CASA dissertation plan submission form-20031364

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| **Programe** | MSc Spatial Data Science and Visualisation |
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**Proposed title of the project**:

Analysis of geographical areas and characteristics of malnutrition and food sustainability studies in London based on Tesco data.

**Proposed research question**:

How can food waste and malnutrition be addressed in the London region with the goal of sustainability and virtuous circle?

What can nutrition data from grocery purchasing habits reveal about the nutritional geographies of London? And how might these interact with (and here you can choose anything you like – a) the geographies of malnutrition and other diet related diseases in London, b) income inequalities c) social and cultural factors? – or anything else.

Subtitle:

How might this information be used to help target charitable services dealing with nutrition and access to food in London?

What can nutrition data from grocery purchasing habits reveal about the nutritional geographies of London? And how might these interact with the geographies of malnutrition and other diet related diseases in London.

**Proposed objectives**:

1. review the existing literature on addressing food waste, nutritional deficiencies and food safety hazards, and identify the value and need for different nutrition labels, and the level of implementability of different solutions.

2. collate and cleanse Tesco sales and nutrition data to assign values to different nutrients. Determine calculation functions and approximation algorithms for regional nutritional levels and use cluster analysis (Jenks Natural Breaks and spatial clustering) after using weighted calculations to identify and filter out areas of London that are undernourished.

3. summarise the characteristics of such areas and the factors influencing nutrient limitation, establish the spatial distribution of impacts and explore any regional variations through spatial and regression analysis and explore potential causes.

4. propose possible solutions in relation to the FEAST project's objectives and action models and compare the results of the scenario's simulations across London's regions, comparing the extent of improvement in malnutrition in different areas.

5. Identify the better sustainable solutions when combined and assess their effectiveness. Finally compare it with other national or regional solutions to food waste and nutrition and whether the programme or project has superiority and welfare value in the London area.

**Background for the research** (**400-500 words**):

Approximately 2 billion people in the world are at risk of impaired health, such as moderate or severe food insecurity, due to a lack of regular access to nutritious, adequate food. While moderate or severe food insecurity is largely concentrated in low- and middle-income countries, nearly 8% of the population in North America and Europe also suffer from it (The State of Food Security and Nutrition in the World 2019). In particular, the prevalence of malnutrition in the UK has exceeded 30% in the last 15 years (Saunders and Smith, 2010). The 2030 Agenda for Sustainable Development identifies hunger, food insecurity and all forms of malnutrition as challenges that must now be addressed. This paper will therefore look at how to address issues such as food waste and malnutrition in the London area, within the context of sustainable development and virtuous circle goals.

On the other hand, it is estimated that in 2019 a total of 931 million tonnes of food globally went into the bins of households, retailers, restaurants and other food service businesses, accounting for 17% of the total food available to consumers (United Nations Environment Programme, 2020). Food waste is present in almost every country and region assessed, and the level of waste is considerable regardless of income level. In the same year, 690 million people around the world went without food, and this number is expected to rise significantly due to the impact of the new crown epidemic (UN News Survey, 2021). Therefore, I chose this topic with the aim of finding an effective and sustainable solution to reduce food waste and malnutrition among citizens.

Improved food service and appetite, as well as increased use of artificial nutritional support, could improve the nutritional intake of patients (O'Flynn et al., 2005). Meanwhile, Wilson, Evans and Frost, G. (2000) suggested that the main factors contributing to malnutrition are reduced dietary intake, reduced absorption of macro- or micronutrients and changes in demand. As a result, there are a number of inspiring food recovery programmes underway in New Zealand. For example, a group of volunteers collect leftover food at various restaurants in Wellington to distribute to those in need. In the UK, the FEAST project is doing the same, albeit limited to six boroughs. through inclusive structural change and by seeing communities as central to mitigating economic vulnerability, FEAST is driving action on food security and nutritional supplementation in the London area.

