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# Characterising healthiness of out-of-home food outlets in Great Britain using online menus

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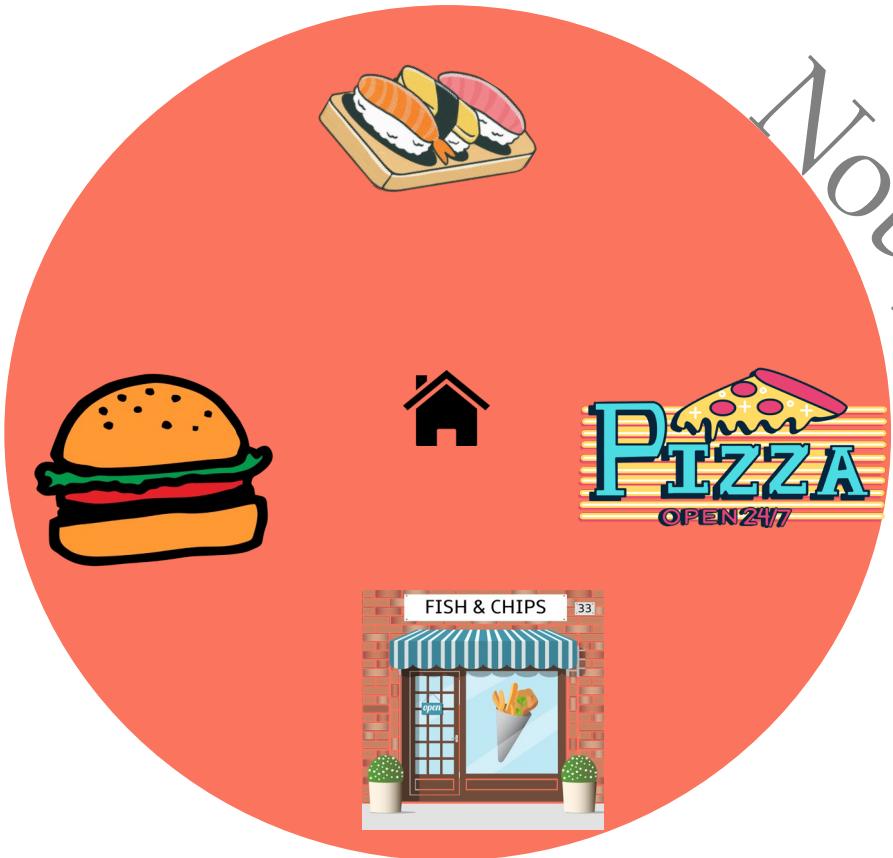


**Mapping the nutritional foodscape is a study that looks at:**

- A. Community nutrition environment
- B. Consumer nutrition environment



# Background



## Exposure measurements

- I am exposed to **4** out-of-home food outlets

## Categorise by type of food outlets

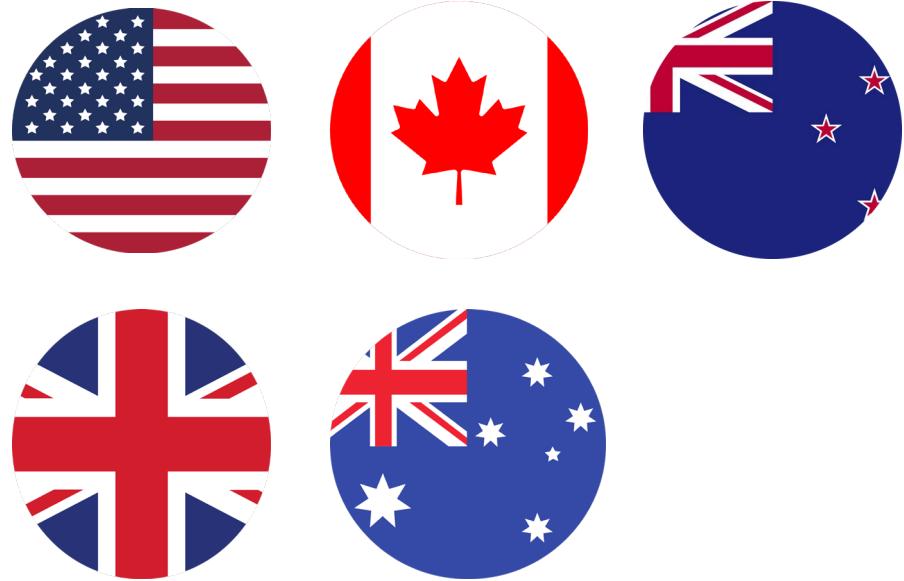
- I am exposed to **2** restaurants and **2** takeaways

