Revised January 2003

FDA Labeling Cost Model

Final Report

Prepared for

Dr. Amber Jessup
DHHS/PHS/FDA/CFSAN/OSAS/DMST
200 C Street, SW
Mail Stop HFS0726
Washington, DC 20204

Prepared by

Mary K. Muth
Erica C. Gledhill
Shawn A. Karns
RTI
Health, Social, and Economics Research
Research Triangle Park, NC 27709

RTI Project Number 06673.010

RTI INTERNATIONAL

RTI Project Number
06673.010

FDA Labeling Cost Model

Final Report

Revised January 2003

Prepared for

Dr. Amber Jessup
DHHS/PHS/FDA/CFSAN/OSAS/DMST
200 C Street, SW
Mail Stop HFS0726
Washington, DC 20204

Prepared by

Mary K. Muth
Erica C. Gledhill
Shawn A. Karns
RTI
Health, Social, and Economics Research
Research Triangle Park, NC 27709

Contents

Figures

Tables

1 Introduction

Many of the food safety and nutrition regulations proposed by the Food and Drug Administration (FDA) require labeling changes for the affected products. In some cases, the labeling change is the purpose of the regulation, while in other cases, it is an indirect effect of the regulation. These labeling changes are part of the costs of complying with regulations and thus are included in the cost-benefit analyses conducted by FDA.

RTI updated the FDA labeling cost model to reflect FDA's current needs in estimating the costs of labeling food and dietary supplement products.

FDA contracted with RTI to update RTI's 1990 labeling cost model to make the model more relevant for the types of analyses currently conducted by FDA. This report provides background information on the process of changing the labeling information on food packaging, a description of the revised cost estimates used in the model, a description of the underlying assumptions and calculations used in developing the model, and instructions for working with the model to obtain specific cost estimates. In this section, we describe the project objectives and provide an overview of the report.

1.1 PROJECT OBJECTIVES

The objective of this project was to update RTI's 1990 labeling cost model to reflect FDA's current needs in estimating the costs of labeling changes associated with proposed food safety, nutrition, and dietary supplement regulations. In revising the labeling cost model, RTI

- developed the model in Stata for Windows with an interface in Microsoft Excel;
- updated the parameter estimates used to generate labeling cost estimates and provided a range of parameter estimates when appropriate;
- added dietary supplements, which have different labeling requirements than packaged food products, to the model;
- based the model on product or stockkeeping units (SKUs) rather than Standard Industrial Classification (SIC) codes; and
- updated SIC code designations to the corresponding North American Industry Classification System (NAICS) codes.

These changes make the model more current and more useful for analyzing the frequent small label changes that affect specific groups of food or supplement products.

1.2 OVERVIEW OF THE REPORT

This report is organized as follows. Section 2 provides an overview of the types of labels and packaging used on food and dietary supplement products, the printing methods used for both label and package printing, and the contents of labeling information that may be changed as a result of a regulation. Section 3 describes the process by which companies change the label information on their labels or packaging. While Section 2 is based primarily on secondary sources of information, Section 3 is based on information RTI collected while visiting packaging converters and interviewing food manufacturers. Section 4 describes the assumptions on which the model was developed, the cost estimates used in the model, and the equations for calculating the total costs of a labeling change. Section 5 provides instructions for using and updating the model. Appendix A presents a table listing product categories by NAICS codes and a table listing the individual Information Resources, Inc. (IRI) product types included in each product category. Finally, Appendix B includes the Stata program used to calculate the cost estimates and instructions for revising the Stata data files.

2 Overview of Packaging and Label Types and Printing Methods

In this section, we describe packaging and label types for food and dietary supplement products, the most commonly used printing methods, and the contents of food labeling. This information provides the background for describing the process of changing labeling information in Section 3.

2.1 PACKAGING AND LABEL TYPES

Labeling information may be printed directly on packaging or on labels and on both inner and outer packaging.

Labeling information can be displayed on a food or dietary supplement package in two ways—it can be printed directly onto the package or it can be printed on a label, which is then applied to the food package. Furthermore, some food and dietary supplement products use inner and outer packaging to enclose one product. Most of the time, the inner packaging will not contain labeling information, particularly if it is not packaged for individual sale. However, sometimes the inner packaging does have labeling information that must also be changed when a new labeling regulation occurs.

Packaging converters and food or dietary supplement manufacturers determine which printing method to use based on whether the labeling information is directly printed on the packaging or is preprinted on a label and on which material is used

for the packaging or label. We describe the types of food and dietary supplement packaging and labeling below.

2.1.1 Directly Printed Food Packaging

The advantages to printing labeling information directly onto the package are that the cost of paper and the two-step process of printing and applying are eliminated (Bruno, 1995). Direct printing also results in more attractive packaging, and the graphics will not inadvertently be removed during the process of manufacturing and shipping (NPES, 2000). However, direct printing may only be cost-effective with highly automated printing systems because of the high cost of packaging waste when an error occurs. Throwing away an entire package is much more costly than throwing away a preprinted label (Bruno, 1995).

The types of packages that are directly printed include cartons, flexible packaging, cans, rigid plastic containers, gable top cartons, and aseptic boxes.

Three basic types of packages that are directly printed are cartons, flexible packages, and metal cans. Other directly printed packages include rigid plastic containers, gable top cartons, and aseptic boxes (which are also known as drink boxes). All cartons and flexible packages are directly printed, but metal cans and rigid plastic containers can either be directly printed or have a label applied. We describe each of the major types of directly printed packaging below.

