Understanding the dynamics of climate crucial food choice behaviours using distributional semantics

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The agricultural sector contributes around **one quarter** of total global emissions.

80% of these emissions are livestock related.

(IPCC, 2014, McMichael et al., 2007, IPCC, 2019).

2019 IPCC report on Land Use highlights dietary change as an important strategy for **mitigation** *and* **adaptation**

"very high" mitigation potential (p.60) - between 0.7 and 8.0 $GtCO_2$-eq/yr (p.58)

- Technical Summary (IPCC, 2019)

"supply-side adaptation measures alone will not be sufficient to sustainably achieve food security under climate change" (p.472)

- 'Chapter 5: Food Security' (IPCC, 2019)

"Achievement of this potential at broad scales depends on consumer choices and dietary preferences that are guided by social, cultural, environmental, and traditional factors" (p.58)

- Technical Summary (IPCC, 2019)

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The missing knowledge

Not enough is known about *why*
we eat what we eat

Essential knowledge to create change

Traditional methods aren't sufficient

Too resource intensive: need lots of data to create generalisable results that are useful to policymakers

Focus is on explicit factors that influence food choice

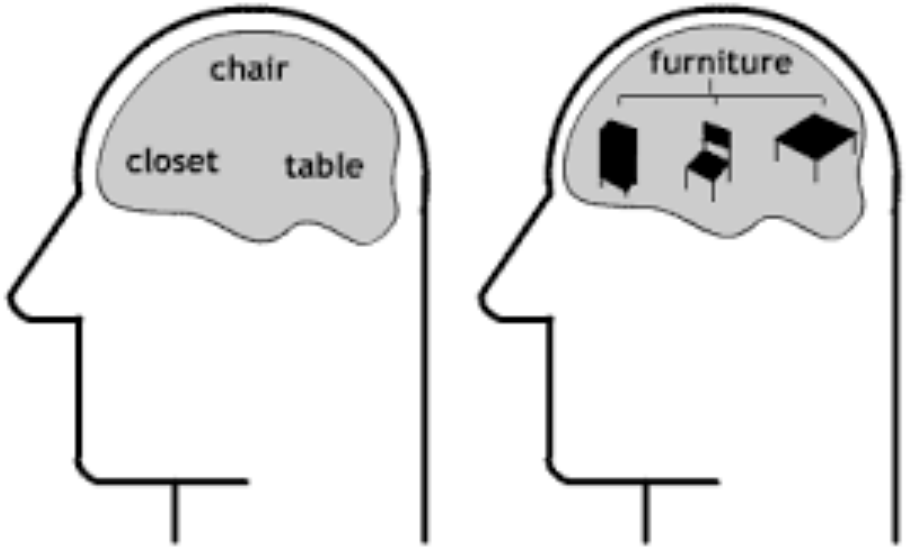
What about implicit influences?

"Achievement of this potential at broad scales depends on consumer choices and dietary preferences that are guided by social, cultural, environmental, and traditional factors"

Studying mental representations of foods

How does the brain represent food concepts?

How are food concepts organized and associated with other foods, and other things?



Standard practice in psycholinguistics to use a **Distributional Semantic Model** for **semantic memory** (Jones et al, 2015)

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Our methods – model

We start with Skip-gram word embeddings (Mikolov et al, 2013) since they give a good approximation to human performance