But....

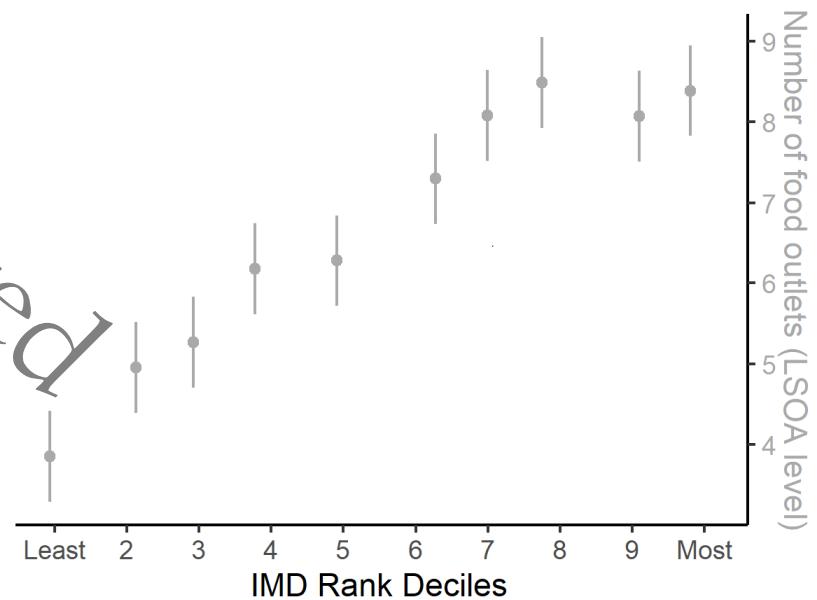
- The sushi restaurant may offer healthier options than the burger restaurant
- Healthiness of the options offered by the pizza shop and fish & chips may be different

# Socioeconomic inequalities in the out-of-home food environment

More takeaways (fast-food) in more deprived areas



Out-of-home food outlet access was greater in the more deprived areas in England



# Research Aims

- Characterise menu healthiness of out-of-home food outlets in Great Britain
- Investigate if menu healthiness of out-of-home food outlets is socioeconomically patterned across neighbourhoods in England.

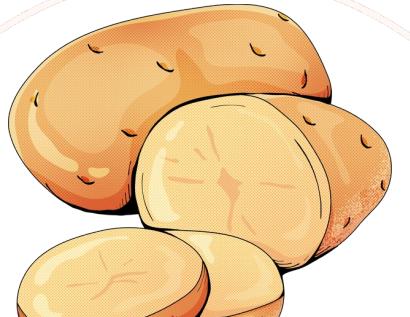
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# Now comes the difficult question...

How to determine the healthiness of menus?

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Article

## Supporting a Healthier Takeaway Meal Choice: Creating a Universal Health Rating for Online Takeaway Fast-Food Outlets

Louis Goffe <sup>1,2,\*</sup> , Nadege S. Uwamahoro <sup>2</sup> , Christopher J. Dixon <sup>3</sup>, Alasdair P. Blain <sup>1</sup> ,  
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Received: 14 October 2020; Accepted: 9 December 2020; Published: 11 December 2020



