Business Case Study: Food Standards Agency

S2DS March-April 2020
James Doherty, Lorena Garcia-Perez, Charlie Jeynes, Mishka Nemes

1. The challenge

The Food Standards Agency (FSA) is a non-ministerial government body that is responsible for food safety and hygiene in England, Wales and Northern Ireland. Its mission is to ensure that you can trust the food you eat, and that it is accurately labelled. The FSA advises the UK government on public food consumption policy.

The FSA gathers information on public food practices by conducting surveys. The Food and You Survey (F&Y) is a flagship biennial study that explores the public's attitudes, knowledge and behaviour relating to food safety and production. Data is analysed and used to compile publicly available reports.

The FSA was concerned that its engagement activities did not reach some demographic groups in Wales, who may have associated food risks. Wales is demographically distinct to the rest of the UK, being less populous, more deprived, with a larger rural population.

Surveys that correctly sample the population are required to make informed policy decisions. The ratio of F&Y respondents to the actual Welsh population is approximately 1:64,000. However, the FSA had not assessed whether the demographic profile of F&Y survey respondents matched those of the Welsh population.

The following specific questions were posed:

1) Does F&Y survey sampling reflect the true demographic profile of Wales?
2) What food risks are associated with undersampled groups, and what is their understanding of food labelling?
3) Are there quantifiable relationships between behaviours related to food safety, and can we predict food risk for defined groups?

This information will allow the FSA to adapt its marketing and public engagement strategy to be more inclusive and informative.

2. Approach

To begin, we focused on whether F&Y survey sampling reflects the true Welsh demographic profile. We compared demographic data in the F&Y survey to corresponding information from the UK 2011 Census carried out by the Office of National Statistics (ONS), which we assumed to be the ground truth. This presented several challenges. For example, data granularity was higher in the census than in the F&Y survey. While seven demographic features were directly comparable, several others required label adjustment, and others were not comparable.

We employed principal component analysis (PCA), correlation analysis, and regression modelling for exploratory data analysis.

The F&Y survey has significantly fewer respondents than the census (1,700 vs. 53,000). It was therefore important to quantify uncertainty in our findings. To do so, we implemented statistical methods that assess variation in the data, such as confidence intervals and non-parametric Chi-squared statistical testing.

We created bespoke label dictionaries and plotting functions, and employed bar plots for clear data visualization and comparison. These features were integrated into a user-friendly, interactive dashboard that may be used by our client (including non-technical staff) to analyse F&Y survey responses going forward.

3. The results and impact

Following extensive visual and statistical analysis, the insights extracted from the F&Y data satisfied our objectives. They may be summarized as follows:

1) Principal component analysis (PCA) provided broad insights into the structure of the whole dataset, and correlation analysis and regression modelling determined food behaviors that impact food poisoning risk in a data-driven manner.
2) We determined that females are consistently oversampled in the F&Y surveys in Wales, England and Northern Ireland. In Wales, 16-24 year olds are undersampled, while people over 55 are oversampled.
3) We found that young people report a higher incidence of food poisoning. They also frequent restaurants, have a higher propensity to handle raw meat unsafely, and do not fully understand food labelling. Other demographic-specific behaviours can be explored using our interactive dashboard.

These insights will inform the design of future FSA engagement campaigns in Wales. This will ultimately increase the food safety of more than 300,000 individuals (10% of the Welsh population) who are not currently being targeted.

Furthermore, our work provides useful information for the design of future F&Y surveys. If granular demographic information about each respondent is collected, more survey and census data categories may be combined. We advise the FSA to perform the analysis developed for this project in 2021, on completion of the next ONS census.

By implementing these recommendations, future work carried out by the FSA can yield richer information, without an increase in cost. More informative advice from the FSA to the relevant departments of the UK government and the National Health Service, will lead to improved policy, practice, and the reduction of expenses.

Finally, the FSA was delighted to be provided with an interactive dashboard to further explore F&Y surveys on demand. Survey data is visualised with clear graphs that illustrate how demographics influence the responses to almost 500 questions. This dashboard is available online and represents a user-friendly interface that will allow stakeholders within the FSA to effortlessly interrogate F&Y data.