Assignment 1

Case Study: Food Labelling

In this assignment, you are assigned to do the job of a data designer working for the fictional company of S.T.A.R. Manufacturers. This document first outlines new laws of the fictional country of the Republic of Batmania, as these laws affect the food-related data storage requirements of S.T.A.R. Manufacturers. The instructions for your assignment task are detailed at the end of this document.

The laws of the Republic of Batmania

The Batmanian government has recently introduced new food labelling laws. All food now requires a traffic light rating on the front of the packaging, so that consumers can quickly compare the relative healthiness of foods. The idea is very similar to Australia's Health Star Rating System (see http://healthstarrating.gov.au). An example of Batmania's labeling is provided in figure 1. A "green light" label indicates healthy food. An "amber light" indicates a food that is recommended to be consumed in moderation. A "red light" indicates a food that should be eaten infrequently (i.e. "junk food"). The categorisation of food as "red", "amber" or "green" is easily calculated from information available on the rest of the packaging using a simple formula. This formula is not expected to change in the future.

Next to the traffic light label a summary of important nutritional information must be provided:

1. The energy in kilojoules per 100 grams of food;
2. The grams of Saturated fat per 100 grams of food;
3. The grams of sugars per 100 grams of food;
4. The milligrams of sodium per 100 grams; and
5. The grams of fibre per 100 grams of food.

In order to place this information in an appropriate context for consumers to make healthy choices the amounts of saturated fat, sugars and fibre are visually indicated as being "high" or "low". Nothing is displayed if a food has a "medium" amount of saturated fat, sugars or fibre. The thresholds for what is needed to be considered "high"/"low" for each of the food properties is changed by the Batmanian government from time to time.
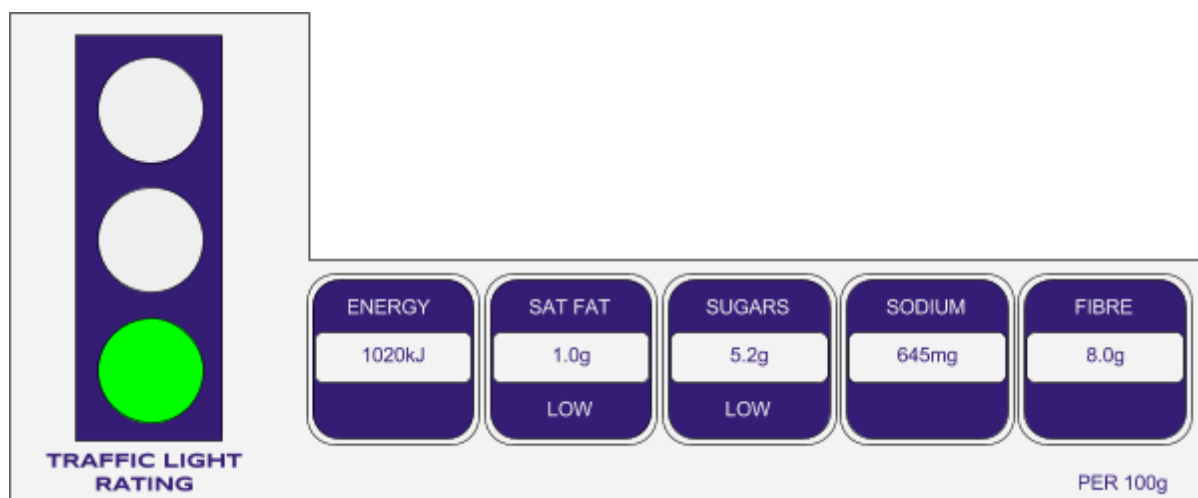
Figure 1: An example Traffic Light label as required by the government. This label would typically be included on the bottom left or bottom right hand corner of the front of food packaging.

The government also requires a Nutrition Information Panel on the back of the food packing. Examples are provided in Figure 2 and Figure 3. The following information must be displayed in the panel:

1. The official name of the product.
2. The number of servings per package.
3. The serving size.
4. The average kilojoules per serving and average kilojoules per 100g of the product. Some food packaging also displays the calories per serving and per 100 grams for customers who prefer this measurement.
5. Protein, per serving and per 100g.
6. Total Fat, per serving and per 100g. Total Fat is the sum of all different types of fats present in a food. However, most food labels only list the Saturated and Trans Fat amounts. It is optional to display the amounts of Trans fat, Polyunsaturated fat and Monounsaturated fat in the Nutrition Information Panel. As such, it is common that the amounts of Saturated and Trans Fat will not actually sum to the same value as Total Fat. Examples can be seen in figures 2 and 3.
7. Total carbohydrates (colloquially "carbs"), per serving and per 100g.
8. Total sugars (please note sugar is a type of carbohydrate), per serving and per 100g.
9. Sodium, per serving and per 100mg.
10. Dietary fibre per serving and per 100g. Although displaying this information is optional.
11. Aspects of food that are commonly grouped under the category of Vitamins and Minerals (for example, vitamin C, A, calcium, iron). Although displaying this information is optional.
12. Some packaging includes information on what percentage a recommended serving is of a recommended average daily food intake for an adult. The recommended daily food intake for an adult is 8700kJ.