Menu attributes of Just  
Eat online menus



Nutrition researcher  
expert ratings

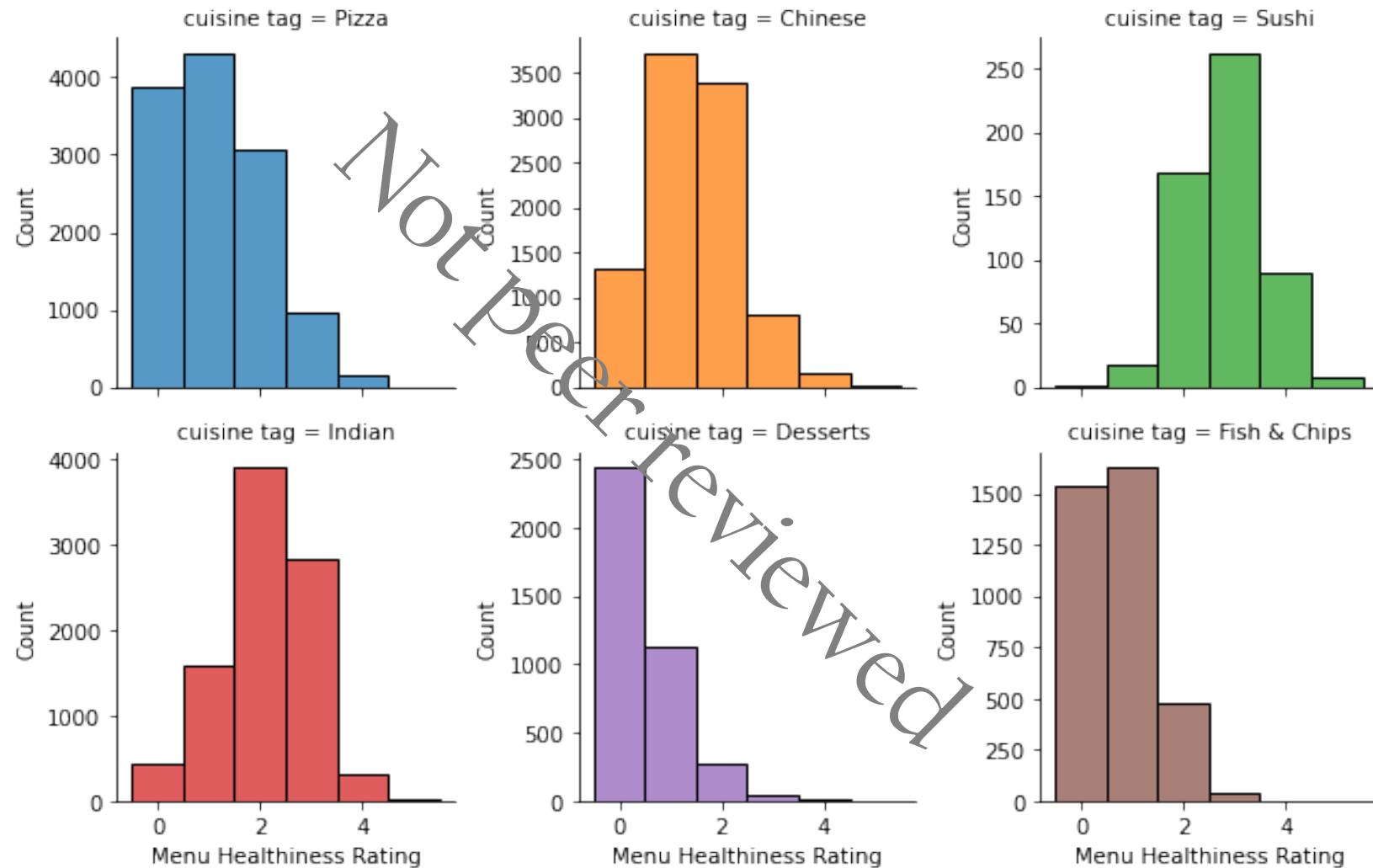
# Modified Universal Health Rating Model



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Attribute	Description
Special offers	The number of special offers", "meal deals", "sharing meals", "and set meals
Desserts	The number of dessert items
Salads	The count of all mentions of salad or related items
Chips	The count of all mentions of chips/fries/wedges
Vegetables	The number of different vegetables mentioned (not fruit)
Milk	The number of milk (non-sweetened) options
Water	The number of water options

