Using Statistical Modelling and Geographic Data to Challenge Declinist Headlines - a Case Study of Fish and Chip Shops in Great Britain

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26th April, 2026

Abstract

The traditional fish and chip shop is an important part of the food environment in many UK neighbourhoods. However, rising costs, changing tastes and competition have resulted in fish and chip shop closures, with some alarmist predictions that up to half of all shops could close in a single year. Using Points of Interest data and multilevel modelling, we look beyond the headlines and model trends in fish and chip shop provision by neighbourhood type between 2022 and 2025. We identify an overall decline in the number of shops yet find no evidence to support the predictions of widespread closures. However, closures have been unevenly spread across neighbourhood types, with the greatest decline in deprived and ethnically diverse urban areas, and less impact on some more affluent neighbourhoods with older populations. Although some adaption may be needed to maintain viable amidst rising costs, our findings suggest that the traditional fish and chip shop remains an important part of the food environment in many neighbourhoods. In conclusion, we highlight the importance of robust data driven insight when considering the changing provision of services and comment on how these approaches could be applied in other contexts.

Keywords Fish and Chip shops; Neighbourhoods; Cost of living; Closures; Adaptations; Great Britain.

1 Introduction

It may be controversial to say so, but the United Kingdom does not have a great culinary reputation. However, it does lay claim to the culinary delight of fish and chips, which vies with the Sunday roast and the English breakfast as its historic and favourite national dish. Typically associated with industrial heritage and cultural traditions (Pickering and Tanaka, 2025), fish and chip shops play an important role as an affordable part of the local food environment in many neighbourhoods. But sensationalist and alarmist headlines suggested that fish and chip shops in the UK are under threat, with up to half predicted to close within a single year (Sprenger et al, 2025), with rising prices for core ingredients, staffing and energy costs hitting the industry and consumers hard (Pegg-Darlison, 2024) (see figure 1).

Figure 1: A fish and chip shop 'BUSINESS FOR SALE' (source : authors)

Other forms of locally provided service are also the subject of similar headlines, including public houses and banks (Butler, 2025). Taking the case of fish and chips in a Great Britain context, we challenge these headlines using high spatial and temporal resolution data to identify the overall rate of closure. We also consider those trends in relation to neighbourhood type and explain how the same approach could be applied to unpick similarly sensationalist headlines in other international contexts, and for other types of locally provided service.

2 Literature

There are two claimants to being the first recognisable fish and chip shop in the UK, one is Mr Malin's in the East End of London who opened a fish and chip shop in 1860 (Becker, 2021), and the other is Mr Lees of Mossley in Manchester who opened a pea and trotters shop in 1863 and later added fish and chips to his menu (Walton, 1989). As a form of fast and cheap food fish and chip shops rapidly began to spread to working class areas in northern industrial towns (Walton, 1994), providing relatively good quality and affordable food (Schuima, 2022). Just 20 years after Mr Malin's shop opened, there were estimates of between 10,000 and 12,000 fried fish shops, increasing to 25,000 by the start of World War I (Panayi, 2014, p 37). In 1950, the first official count of fish and chip shops was conducted, revealing 17,216 (Panayi, 2014, p 62). This lower number may have represented a reduction due to bomb damage; a corrective to earlier estimates; or be a first indication that numbers were beginning to decline. By 2003 these estimates had halved to 8,600.

Using Points of Interest (PoI) data which we introduce below, Figure 2a illustrates the geographic distribution of fish and chip shops across neighbourhoods in England and Wales. This figure shows the ubiquity of such shops across neighbourhoods and communities, with clusters in some of the major cities and former industrial areas in the north of England, alongside evidence of higher provision in many coastal localities. Unlike other forms of hot food takeaway, the fish and chips sector is dominated by independent owner-run small businesses, situated within the neighbourhoods that they serve – with the National Federation of Fish Fryers acting as a advocacy organisation for the sector (National Federation of Fish Fryers, 2025).