Either a "Use by" or a "Best Before" date must be included somewhere on the packaging. It is also possible for a product to have both a "Use By" and a "Best Before" printed on it. The front of the packaging must display the country of origin ("Made in Australia", "Made proudly in Batmania", "Made in the European Union").

NUTRITION INFORMATION: Mitchell's Health Bars
Serving per pack: 12   Serving Size: 31.1g (Per Bar)

	Quantity Per Serving	Daily Intake Per Serving	Quantity Per 100g
Energy	510kJ	6%	1640kJ
Protein	2.3g	5%	7.3g
Fat Total	3.6g	5%	11.4g
- Saturated	1.3g	5%	4.2g
Carbohydrate	18.8g	6%	60.0g
- Sugars	5.2g	6%	16.5g
Dietary Fibre	3.4g	11%	10.8g
Sodium	6mg	0.3%	20mg

All specified values are averages. Daily intakes are based on on an average adult diet of 8700kJ. Your daily intakes may be higher or lower, depending on your energy needs.

Figure 2: An example Nutrition Information Panel.

NUTRITION INFORMATION: Mitchell's Healthy Soup
Serving per pack: 3   Serving Size: 350g

	Quantity Per Serving	Quantity Per 100g
Energy	471kJ (113Cal)	135kJ (32Cal)
Protein	4.3g	1.2g
Fat Total	0.9g	0.3g
- Saturated	0.2g	Less than 0.1g
- Trans	0.2g	Less than 0.1g
Carbohydrate	18.6g	3.2g
- Sugars	11.3g	313mg
Sodium	1090mg	

All specified values are averages. Daily intakes are based on on an average adult diet of 8700kJ. Your daily intake may be higher or lower, depending on your energy needs.

Figure 3: Another example of an Nutrition Information Panel.

Basic packaged foods that are typically used as ingredients for cooking do not require food labelling. For example, packaged flour does not need food labelling under Batmanian law.

Next to the Nutrition Information Panel the ingredients of the food must be listed. Below the ingredients must be a text description warning customers of potential health warnings (for example, "May contain traces of nuts", "Contains gluten", "Refrigerate after opening" and so on). There are a few details which must be on the packaging, but are not required in a particular position on the packaging:

1. The address where the product was manufactured. This may change over time as companies often change where they manufacture certain foods.
2. Website address related to the product.
3. Total weight of the food.
4. A barcode.

S.T.A.R. Manufacturers

S.T.A.R. Manufacturers are a multinational food manufacturing company (about the same size as the non-fictional company of *Mondelez International*). However, most of their operations are in the country of Batmania. The company is eager to comply with the new Batmanian laws described above.

Thus S.T.A.R. Manufacturers need to design a database to store all the relevant information that is needed to generate product labels that comply with the package labelling laws of Batmania.

The CEO has demanded that MySQL be used for the solution.

The S.T.A.R. Manufacturers CEO has said that they face particular difficulties complying with the laws because the specific ingredients they use are constantly changing from year to year. For example, seasonal fruits are used as ingredients and thus the ingredients may be different between Winter and Summer. Furthermore, natural disasters such as cyclones can make ingredients such as bananas more expensive. Thus a recipe may temporarily use a cheaper banana substitute. The CEO wants to record historical data in the database so that she can make ad-hoc queries such as: what values would have appeared on a label for *Mitchell's Healthy Soup* two years ago or 11 days ago. Thus the company has useful records of compliance with the laws. The CEO would *prefer* the solution to be flexible to accommodate plausible changes to the laws.

Instructions

Your task for this assignment is to act as a database designer in the case study that has been provided.

You need to model the system described in the case study by creating a Physical Data Model using *MySQL Workbench*. Your diagram must conform to the notation used in this subject (e.g. showing crow's feet). If your model includes resolved subtypes you must explain this in the written part of the submission. You may wish to add labels to your ER diagram to aid your explanation (e.g. "*... as seen next to point 1.1 in the ER diagram...*"). You need to show the name of each relationship.

Write down any assumptions you made when designing your model. (Making an assumption for no other reason than to simplify the exercise will not be accepted.) Your assumptions should be about 500 words. Make sure you explain the reasons for your design decisions or you will receive lower marks. For example, you may decide to denormalise part of your solution for the purposes of query speeds. However, such answer is indistinguishable from the answer of a student who simply did not know how to create a fully normalised answer! The only way we'll know you've made a *deliberate decision* rather than a *mistake* is if you tell us! We can't read your minds!