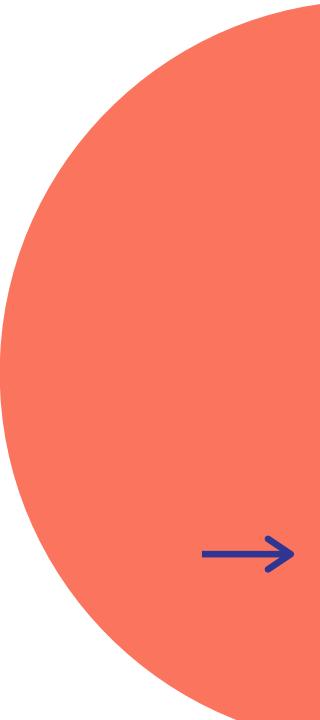
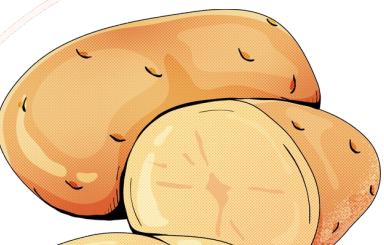
# Menu Healthiness Ratings By Cuisine Tags for Out-of-home food Outlets on JustEat



# Now comes the next difficult question...

How to predict the menu  
healthiness for those without  
online menus?

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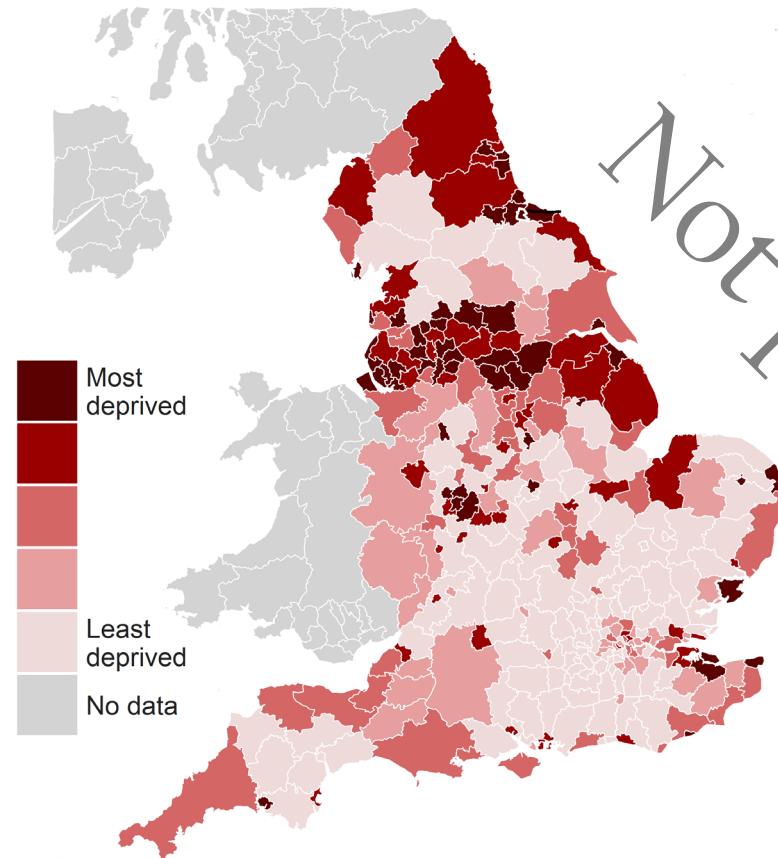
# Predicting menu healthiness

```
>>> fastai_model.predict(['Yuru\'s sushi restaurant'])
```

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## Deprivation across England