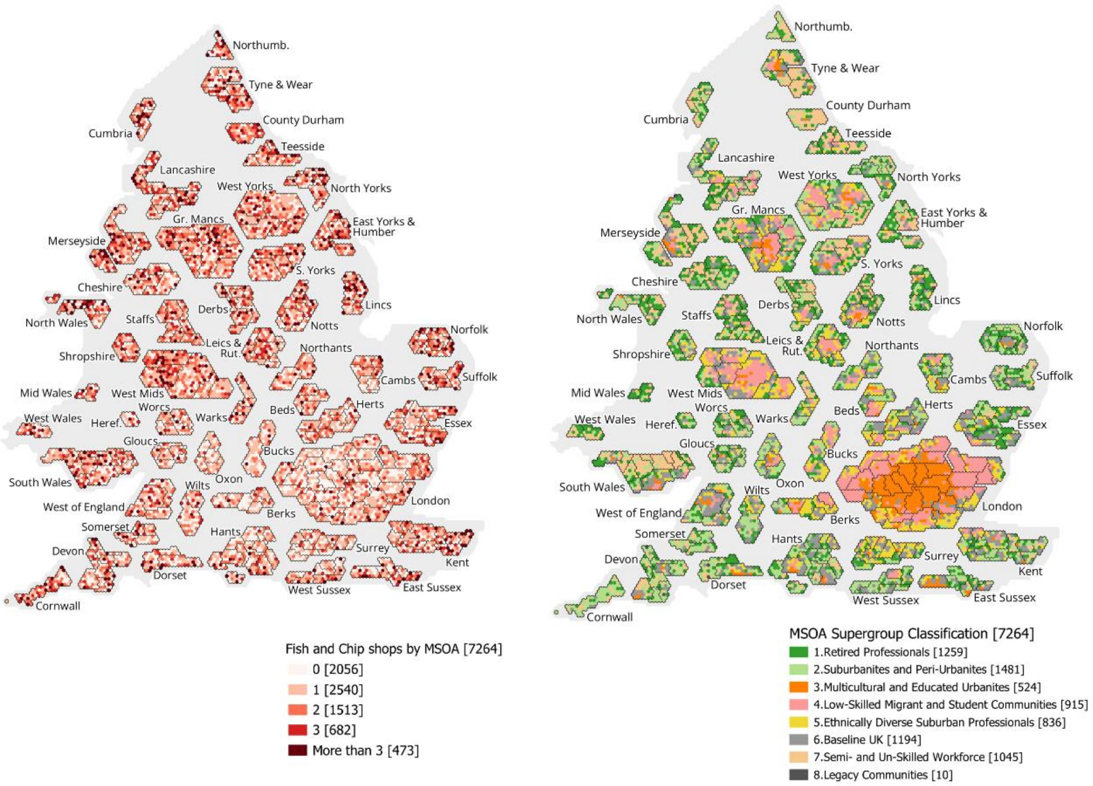

Figure 2: Distribution of fish and chip shops (2a) and the MSOA Supergroup (2b) for England and Wales (Scotland is omitted).

The place of fish and chips in the nation's consciousness has been long been debated, as typified by early coverage in newspapers (Levine-Clark, 2022) and more recent challenges of appropriateness for 'Britishness' (Hunter-Henin and Vincent, 2018). In more recent times, such is the significance of fish and chips that their impact on the nation's health has been studied (Albalawi, et al., 2020; Caraher and Lloyd, 2010; Lokuruka, 2019; Wrieden et al., 2016), particularly amongst the young in terms of both dietary and social well-being (Birch, et al., 2018; Burningham and Venn, 2022).. In the realm of politics, the fisheries sector had a dis-proportionate influence in the run up to the 2016 Brexit referendum in the UK (Billet, 2019). Indeed, subsequently correlates have been investigated between the density of fish and chip shops and the 2016 Brexit vote (Pickering and Tanaka, 2025) finding that constituencies with a higher number of shops showed significantly higher support for Brexit. The study also highlighted that food environments can act as proxies for neighbourhood characteristics such as deprivation, cultural identify and political sentiment, with these shops acting as a barometer of neighbourhood type and sentiment (Pickering and Tanaka, 2025).

