt* and food insecurity can be difficult to interpret as respondents not receiving
26 social benefits may have been affected by conditionality rules in which social assistance receipt is
27 contingent upon activities such as job search behaviour. Ecological evidence linking benefit sanctions
28 to greater UK foodbank use (Loopstra *et al.*, 2018) suggests that conditionality increases the risk of
29 food insecurity and could thus complicate the association between social benefit *receipt* and food
30 insecurity explored here. In comparative analyses, greater conditionality is anticipated to weaken
31 any associations between social benefit *receipt* and food insecurity. This possibility merits further
32 dedicated research attention.

33 34 *Strengths and limitations*

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

48
49 Second, the study directly examined the associations between social benefits and food insecurity
50 using data on both the *value* and *receipt* of this provision. Some previous research relies on
51 indicators of welfare state regime, which do not directly explore social benefit spending (Davis and

1 Baumberg Geiger, 2017), while more detailed analyses appear to rest on the assumption that social
2 benefits exerts protective effects via benefit *receipt*, without testing this mechanism using
3 individual-level data (Loopstra *et al.*, 2016). By considering the associations between food insecurity
4 and the *value* and *receipt* of social benefits, the current study provides the first direct assessment of
5 the combined micro- and macro-level roles of social benefits on food insecurity.
6

7 The study's main limitation is the reliance upon a single measure of the affordability of meat or fish
8 to assess food insecurity. Food insecurity would ideally be determined using the multidimensional
9 instruments used in the US and Canada, which capture a wide range of food concerns and
10 restrictions, and their duration. Such measures are absent from European datasets, and their
11 inclusion in future surveys should receive serious consideration. Statistically, the measure used here
12 is probably less sensitive to marginal food insecurity – such as compromises over food quality which
13 precede more significant changes in purchasing (O'Connell *et al.*, 2018) – than multidimensional
14 measures, so estimates may consequently under-state the scale of food insecurity. Nonetheless,
15 economising on food typically includes reducing meat consumption (Griffith, O'Connell and Smith,
16 2015), and the current measure is included in material deprivation indicators in Europe (Carney and
17 Maître, 2012; Eurostat, 2018b). It is also correlated with multidimensional food insecurity (Bocquier
18 *et al.*, 2015), and affordability (Davis and Baumberg Geiger, 2017), demonstrating its financial basis.
19 Furthermore, the correlates of food insecurity identified here replicate those obtained using
20 detailed multidimensional indicators used by the UN, and to monitor food insecurity in the US and
21 Canada. Such correspondence provides initial evidence that the current analyses did adequately
22 identify people experiencing food insecurity, although further work comparing the correspondence
23 between single and multidimensional measures would nonetheless be valuable.
24

25 *Conclusions*

26 This study provided the first empirical identification of the demographic groups most at risk of food
27 insecurity in Europe in 2007 and 2011; these groups are broadly consistent with those identified in
28 the US and Canada. It established an equivocal role of social benefit *receipt*: people receiving out-of-
29 work benefits and any social benefits were significantly more likely to report food insecurity, which
30 may reflect benefit conditionality. Furthermore, higher-*value* social benefits were not associated
31 with lower risks of food insecurity across the different recipient groups. Social benefits therefore
32 appeared unable to fully mitigate the individual risk factors for food insecurity, perhaps because
33 their value is too low, or because wider individual and structural risk factors outweigh an otherwise
34 protective role. The topic of food insecurity has received limited research attention in Sociology, yet
35 it signals the existence of severe material deprivation, health inequalities, and social stratification
36 across Europe.
37
38