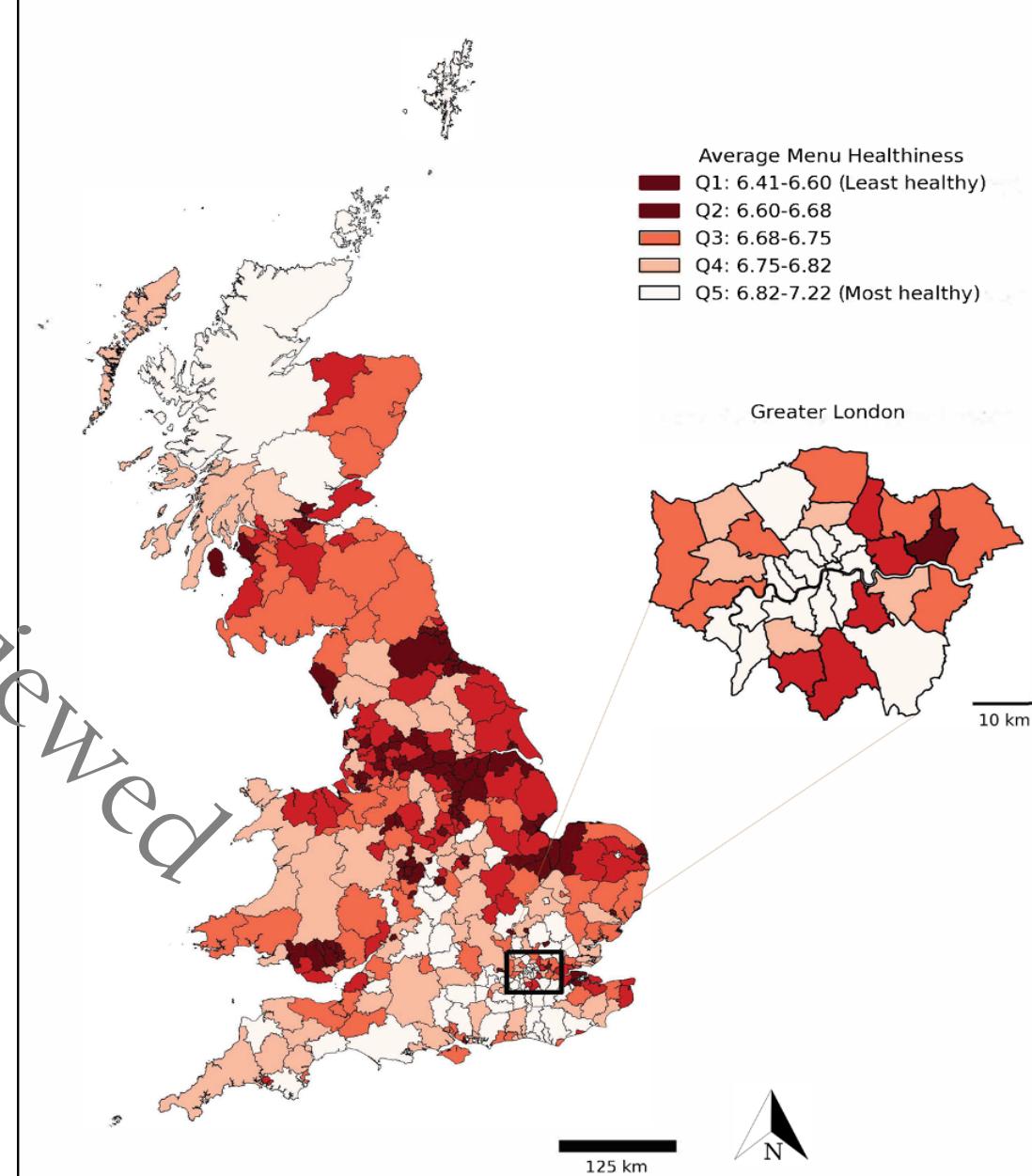
Indices of multiple deprivation 2019