3 Materials

For this study use is made of the Ordnance Survey (OS) PoI database (Ordnance Survey, 2025). Starting in October 2014, this database is compiled by the OS from a number of sources, with traditional fish and chip shops having their own designation (a pointx class of 1020020). Whilst similar PoI data are available, including Open Street Map (OSM) and Overture, their coverage and completeness varies by feature type and location (Ballantyne and Berragan, 2024). The OS PoI data have, however, been used in previous studies of the retail food environment and shown to have validity as a research database (Burgoine, et al., 2013; Wilkins et al., 2017; Libuy et al., 2023). However, one feature that the database has is the presence of duplicate entries, a result of having multiple sources for the same data. To help to identify and remove duplicates, an algorithm is applied. Firstly, fish and chip shops on the same street are identified and their straight-line proximity calculated. If there are two shops within 25m of each other and with similar names, then one of them is removed. To establish if the names are similar the Jaccard distance between the lower-case name strings is calculated (Doan et al., 2012), after the words 'fish' and 'chip' are removed[1]. If this distance is less than 0.5 then the names are assumed to be the same and one shop is removed. This process removes around 0.6% of entries early in the time series, but by June 2025 this rises to 3.4%. Once a finalised set of shop locations have been arrived at, they are geo-located to their 2021/22 Census Middle Super Output Areas/Intermediate Zones (MSOA/IZ) (Office for National Statistics, 2025). MSOA/IZs with no fish and chip shops are added into the data to provide a complete picture of the spatial distribution of shops.

To differentiate by type of neighbourhood a geodemographic classification of MSOA/IZ is used (Geographic Data Service, 2025). This classification is built using 2021/22 Census data for the United Kingdom and classifies neighbourhoods based on their commonality of socio-demographic traits (Wyszomierski et al., 2023). These traits include age structure, ethnicity, living arrangements and employment. The classification is hierarchical (see Figure 2b), and here we use the Group level, providing 21 neighbourhood types. Figure 3 shows the trend in the number of fish and chip shops by the MSOA/IZ classification. At the start of this series in 2014, there are 9,777 fish and chip shops, which peaks at 11,591 shops by quarter 1, 2022. For modelling purposes only three years of recent trend data, from June 2022 (11,488 shops) to June 2025 (10,959 shops) is used, this period corresponds to a post-COVID economy and includes a period of high inflation, which notably affected the cost of energy, food and drink.