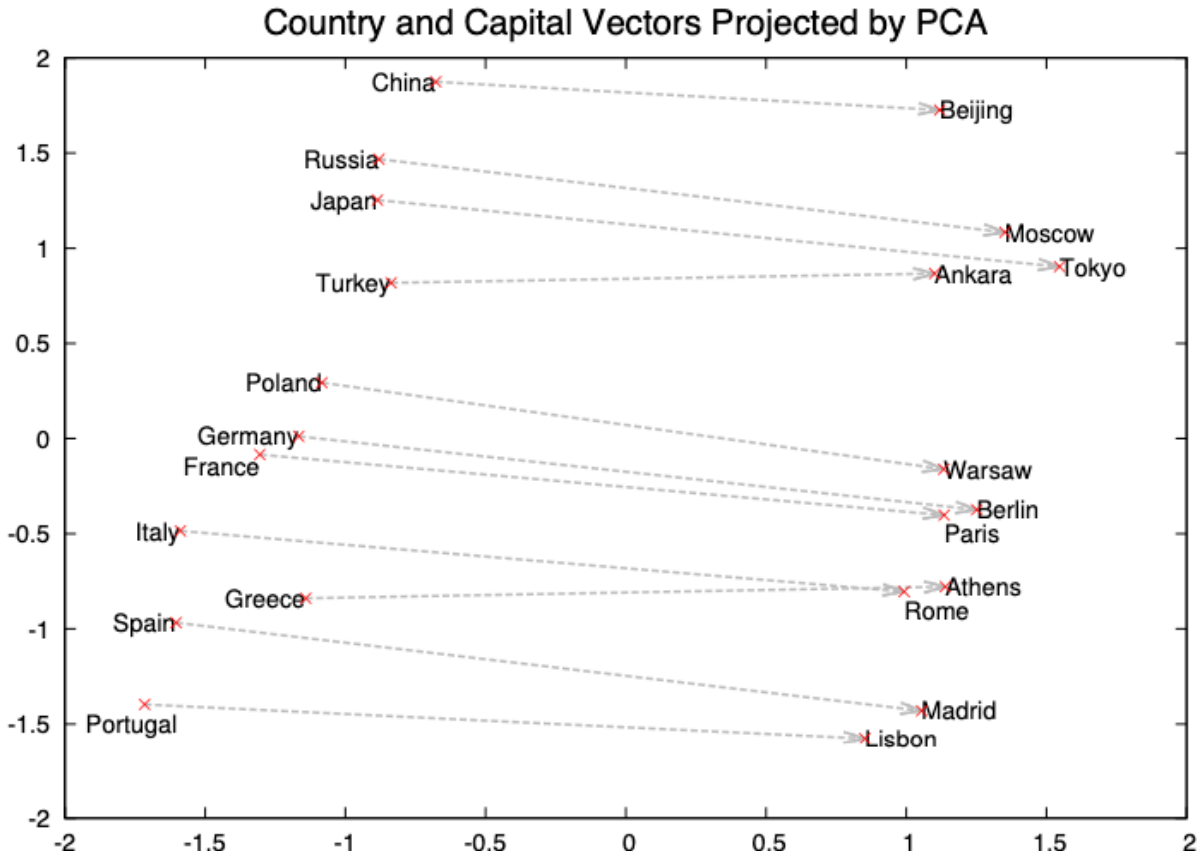

Figure from Mikolov et al (2013)

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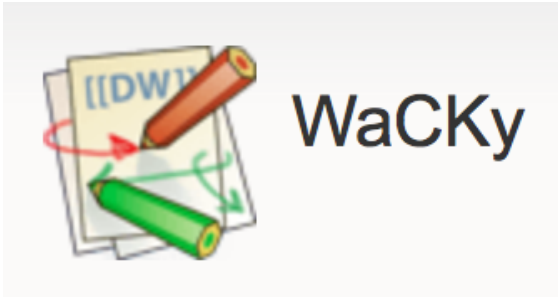
Our methods – data

Constructing a meaningful model of semantic memory requires the right training data:



Baroni et al (2007)