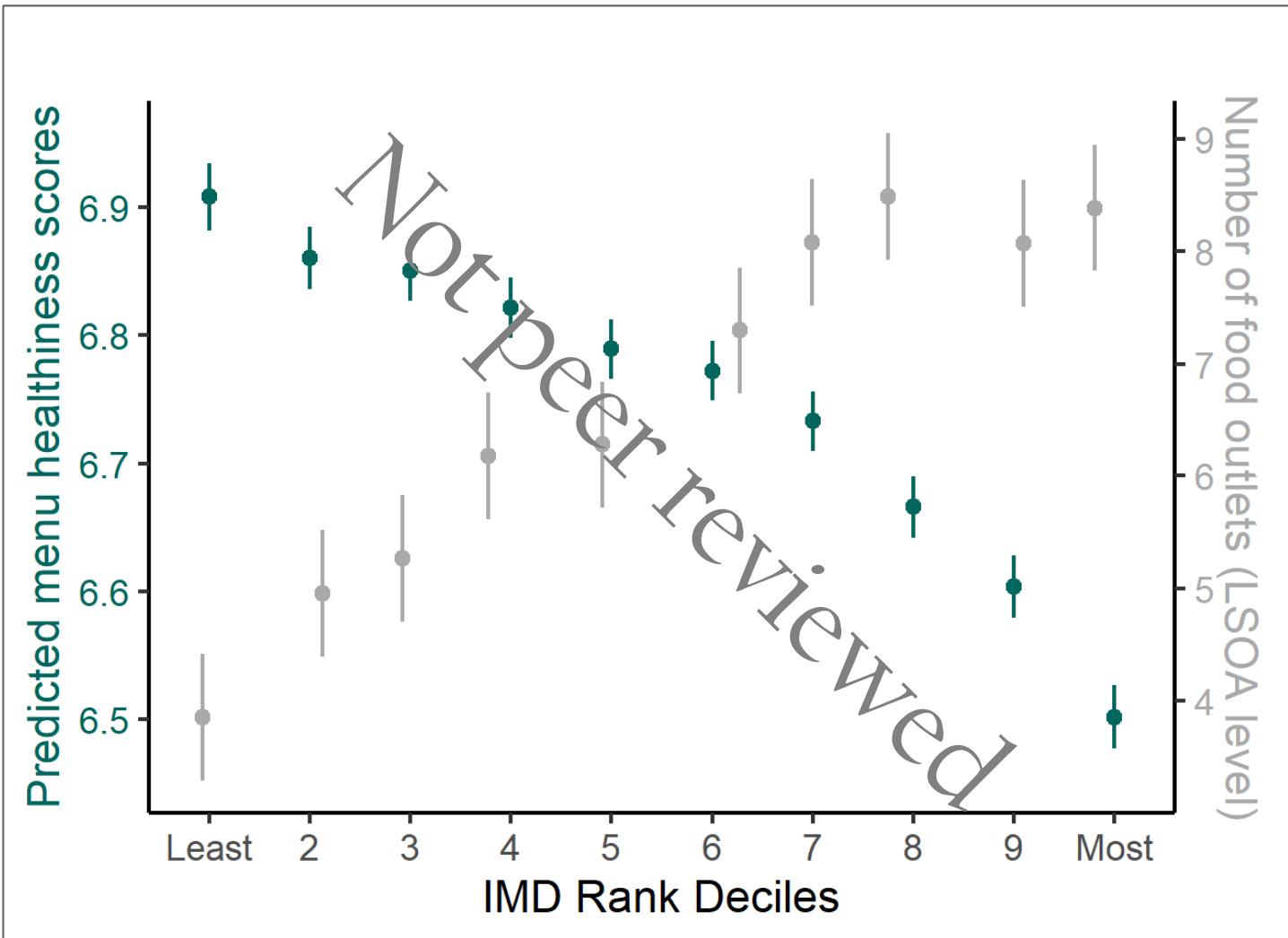
Source: BBC news <https://www.bbc.co.uk/news/uk-england-49812519>