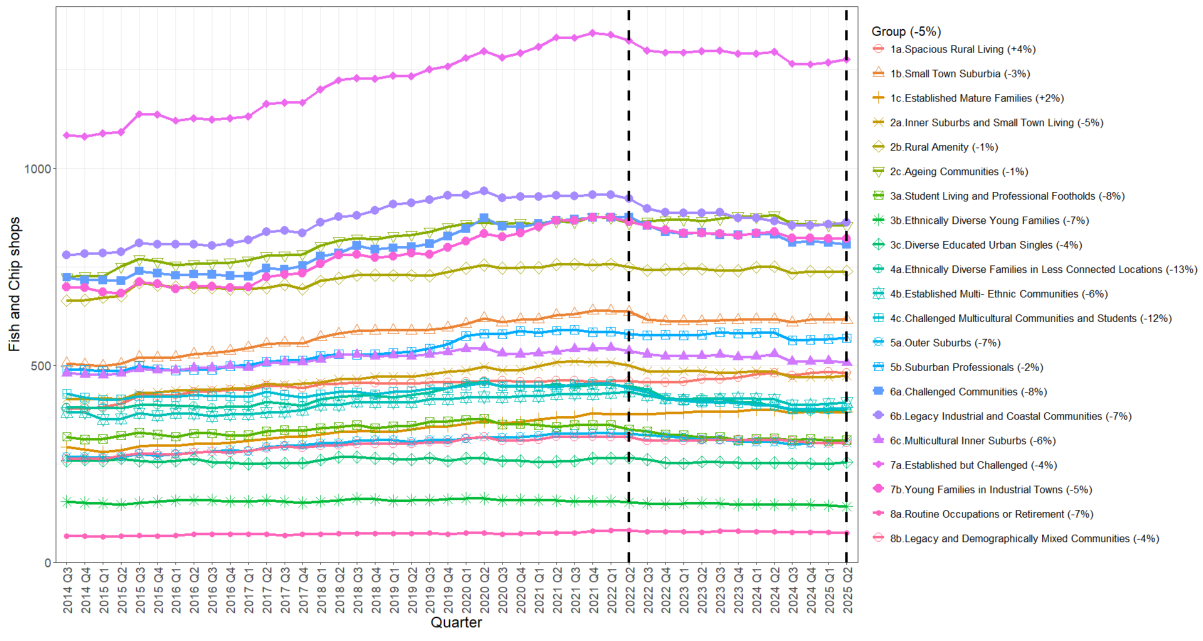

Figure 3: Trends in the number of fish and chip shops by MSOA/IZ Group

[1] These two 'noise' words are removed since they are arbitrarily used. For example the Jaccard distance between 'marina fish n chips' and 'marina' is 0.55, which is above the 0.50 distance threshold and incorrectly leads the algorithm to determine that these two nearby shops are not the same shop. However, the Jaccard distance between 'marina' and 'marina n s' is only 0.29 which is below the 0.5 threshold and correctly leads the algorithm to say these are the same shop, only one of which will be included.

4 Methods

To estimate the trends in these data by the MOSAO/IZ classification, a multi-level modelling approach is used with level 1 being the time of the year (quarter) and level 2 being the neighbourhood type (Gelman & Hill, 2006). The model is fitted with random intercepts and slopes to reflect the variation in the number, and changes in the number, of fish and chip shops within each neighbourhood. An interaction of time and the classification is used to measure trends within the Group. This formulation allows for the estimation of an overall Group level time trend effect.

This formulation is expressed in the following equation.

$$y_i = \alpha_{[i]} + \beta_{1[i]}T + \beta_{2,j}G + \beta_{3,j}T * G + \varepsilon_i \tag{1}$$

Where y_i is the number of fish and chip shops in MSOA/IZ i;
T is time 0, 1, 2,…, 30, 31 (scaled to 0…1);
G is the Group classification of area i;
$\alpha_{[i]}$ is the random intercept for area i;.
$\beta_{1[i]}$ is the random time trend (slope) for area i;
$\beta_{2,j}$ is the fixed effect of classification Group j membership;
$\beta_{3,j}$ is the fixed effect of the interaction of time and classification Group j membership;
ε_i is a residual error term.

The model is fitted using the lme4 package in R (Bates, Mächler, Bolker, & Walker, 2015).

The time trend parameter estimates from equation (1) measure the reduction in the number of fish and chip shops in each neighbourhood, over a three-year time period. The estimate for the time trend by Group j is calculated as:

$$\beta_j = \beta_1 + \beta_{3,j}$$

Where β_1 is the fixed effect for time;

$\beta_{3,j}$ is the fixed effect interaction of time and Group j

The standard error is calculated using the formula:

$$se(\beta_j) = \sqrt{var(\beta_1) + 2covar(\beta_1, \beta_{3,j}) + var(\beta_{3,j})}$$

5 Results

The estimates from model (1) are shown in Table 1. From Table 1 it is clear that fish and chip shops are most commonly found in '*6b.Legacy Industrial and Coastal Communities*' (a mean of 2.68 shops in each MSOA) and additionally, Groups within the Supergroups of '*4.Low-Skilled Migrant and Student Communities*', '*6.Baseline UK*' and '*7.Semi- and Un-Skilled Workforce*' all have high densities of shops. Shops are least common in '*1c.Established Mature Families neighbourhoods*' (0.74) and are also not at all common in other Groups within this same '*1.Retired Professionals*' Supergroup and in the '*3.Multicultural and Educated Urbanites*' and '*5.Ethnically Diverse Suburban Professionals*' Supergroups.