Enough high-quality examples of UK English that are representative of UK culture

~2 billion tokens from ~3 million documents

extensively linguistically post-processed

varied content extracted from .uk web domains

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Our methods – seed words

Appendix R to the National Diet and Nutrition Survey (PHE, 2018) cross-referenced with with WordNet (Princeton University, 2010) and BBC Food (n = 925 terms)

frequency < 20 removed

high frequency polysemic (i.e. ‘date’, ‘Turkey’) removed

14 Native English speakers were consulted over removal of words of more ambiguous polysemy (i.e. ‘roll’, ‘chop’)

final list n = 640 terms

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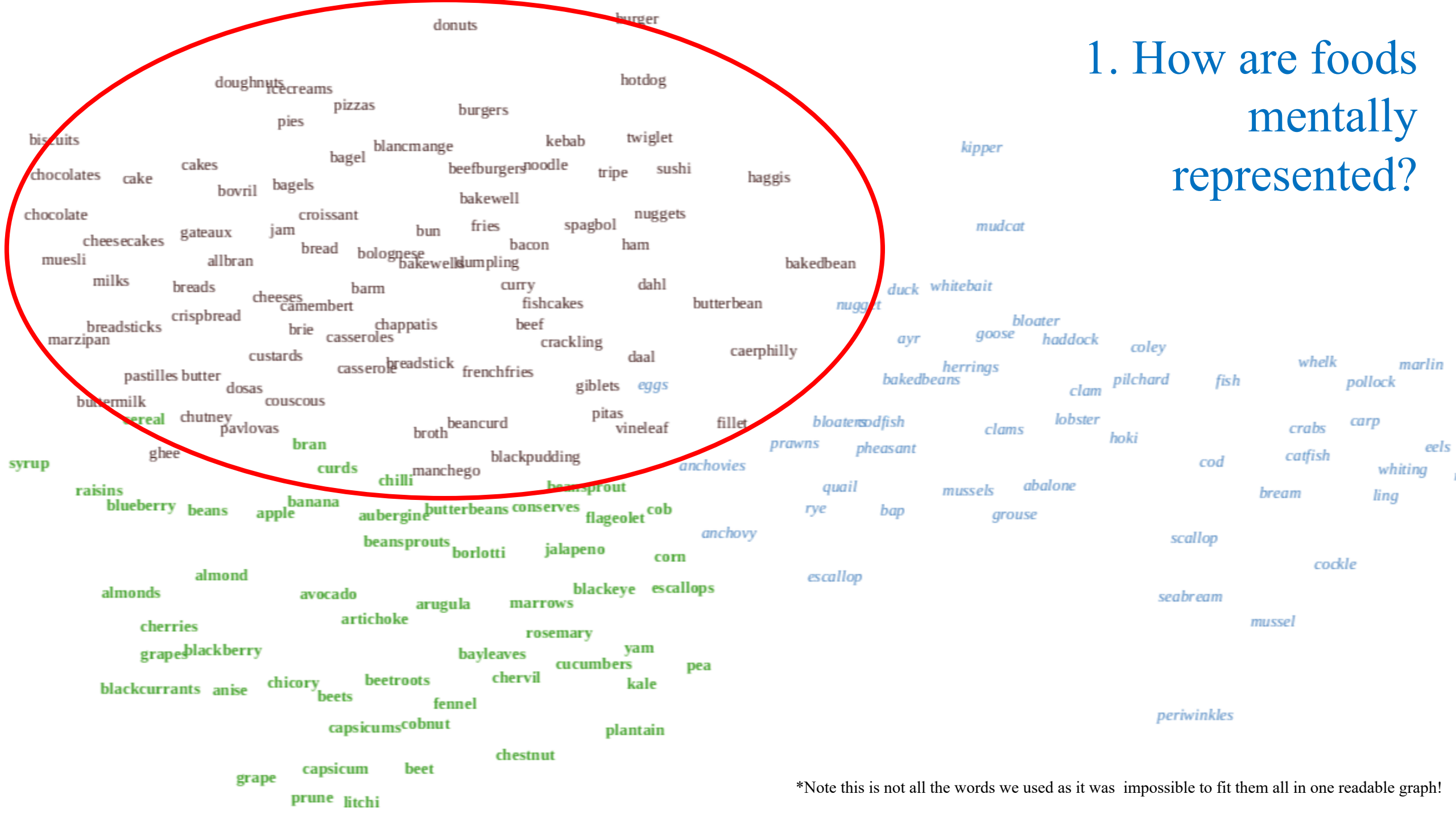
Research questions

1. How are foods mentally represented?

2. How does affect (i.e. emotional association) vary between foods?

3. How do descriptive features vary across foods?

1. How are foods mentally represented?



*Note this is not all the words we used as it was impossible to fit them all in one readable graph!

