

Radiation Label Case Study

(All historical content and radiation and health data are entirely fictional.)

Due to a regional nuclear war, the planet's food supply has been contaminated with many different forms of radiation, resulting in a much-elevated risk of cancer and other life-threatening illnesses. In the United States, the Food and Drug Administration (FDA) and the National Institutes of Health (NIH) have jointly established a mandatory consumer-information program that will include a website, a smartphone application, and physical point-of-purchase labels. These labels will be affixed directly to foods and food wrapping and will be affixed to or incorporated into printed food packaging. Fresh beef and processed beef products will be the first products to be labeled.

Your firm has been chosen to design the label for beef. If the design is successful, your firm is likely to win the contract to design similar labels for the full range of food categories. Your firm also has an interest in designing the website and the software application. Below is the FDA/NIH specification for the Beef Label.

Each package will indicate the number standard servings (100g) and the units of Alpha radiation and Strontium 49 in each serving.

The label will divide the population into four groups and rank these groups according to their degree of risk to life-threatening radiation-caused illness. The groups and rankings (greatest to least) appear below:

- (1) Pregnant and nursing mothers and their infants
- (2) children under 18
- (3) healthy adults
- (4) people over 75 (least vulnerable because they are more likely to die first from other causes)

Because many consumers are unwilling accept the severe restrictions of a low-risk diet, the label distinguishes between low-risk and moderate-risk levels of Alpha radiation and Strontium 49. In other words, consumers may opt for either a low-risk diet or medium-risk diet or go back and forth between the two.

Because Strontium 49 occurs only in beef products, it's possible to indicate the maximum number of beef servings per week that result in a low-risk or moderate-risk of contracting Strontium 49-caused illness. For example, children under 18 should consume no more than three standard servings of beef per week for a low-risk diet and no more than five standard servings for a moderate-risk diet.

Because Alpha radiation occurs in a wide range of food products, the risk of contracting Alpha-caused illness is spread over the individual's complete weekly diet. Therefore the label indicates the percentage of the maximum weekly limit for both risk levels that is contained in a standard serving. For example, for the under 18 population group, a serving of beef constitutes 6% of the maximum Alpha consumption for a low-risk diet and 4% for a medium-risk diet. For pregnant and nursing mothers, a serving of beef constitutes 9% of the maximum Alpha consumption for a low-risk diet and 7% for a medium-risk diet.

Although the phenomenon is not well understood, for children under 18 there is an enhanced risk due to the following interaction between Strontium 49 and Alpha radiation: If someone under 18 reaches the threshold of five standard servings of beef per week, that individual's risk of Alpha-caused illness roughly doubles at each of the two Alpha risk levels. This interaction must be indicated on the label. Furthermore, more such interactions may be discovered, so the label design will need to accommodate them.

The label your firm designs and tests must clearly and succinctly communicate all this information to very wide spectrum of the population, including low-skill readers and those with color confusion. The label should be a rectangle or rounded rectangle. Although there are no specified maximum dimensions, there is significant pressure from the food industry to keep the label small. Your design can incorporate representational art and color. Because the label should be integrated with the (planned) website and smartphone application, space must be reserved for a QR code.

When the beef labeling program begins, the same values will be used for all beef products. In other words, beef grown in Iowa and beef imported from Argentina will be presumed to pose the same levels of risk. Over time, however, the FDA and NIH hopes to distinguish among beef suppliers and authorize different values for, say, the labels on Iowan beef and Argentinian beef. Your design must accommodate this extra information.