Saunders, J., & Smith, T. (2010). Malnutrition: causes and consequences. *Clinical Medicine*, *10*(6), 624.

O’Flynn, J., Peake, H., Hickson, M., Foster, D., & Frost, G. (2005). The prevalence of malnutrition in hospitals can be reduced: results from three consecutive cross-sectional studies. *Clinical Nutrition*, *24*(6), 1078-1088.

Wilson, A., Evans, S., & Frost, G. (2000). A comparison of the amount of food served and consumed according to meal service system. *Journal of human nutrition and dietetics*, *13*(4), 271-275.

Fruits and vegetables crucial for healthy lives, sustainable world: Guterres

<https://news.un.org/en/story/2021/03/1086402>

(SAFE) FOOD RECOVERY - Dr Miranda Mirosa, University of Otago

<https://www.crcc.nz/node/102>

**Methodological outline (300-500 words)**:

1) Assignment as well as multivariate functions to calculate two indicators

* The first indicator is the regional nutritional level, which is calculated by assigning values to the nutritional labels contained in the different foods, which are representative of the daily nutritional intake of the people in the region.
* In addition, another indicator is the food waste index, which represents the severity of food consumption in the area and can be calculated as the amount of food waste disposed of per capita or the amount of excess food purchased per capita.

2) Cluster analysis

A cluster analysis of the calculated values of nutrition levels and food waste in each London region was carried out using k-means analysis or Jenks Natural Breaks in Real Statistics, classifying the former into three categories.

* Areas with normal nutrition
* Nutritional deficient areas
* Severely undernourished areas

Food waste can also be divided into three categories.

* Environmentally friendly areas
* Normal food waste areas
* Severe food waste areas

This gives nine different urban areas relating to nutrition and food, such as severely undernourished normal food waste areas, for better spatial analysis. And for the particular severely undernourished and at the same time severely food wasted areas, the simulated solution allows for a comparison of the degree of recovery of nutrition levels in other areas.

3) Spatial analysis and multiple regression analysis

* Mainly including OLS and GWR model analysis, and finally visualisation
* Modelling the phenomenon of food waste and undernutrition in order to better understand and influence policy formulation and decisions on what to do accordingly based on this phenomenon.
* The basic objective is to measure the extent to which changes in one or more variables affect changes in regional nutritional levels.

4) Modelling food redistribution patterns similar to the FEAST project using ABM

* Basic parameters: total population, food availability, disposable income on food
* Model parameters: per capita food consumption rate (well-nourished), food recovery rate, food redistribution rate
* Adjusting the parameters to simulate the required food recovery rate and redistribution rate to the undernourished, while ensuring that the majority of the population is at least well nourished.

**The sources of data you are considering using:**

1. Clubcard linked purchase data for 2015 from TESCO at 411 shops in London.

https://www.nature.com/articles/s41597-020-0397-7-LSOA

2. Feast will provide a detailed service evaluation survey of people using its services in London. Contains demographic information and data on 92 variables such as diet, cooking skills and eating habits.

3. grocery stores in London. supermarket distribution and demographic and economic data for the London area.

<https://www.nomisweb.co.uk/query/construct/summary.asp?menuopt=200&subcomp>=

4. Other datasets that may be used, such as Manufacture of homogenised food preparations and dietetic food; Manufacture of other food products; Take away food shops and mobile food stands

**Ethical considerations** (**100-200 words**)

Throughout the research process, I will adhere to academic standards of practice, including proper attribution of others' ideas, data and code.

I will also work with my supervisor to review and determine whether my use of the FEAST project survey dataset and TESCO statistics requires ethical approval. The dataset contains demographic and shopping information on individuals but does not contain any directly identifiable personal information. I will ensure that this data is referenced appropriately and does not violate privacy.

Finally, other data from TESCO and external sources that I plan to use are not sensitive and the dataset is aggregated at the census tract level in order to maintain anonymity.