## Average Menu Healthiness of Out-of-Home Food Outlets at the Local authority level in GB

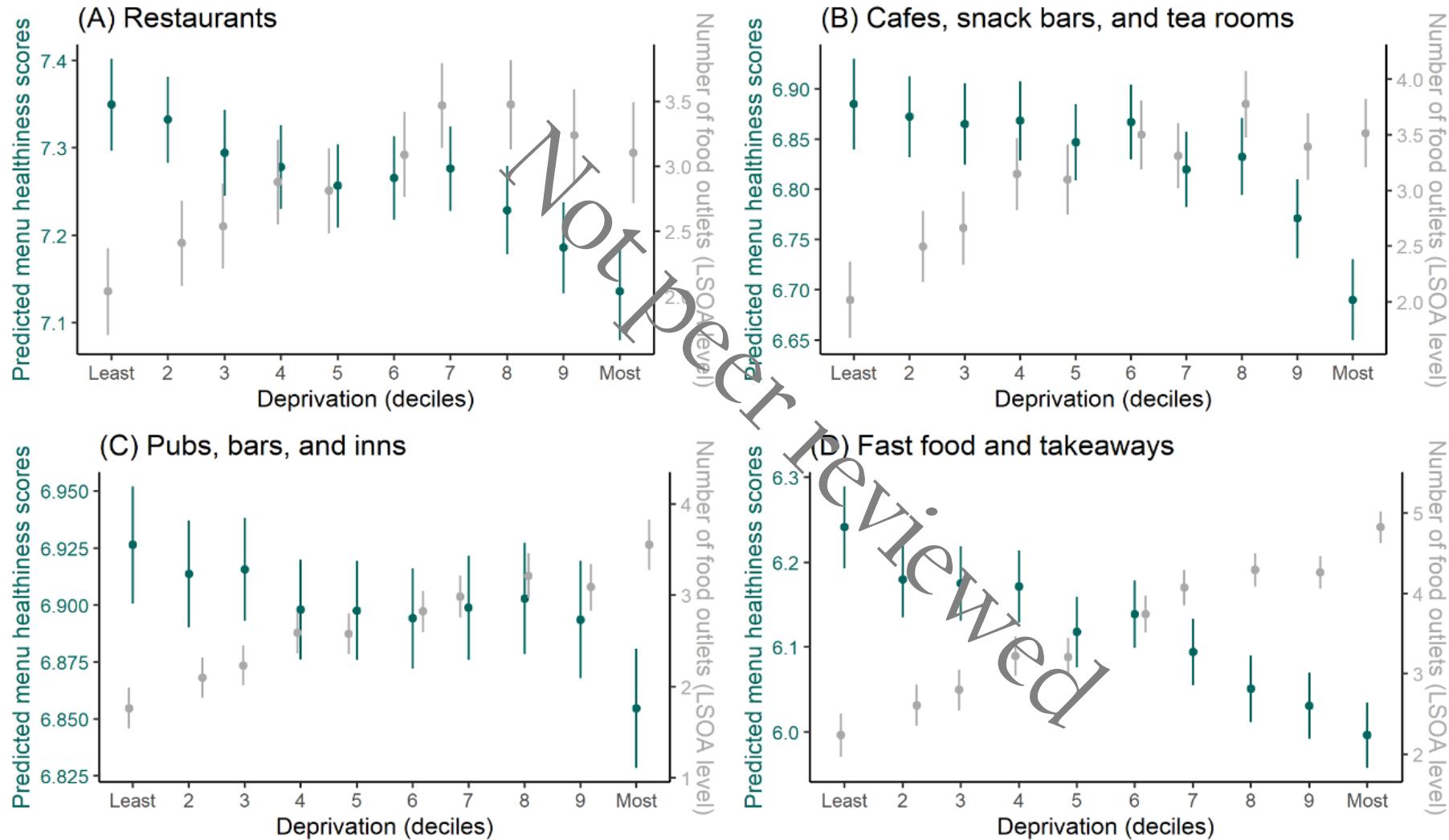
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# Multiple deprivation index, menu healthiness and out-of-home food outlet access



# Multiple deprivation index, menu healthiness and out-of-home food outlet access, by type of food outlet



# Study Limitations



Small sample size



Restaurant names alone

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Interpretation of the scores



What's on the menu,  
rather than purchasing

# Conclusions

## Conclusion 1

For the first time in the internationally published literature, we used online menus and outlet names to characterise the healthiness of all out-of-home food outlets on a national scale.

