Food Insecurity Risk Indices for Neighbourhoods 2021

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The University of Southampton has updated its local food insecurity risk index with the latest published data at a smaller geographical scale than previously available (1). This new multi-dimensional index estimates the relative rank of food insecurity risk across local neighbourhoods in England. The index was developed for 32,844 Lower Super Output Areas (LSOAs) with populations between 1,000 to 3,000 people. All data are open-source and easily updated to enable detailed mapping of risk for local government resource planning for JSNAs. Maps and data by Local Authority are available for download at https://www.mylocalmap.org.uk/iaahealth/.
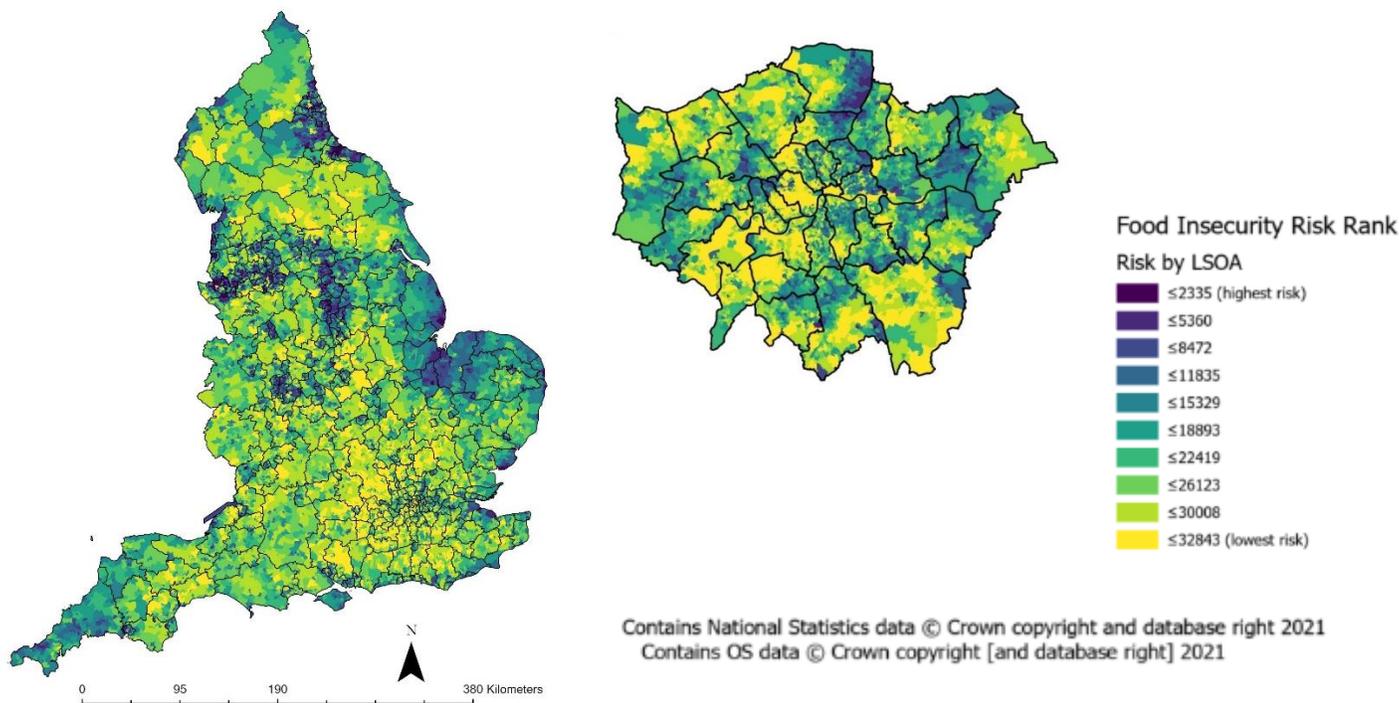
The variables selected for these updated indices were informed by interviews with stakeholders in local governments and food aid, asking them to reflect on previous maps of risk and their observations of households seeking support for food over the last several years. We assessed four approaches to estimating risk. The **Simple** Index illustrates food poverty risk based on benefits claimants and low-income at a household level and is well suited to estimating risk in urban areas. The **Complex** index incorporates two domains (see also Appendix for data details):

Simple index	Complex index	
	Compositional (50%)	Structural (50%)
Based on benefits claimants and low-income at a household level	Simple Index measures plus mental health and adult educational attainment[1]	Direct and indirect economic obstacles: bus stops, distances to employment and food stores and internet speeds[2]

'**Structural**' sources of food insecurity risk are particularly impactful in rural areas (2) and '**Compositional**' sources include direct and indirect economic obstacles, reflecting population characteristics within small areas. Using several indicators in the complex index reduces the bias that may be produced from considering only the economic dimension of food insecurity risk. The two domains were assessed independently and then combined to create a food insecurity risk measure for each LSOA, ranked relative to all other LSOAs.

Results

Figure 1: Food insecurity risk by LSOA, 2021, estimated using the Compositional domain for England and London

Food Insecurity Risk Rank
Risk by LSOA
- ≤2335 (highest risk)
- ≤5360
- ≤8472
- ≤11835
- ≤15329
- ≤18893
- ≤22419
- ≤26123
- ≤30008
- ≤32843 (lowest risk)

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Validation

Results were assessed for all of England and then by area classification as urban or rural to reflect differing barriers to food security in these settings. The Simple index is correlated well with the IMD 2019 (r_s=0.872). The Simple index also correlates well with the 2016 percentage of free school meal eligible pupils (r_s=0.812) and year 6 obesity rates (r_s=0.730), when ranked by small areas, both

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[1] Data compiled from the 2011 Census, 2020 DWP benefits data, 2019 IMD underlying data on mental health
[2] Data compiled from 2017 DfT, 2020 Ofcom

outcomes associated with food insecurity. The Complex food poverty index correlates moderately with the IMD 2019 (r_s=0.659) but when restricted to areas classified as rural, it is well correlated (r_s=0.754). Urban areas are less well correlated with the Complex index (r_s=0.716) but the Compositional domain for all areas (r_s=0.844) and for urban areas alone (r_s= 0.862) correlates very well with the IMD 2019. The Compositional domain demonstrates a strong correlation with free school meals (r_s=0.705) and obesity rates (r_s=0.641) in both urban and rural areas. Further validation and chi-squared analysis with Free School Meal uptake, childhood obesity prevalence and the 2019 IMD Income domain[3] indicates that the Simple index and Compositional Domain reflect food insecurity risk well.