2. How does affect (i.e. emotional association) vary between foods?

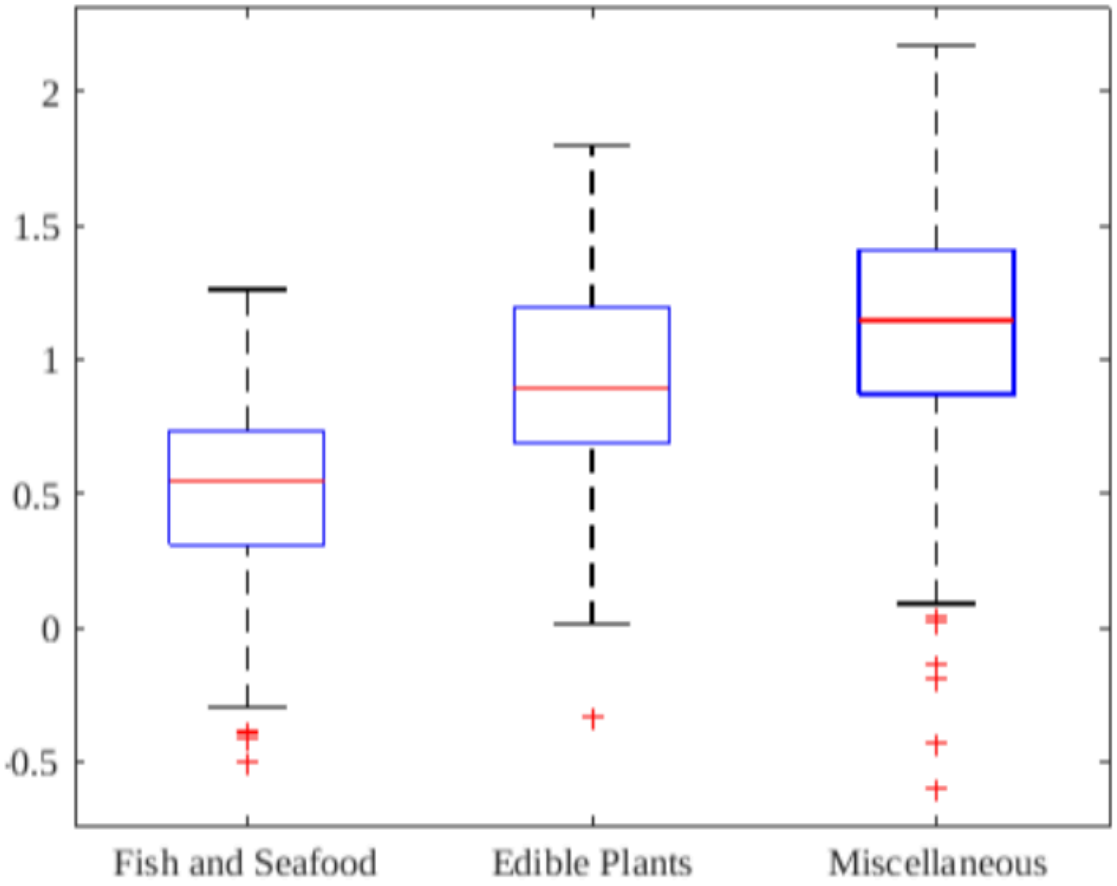


Figure 2: Box-plot of bootstrapped valences for the k-means clusters as defined in Section 3.2