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## Conclusion 2

We found that there tended to be **more out-of-home food outlets** in more deprived neighbourhoods and these tend to be less healthy, and the difference is the most pronounced in fast food and takeaway food outlets

# Acknowledgement

- Thank you to my supervisors Prof Jean Adams and Dr Thomas Burgoine, and my co-author Tom R.P. Bishop.
- This work was supported by the Medical Research Council (grant number MC\_UU\_00006/7) and I am supported through a Gates Cambridge Scholarship



# Thank you!



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# Supplementary Model Performance

Experiment #	Features used	Tokenization	Model summary/architecture	Mean absolute error (test set)
<b>Using restaurant names only, all Just Eat data in GB</b>				
<b>Model_0 (baseline)</b>	Restaurant name	Word	Term frequency-inverse document frequency (tfidf); Support Vector Regression (SVR)	0.87
<b>Model_1</b>	Restaurant name	Word	Input -> Text (character or word) vectorization layer -> Embedding layer -> Long Short-Term Memory networks (LSTM) layer -> Flatten -> Dropout layer (0.2) -> Dense layer (Relu) -> Output	0.87
<b>Model_2</b>	Restaurant name	Character		0.91
<b>Model_3</b>	Restaurant name	Word	Input -> Text vectorization layer -> Embedding layer -> Gated recurrent units (GRU) layer -> Dropout layer (0.2) -> Output	0.88
<b>Model_4</b>	Restaurant name	Character		0.91
<b>Model_5</b>	Restaurant name	Word	Input -> Text vectorization layer -> embedding layer -> Convolutional neural network (CNN) layer -> Global Average Pooling layer -> Dropout layer (0.2) -> Output	0.97
<b>Model_6</b>	Restaurant name	Character		0.93
<b>Model_7</b>	Restaurant name	Combining word and character level embeddings	Pre-trained token embedding (universal sentence encoder) + character embedding (concatenated) feature extraction + fine tuning	1.20
<b>Model_8</b>	Restaurant name	Letter tokenization	Transfer learning (ULMFit) – FastAI implementation	0.82
<b>Using restaurant names and hygiene ratings, Just Eat data and hygiene rating data in England</b>				
<b>Model_9</b>	Restaurant name, hygiene rating	Word	Input layer -> Embedding layer -> GRU layer -> Concatenated with the Dense layer for hygiene rating -> Dense layer -> Output	0.85
<b>Model_10</b>	Restaurant name, hygiene rating	Character		0.87

# Supplementary Comparison of food outlet scoring system

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Healthier Catering Commitment (1)(London)	Relevant Metrics included in model development by Goffe et al.
1. Cooking and preparation (e.g., visible fat is removed from meat before cooking)	
1. Where deep fat frying is unavoidable (e.g., the oil is properly maintained)	
1. Milk, spreads, dressings and sandwich fillings (e.g., semi skimmed or skimmed milk is used for drinks)	
1. Salt (e.g., where salt is added after cooking/preparation, customers add their own salt.)	
1. Sugar (e.g., drinking/tap water is always available.)	The number of sugar-sweetened beverages, the number of diet drinks, and the number of water
1. Fruit and vegetables (e.g., portion (80g) of vegetables or salad is always available as an accompaniment)	The number of different vegetables mentioned (not fruit), the number of salads
1. Carbohydrates (e.g., chips are served, there is always a healthier starchy alternative (e.g. jacket potato, bread, rice, pasta, wraps, couscous etc.).)	The count of all mentions of chips/fries/wedges
1. Portion size (e.g., smaller portions are available for children and adults and are on display or advertised)	The number of meals that are available in multiple sizes, the number of meal items that are specifically labelled as small
1. Healthier option promotion (e.g., healthier eating is promoted by staff)	