Only one Group '*1a.Spacious Rural Living*' shows a significant increase in fish and chip shops over these three years, with an average of a 0.05 increase over three years (equivalent to one additional shop amongst 20 such neighbourhoods in 3 years, or one shop in 60 neighbourhoods annually). The remaining significant trends are all negative, with the largest being for '*4a.Ethnically Diverse Families in Less Connected Locations*' with an equivalent to an annual loss of one shop amongst 16 such neighbourhoods. In the same Supergroup, the Group '*4c.Challenged Multicultural Communities and Students*' also shows an annual reduction of a similar magnitude (one shop amongst 18 neighbourhoods). Outside this Supergroup, the Group with the largest density of shops, '*6b.Legacy Industrial and Coastal Communities*', shows a large annual reduction of one shop amongst 17 such neighbourhoods.

6 Discussion

Whilst we are seeing almost consistent reductions in the number of fish and chip shops in Great Britain, the rate of reduction is not uniform, and is difficult to reconcile with some recent declinists predictions. In particular, the source and justification for the headline of a 50% reduction in shops in the next year has been difficult to locate. The closest we have come is a 'Fryday' campaign by the vinegar company Sarsons in 2023 which predicted a 50% reduction within three years (Simone, 2023). Our analysis shows a more modest 5% reduction over a similar period.

This is not to say that some types of neighbourhoods have not seen significant reductions. Two of the neighbourhoods with the largest decreases are typified by their multi-cultural and ethnic composition, high deprivation, and in urban locations. The Group '*4a.Ethnically Diverse Families in Less Connected Locations*' is estimated to have the greatest reduction, and is typified as being located in outer London and in major towns and cities, with Africa being a common place of birth, and with a concomitant Black ethnic identity. The population is also generally young and works in 'lower-status' occupations. It is also one of the more deprived groups. Its sister Group of '*4c.Challenged Multicultural Communities and Students*' shares some these traits (including deprivation), but this time the ethnic mix is predominately South Asian, and with people living in terraced properties. Geographically such neighbourhoods are to be found in east London and the major cities of the Midlands and northern England. Looking at potential reasons for these declines, the most noticeable factors are the ethnic mix of the neighbourhoods and their deprivation. This ethnic dimension is interesting since historically minority ethnic groups have played a key role in the development of fish and chip shops, from the early Jewish pioneers, the Italian immigrants in central Scotland, and recent Chinese participation. So, whilst fish and Chips are enjoyed by all ethnicities, in modern times there looks to be a greater tendency or imperative for existing traditional fish and chip shops in such neighbourhoods to extend or innovate their offerings to either cater for local tastes or to mitigate cost increases (Boland, 2022). A result of this may be a change in the designation of the outlet in the PoI away from the traditional fish and chip shop classification to a more general fast food classification. Thus, the business may still operate but not as a traditional fish and chip shop. Indeed, this pivot to offer consumers new and different options is one of the Seafish organisation's recommendations to help shops stay viable (Pegg-Darlison, 2024).

The other Group with an estimated large reduction in fish and chip shops is '*6b.Legacy Industrial and Coastal Communities*'. These types of neighbourhoods could be regarded as the home of the traditional fish and chip shop, with a high density of shops, driven either by cultural history or by leisure pursuits. In such locations competition between shops is likely to be high and they may therefore not be able to fully pass on the increased cost of fish, potatoes, cooking oil and energy to customers. Additionally, whilst the level of deprivation in these neighbourhoods is only moderate, lack of household income may also prevent shops in these locations from raising their prices. Both these dynamics would affect the financial viability of such shops and could lead to closures.