Exploring the geography of risk, for the top decile of risk in the Compositional domain, 32.5% of the LSOAs were located in the North West region with 96% in urban areas. When comparing the two domains, Red LSOAs are in the top 10% most risk for both domains, while blue LSOAs are in the top 10% of risk for one domain but the lowest 10% for the other (Table 1).

Table 1 Ten most at risk LSOAs based on Rank, where 1=highest risk

Index rank	Simple	Complex	Urban		Rural	
			Compositional	Structural	Compositional	Structural
1	Middlesbrough 003F	Tendring 018A	Wirral 016E	East Lindsey 006B	Tendring 018A	Carlisle 001D
2	Blackburn with Darwen 006E	Wirral 016E	Wirral 011C	Forest Heath 003G	Wakefield 039D	Northumberland 019C
3	Wirral 016E	Wakefield 039D	Blackpool 006A	East Lindsey 006A	County Durham 025B	Northumberland 003B
4	Wirral 011C	East Lindsey 017D	Wirral 027C	East Cambridgeshire 004A	Allerdale 005B	Eden 002D
5	Birmingham 050B	Wirral 009A	Stockport 004B	Herefordshire 009B	County Durham 045F	Teignbridge 003C
6	Birmingham 121B	Scarborough 012B	Middlesbrough 007E	East Lindsey 012C	County Durham 059F	Northumberland 007D
7	Wigan 009C	Stockport 004D	Stockport 004D	East Lindsey 006C	Wigan 031A	Eden 001C
8	Kingston upon Hull 017E	Stockport 004B	Wirral 008C	Central Bedfordshire 007A	County Durham 051E	Herefordshire 020C
9	Wirral 008C	Knowsley 006B	Blackpool 010A	Tower Hamlets 025E	County Durham 051A	Allerdale 002D
10	Oldham 014B/Middlesbrough 011B	Cheshire West and Chester 040B	St. Helens 014D	East Hampshire 004A	County Durham 051D	Eden 006C

Interpretation

Final maps were shared with stakeholders across several local authorities in Wessex and the North of England to compare with food aid uptake and observations of demand, confirming that the Compositional domain provided an accurate estimate of risk in urban areas, with rural areas gaining further insight from the Structural domain. The importance of including data (such as mental health and qualifications) beyond immediate economic circumstances (Simple index) were highlighted in our interviews, which is reflected in the Compositional domain. The Complex index reveals that most areas are not in the highest decile of risk for both composition and Structural domains, however, poor access creates a double burden for households with economic disadvantage in rural locations. Rural areas should use both the composition and structural domains side-by-side to assess local issues of rural access. As a relative measure, the ranking of an LSOA is not an absolute measure of household risk but can be used to compare against the ranked conditions found in other LSOAs, particularly useful for illustrating areas at higher risk. Although the index is measured at the neighbourhood level, this area rank may not reflect the situation of every resident living in an LSOA.

Recommendations

- The updated food insecurity risk measures can be used to estimate household risk in small areas for England, for the purposes of prioritising interventions to address food insecurity, such as food pantries, holiday hunger activities (HAF) and in JSNAs.
- For most areas, the compositional domain reflects risk well and is the preferred option.
- In rural areas the structural domain can be explored alongside the compositional measure to understand additional barriers to food security.

1. Smith D, Thompson C, Harland K, Parker S, Shelton N. Identifying Populations and Areas at Greatest Risk of Household Food Insecurity in England. *Applied Geography*. 2018; **91**:21-31.
2. Burke A, Jones A. The Development of an Index of Rural Deprivation: A Case Study of Norfolk, England. *Social Science & Medicine*. 2019; **227**:93-103.

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[3] Using 2016 FSM data, 2017 NCMP obesity for year 6 prevalence

Appendix: Food Insecurity Index Domains and Indicators

Simple Domains	Simple Indicators	Complex Domains	Complex Indicators	Source
Benefits (50%)	Claimants of benefits, age 16-64 (%)	Household Composition (50%)	Claimants of benefits, age 16+ (%)	DWP 2020/21
	Claimants of benefits, age 65+ (%)			
Household Composition (50%)	Persons on low income and either living alone, or living in a household with dependent children, age 0-64 (%)		Persons on low income and either living alone, or living in a household with dependent children, all ages (%)	Census 2011
	Living alone, age 65+ (%)			
Complex Index Only			Persons with no educational qualifications, age 16+ (%)	Census 2011
			Mental ill health, composite	IMD 2019 Mood & Anxiety indicator
		Structural Risk (50%)	Minutes to nearest employment centre (size 100+ jobs) by public transport (bus, train, walking), age 16-74	Department for Transport 2017
			Median download speed Mbit/s by connections in an area	Ofcom Fixed performance data 2020
			Bus stops per km^2 using LSOA area size from the ONS	National public transport access node (NaPTAN) 2020
			Distance (Euclidean km) to medium and large grocery stores (1,400m^2+)	Geolytix Retail Points 2021