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9

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, 2007ⁱ

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

Tertiary (advanced level)			1.000 (.)	1.000 (.)
Employed			1.000 (.)	1.000 (.)
Unemployed			2.097*** (0.109)	2.094*** (0.108)
Unable to work			1.681*** (0.132)	1.679*** (0.134)
Retired			1.245*** (0.067)	1.245*** (0.067)
Homemaker			1.190** (0.076)	1.188** (0.076)
Student			0.935 (0.089)	0.933 (0.088)
Other			1.280* (0.145)	1.280* (0.145)
Urban location			1.000 (.)	1.000 (.)
Rural location			0.969 (0.029)	0.968 (0.029)
No disability			1.000 (.)	1.000 (.)
Has a disability			1.538*** (0.051)	1.539*** (0.052)
GDP per capita				1.000*** (0.000)
Unemployment rate				1.036 (0.020)
<i>Variance components (level 2)</i>				
Intercept variance	6.309*** (3.510)	6.390*** (3.574)	8.506*** (5.383)	1.938** (0.408)
Slope variance	1.317** (0.120)	1.328** (0.123)	1.351** (0.132)	1.282** (0.106)
Intercept–slope covariance	0.765 (0.134)	0.759 (0.133)	0.787 (0.148)	0.871 (0.087)
Variance partition coefficient (%)	39.8	41.2	43.6	16.7
<i>Goodness of fit</i>				
DIC	37,947.14	37,471.12	33,833.29	33,833.2
<i>n</i>				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
<i>Regression coefficients (exponentiated coefficients, standard errors)</i>				
Intercept	0.033*** (0.011)	0.034*** (0.015)	0.029*** (0.010)	0.036*** (0.019)
2007	1.000 (.)	1.000 (.)	1.000 (.)	1.000 (.)
2011	1.215 (0.165)	1.231 (0.181)	1.268* (0.153)	1.254 (0.169)
GDP per capita	1.000*** (0.000)	1.000*** (0.000)	1.000*** (0.000)	1.000*** (0.000)
Unemployment rate	1.032 (0.025)	1.027 (0.028)	1.023 (0.021)	1.022 (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)
<i>Variance components (level 2)</i>				
Intercept variance	1.922** (0.394)	1.967** (0.430)	1.937** (0.407)	2.000** (0.464)
Slope variance	1.286** (0.107)	1.291** (0.112)	1.281** (0.105)	1.291** (0.112)
Intercept–slope covariance	0.877 (0.087)	0.870 (0.089)	0.873 (0.087)	0.865 (0.091)
Variance partition coefficient (%)	16.6	17.1	16.7	17.4
<i>Goodness of fit</i>				
DIC	33,827	33,833	33,832	33,785
<i>n</i>				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
<i>Regression coefficients (exponentiated coefficients, standard errors)</i>						
Intercept	0.023*** (0.008)	0.028*** (0.013)	0.012*** (0.007)	0.022*** (0.018)	0.076*** (0.054)	0.059*** (0.042)
2007	1.000 (.)	1.000 (.)	1.000 (.)	1.000 (.)	1.000 (.)	1.000 (.)
2011	1.220 (0.164)	1.130 (0.151)	1.228 (0.200)	1.095 (0.184)	1.305* (0.171)	1.301 (0.179)
GDP per capita	1.000*** (0.000)	1.000*** (0.000)	1.000*** (0.000)	1.000*** (0.000)	1.000*** (0.000)	1.000*** (0.000)
Unemployment rate	1.020 (0.022)	1.033 (0.027)	1.015 (0.031)	1.020 (0.030)	1.026 (0.025)	1.025 (0.025)
Total spending	1.018 (0.817)					
Disability spending		0.332 (0.508)				1.786 (1.997)
Family spending		261.632** (506.430)		11.972* (11.914)		
Housing spending		0.663 (0.578)				
Old age spending		0.709 (0.572)	0.603 (0.402)			
Healthcare spending		0.189 (0.220)				
Social exclusion spending		3.235 (2.591)				
Unemployment spending		0.556 (0.405)			1.162 (0.776)	
<i>Variance components (level 2)</i>						
Intercept variance	2.048** (0.475)	1.610** (0.277)	1.988** (0.500)	1.552* (0.277)	1.814* (0.426)	1.846* (0.445)
Slope variance	1.235** (0.092)	1.258** (0.110)	1.282* (0.129)	1.373* (0.176)	1.177 (0.105)	1.177 (0.102)
Intercept–slope covariance	0.904 (0.090)	0.851 (0.078)	0.879 (0.108)	0.968 (0.109)	0.882 (0.103)	0.877 (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
<i>n</i>	42,732	42,732	26,236	14,461	8,806	8,806

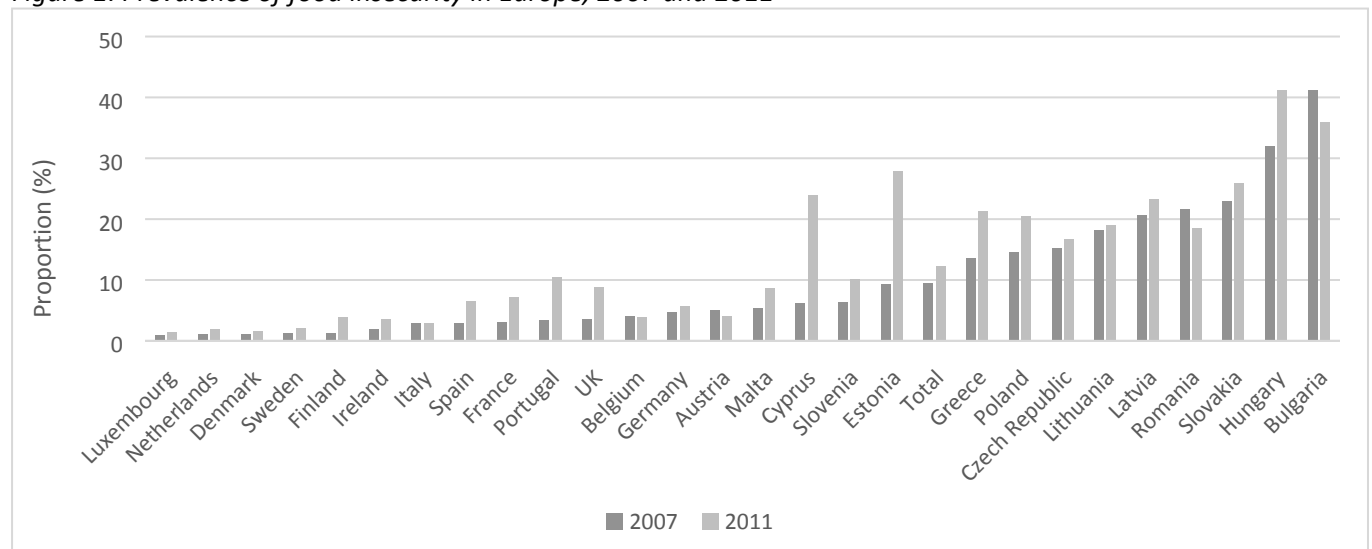
* $p < .05$, ** $p < .01$, *** $p < .001$. DIC = Deviance Information Criterion

† 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.