Supergroup	Group (mean IMD rank in England)	2025 IMD†	MSOA /IZ (Count)	Fish and Chip shops (June 2025)	Fish and Chip Shops per MOSA/IZ	Time Trend	SE(Time Trend)	t(Time Trend)	# areas for one annual gain/loss
1.Retired Professionals	1a.Spacious Rural Living	20,908	577	480	0.83	**0.0505**	**0.0250**	**2.02**	+59
	1b.Small Town Suburbia	24,412	562	615	1.09	-0.0121	0.0253	-0.48	-248
	1c.Established Mature Families	28,189	514	382	0.74	0.0119	0.0265	0.45	+251
2.Suburbanites and Peri-Urbanites	2a.Inner Suburbs and Small Town Living	20,909	345	474	1.37	**-0.0638**	**0.0323**	**-1.98**	-47
	2b.Rural Amenity	19,601	795	739	0.93	-0.0096	0.0213	-0.45	-312
	2c.Ageing Communities	21,014	503	854	1.70	-0.0169	0.0268	-0.63	-177
3.Multicultural and Educated Urbanites	3a.Student Living and Professional Footholds	15,902	219	310	1.42	**-0.1147**	**0.0406**	**-2.83**	-26
	3b.Ethnically Diverse Young Families	8,678	160	142	0.89	-0.0515	0.0474	-1.09	-58
	3c.Diverse Educated Urban Singles	18,216	276	254	0.92	-0.0327	0.0361	-0.91	-92
4.Low-Skilled Migrant and Student Communities	4a.Ethnically Diverse Families in Less Connected Locations	6,258	312	389	1.25	**-0.1851**	**0.0340**	**-5.45**	-16
	4b.Established Multi-Ethnic Communities	12,129	333	405	1.22	**-0.0745**	**0.0329**	**-2.26**	-40
	4c.Challenged Multicultural Communities and Students	5,285	275	391	1.42	**-0.1688**	**0.0362**	**-4.66**	-18
5.Ethnically Diverse Suburban Professionals	5a.Outer Suburbs	26,121	317	304	0.96	**-0.0786**	**0.0337**	**-2.33**	-38
	5b.Suburban Professionals	23,723	559	569	1.02	-0.0230	0.0254	-0.91	-130
6.Baseline UK	6a.Challenged Communities	9,426	552	806	1.46	**-0.0963**	**0.0255**	**-3.77**	-31
	6b.Legacy Industrial and Coastal Communities	12,819	322	862	2.68	**-0.1743**	**0.0334**	**-5.21**	-17
	6c.Multicultural Inner Suburbs	20,349	350	507	1.45	**-0.0667**	**0.0321**	**-2.08**	-45
7.Semi- and Un-Skilled Workforce	7a.Established but Challenged	9,496	818	1,276	1.56	**-0.0526**	**0.0210**	**-2.51**	-57
	7b.Young Families in Industrial Towns	9,272	504	821	1.63	**-0.0708**	**0.0267**	**-2.65**	-42
8.Legacy Communities	8a.Routine Occupations or Retirement	5,641	65	75	1.15	-0.0599	0.0744	-0.80	-50
	8b.Legacy and Demographically Mixed Communities	9,689	240	304	1.27	-0.0382	0.0387	-0.99	-79
TOTAL			8,598	10,959	1.27				

Table 1: Counts of MSOA/IZs, Fish and Chip shops and model time trend estimates (5%, two-tailed, significant trends shown in **bold**).

† A mean rank of multiple deprivation for OAs in England only, with ranks ranging from 1 the most deprived, to 33,755 the least deprived (Ministry of Housing, Communities and Local Government, 2025).