3. How do descriptive features vary across foods?

	Fish and Seafood	Edible plants	Miscellaneous
Sensory	**6.3**	26.8	22
Situational	0	0	0.9
Hedonic	0	0	**5.4**
Food preparation	32.6	26.8	40.9
Nutrition	0	0.1	0.4
Other foods	48.3	44.7	29.7
Other - unrelated	**12.8**	1.6	0.7

Table 1: Percentage of neighbour-adjectives in each description category for the three food clusters

Summary of results

UK mental representations of food concepts divide into three categories – Fish and Seafood, Edible Plants, and Miscellaneous (including Meat, Animal Derivatives and Sweet Foods)

The Miscellaneous category has on average higher associated affect than the other categories

Hedonic language is associated *only* with foods in the Miscellaneous category

Meat substitutes (i.e. tofu) appear as part of the Edible Plants category

The Fish category has lower associated affect, and its descriptive features show a lack of familiarity with Fish as a food

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People in the UK have an implicit idea that meat is the centre of the meal

both historically, and today (see Yates and Warde (2015))

“It’s not a meal without meat”

Macdiarmid et al (2017, p.491)

Future research using this method

This method has promise

Studying the UK, we see Fish and Seafood as a separate, non-food category

> "I'm having fish for dinner" is a very natural thing to say in UK English

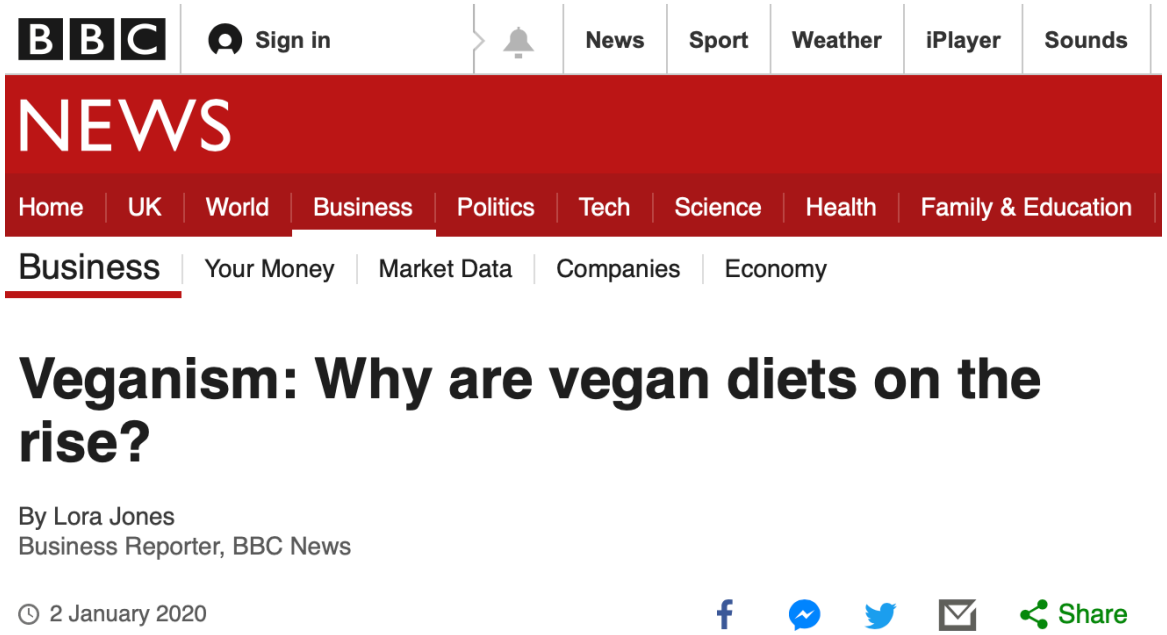
But we wouldn't expect this in Japan!

Suggests the method *is* capturing implicit and explicit cultural information

Future research using this method

Our corpus was from 2007

Has there been a genuine cultural shift? Is it just a trend?



Longitudinal studies using corpora from a variety of time-points could measure effectiveness of policy etc

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