The Groups that show the more modest reductions in shops are less deprived in character. The Groups within the Supergroup '*1.Retired Professionals*' are perhaps the least deprived and least culturally diverse, and on the whole, are the least impacted of all Groups. Households located in such neighbourhoods are more able to absorb any increases in prices and culinary tastes may be more traditional. The nature of the shops in such locations may also have an impact on the viability of the shop, with an opportunity to offer 'premium' services such as dine-in, although this is difficult to test with these data.

The Seafish organisation proposes some additional measures that shops can adopt to help it to continue to trade (Pegg-Darlison, 2024). These include targeting younger consumers; encourage the purchase of fish and chips outside the traditional Friday and Saturday; implement loyalty schemes; and offer an on-line option for both purchases and home delivery. Their top measure however is to offer value for money, and the significance of this is seen in these results, where deprivation, and associated lack of income, does appear to signal greater reductions in the number of shops. These savings be achieved by switching to cheaper species of fish; adjusting the prices of the non-core menu items; or re-considering what opening hours are best for the business.

7 Limitations

The modelling undertaken here is based on three years' worth of recent data, capturing a post-COVID-19 period. However, figure 3, provides the longer term trends in fish and chip shop provision across neighbourhoods and shows evidence of a slight upturn in the number shops in some neighbourhoods in the latter part of 2020 and throughout 2021. During these years, households exhibited a tendency to holiday in the UK (the 'staycation' due to international travel restrictions). With this increase in visitor numbers, many coastal resorts witnessed a boom in tourism and associated spending on food and drink, which may have led to a short-term growth in fish and chip shops in the period immediately prior to our analysis.

The issue of diversification for traditional fish and Chips shops has not been directly studied here. However, using the longitudinal nature of the PoI it may be possible to use address information to track the designation of the same retail unit over time and quantify this diversification away from fish and chip shops to fast food outlets. So, whilst many of the communities featured above have lost their local neighbourhood fish and chip shop, they may have retained access to fish and chips and other hot food takeaway options.

Similarly, and in keeping with trends across the takeaway food sector, a number of fish and chip shops have joined food ordering and delivery platforms such as Just Eat and Deliveroo. Whilst there are several studies which have considered neighbourhood-level access to food via online delivery platforms (e.g. see Keeble, Adams and Burgoine, 2023), we have not been able to consider provision of fish and chips via online delivery platforms in this study.

8 Conclusions

Whilst evidencing a decline in the provision of fish and chip shops in some neighbourhood types, our analysis does not support the extreme 'declinists' predictions of widespread closures. Our analysis suggests that just 5% of fish and chip shops operating in June 2022 had closed by June 2025, far less than the media predictions that 50% of these shops would close within a single year. Our modelling suggests that closures are more likely in deprived urban neighbourhoods, especially those that are more ethnically diverse. This may reflect changing tastes, competition from/diversification into alternative takeaway food sources and cost-of-living pressures. In many neighbourhoods the traditional fish and chip shop is still going strong. Whilst some adaptation may be needed to maintain viability, fish and chips remain an important part of the food environment across many UK neighbourhoods. In this article we have shown that only through robust modelling using high spatial and temporal resolution data can we fully understand the decline in locally provided services. The analysis presented here, underpinned by high spatial and temporal resolution PoI data, could be applied more broadly to the wider food environment or other forms of locally provided service (Clark et al., 2023).

Acknowledgements

The Geodemographic data for this research have been provided by the Geographic Data Service, a Smart Data Research UK Investment, under project ID GeoDS 3232, ES/Z504464/1. The Points of Interest was obtained as CSV geospatial data, Scale 1:1250, Tiles: GB, Ordnance Survey (GB), Using: EDINA Digimap Ordnance Survey Service, https://digimap.edina.ac.uk. This work was funded by UK Research and Innovation, ESRC grant ES/Z504336/1.

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