Cartons

Cartons made up 7.9 percent of the overall packaging market in 1993, but its share was expected to fall to 7.3 percent in 2000 (NPES, 2000). Cartons are made of either bleached or unbleached paperboard.[1] Cartons also differ in the method that they are cut and glued together before shipment to the manufacturer. Knockdown cartons are cartons for which the sides are already glued but not the tops and bottom so that the carton can be collapsed. The food or dietary supplement manufacturer pops open the carton, fills it, and glues the top and bottom closed. Although this type of packaging is easy for the manufacturer to fill, it is bulky; therefore, large amounts of inventory are usually not stored. In contrast to knockdown cartons, flat blank cartons are cut so that they are shipped as one flat piece of paperboard. The food

[1] Recycled unbleached cartons are not used if they would come into contact with the food.

manufacturer forms the cartons by folding and gluing all sides. Flat blank cartons are much less bulky than knockdown cartons; therefore, larger amounts of inventory can be stored.

The graphic designs on cartons usually have four colors but could have five or six. Because they are made of a paperboard material, 75 percent of cartons are printed with offset lithography. Rotogravure is used for many of the long-run items and is used to print approximately 15 percent of all cartons. Approximately 8 percent of all cartons are printed with flexography (NPES, 2000).

Flexible Packages

Flexible packages are single-walled units or laminations of several materials, usually paper, plastic film, and/or foil in various combinations. Flexible packages made up 16.2 percent of the overall packaging market in 1993, and their share was expected to rise to 16.5 percent in 2000. However, for food product packaging, Aaron Brody (2001) estimates that as much as 50 percent are packaged with flexible packaging. The reason for this is because more food manufacturers are eliminating the outer box in bag-in-the-box packaging and are relying entirely on the inner flexible package for complete packaging. Approximately 60 percent of flexible packages are printed with flexography, because of its low cost and ability to conform to the irregular shape of many flexible packages. Rotogravure is the print type for 20 percent of flexible packages, and the remaining 20 percent are unprinted, such as what is generally used for the inner bag in bag-in-the-box packaging (NPES, 2000).

Metal Cans

Metals cans used for food and beverage packaging are formed by using either two or three pieces of aluminum or steel. Two-piece cans have a base that is formed into a cup whereas three-piece cans have three distinct pieces: the base, the side (which is formed into a cylinder), and the top. All aluminum cans are two-piece cans and are usually used for packaging beverages. Steel cans are almost always used for food packaging, and approximately two-thirds of them are three-piece cans, while the remaining one-third are two-piece cans (Can Manufacturers Institute, 2001). Of all steel cans, only 20 percent are printed directly, while the other 80 percent are

unprinted and attached with a label (NPES, 2000). All two-piece aluminum beverage cans are directly printed in the round with special dry offset printing units that are built into the post can-forming machinery, while two- and three-piece steel cans are printed in the flat using offset. In 1993, 74 percent of all cans were two-piece aluminum cans and 26 percent were composed of steel. Overall, for all types of cans, 82 percent are printed with dry offset, 14 percent are left unprinted and attached with a label, and 4 percent are printed using standard offset (NPES, 2000).

Other Types of Packaging

Other types of directly printed packaging include rigid plastic packages, gable top cartons, and aseptic boxes. Rigid plastic packaging can be formed into many shapes including bottles, jars, and tubs. Plastic bottles and jars usually have a preprinted label attached, but many plastic tubs are printed directly. When a rigid plastic container is printed directly, it is usually done with offset. Gable top cartons are made of a plastic coated paperboard material that is sealed with a heat-sealed closure system to protect the product, usually juice or milk, from external factors that would cause it to deteriorate rapidly (Brody, 2000b). They are printed directly and are usually printed with flexography. Aseptic boxes are also generally used to hold fruit juices and milk. Aseptic processing involves heating liquids quickly to a high temperature to sterilize the liquid. The liquid is then cooled and placed into a sterile container. Aseptic boxes are made up of three layered materials—paper to provide stiffness and strength, layered polyethylene plastic to seal the package, and aluminum foil as a barrier against air and light (University of California at Davis, 2001). These containers are commonly printed with offset and rotogravure.

2.1.2 Preprinted Labels

The types of labels used on food and dietary supplement packages include glue-applied, pressure sensitive, heat-sealed, in-mold, heat transfer, and sleeve labels.

Food packages that are not printed directly have a preprinted label applied instead. Typical packages that have preprinted labels include glass bottles and jars, plastic bottles and jars, and steel metal cans (NPES, 2000). Using preprinted labels lowers inventory costs and has advantages for products with shorter production runs (NPES, 2000). Of all preprinted labels, 40 percent are printed with offset, 33 percent with flexography, and 7 percent with rotogravure

(NPES, 2000). A variety of substrates and application methods are used for printed labels. These include glue-applied labels, pressure-sensitive labels, heat-sealed and in-mold labels, heat transfer labels, and sleeve labels. Approximately 60 percent of all preprinted labels are paper, and 40 percent are plastic, foil, or laminates of plastic/foil/paper in various combinations (NPES, 2000). We describe each of the types of labels in more detail below.

Glue-Applied

Glue-applied labels, which are also known as "cut and stack" labels, are generally made of a paper substrate to which glue or adhesive is applied just before the label is attached to the container (Bruno, 1995). This type of label makes up approximately 45 percent of labels in the packaging market and is usually printed with offset (Bruno, 1995). This application technique is the cheapest process on a per-label basis (Freedonia Group, 1999) and has the highest speed of all labeling systems (Bruno, 1995).

Pressure-Sensitive

Pressure-sensitive labels are sticker-like labels with adhesive that is tacky at room temperature. They attach to a variety of different substrates with hand pressure. Pressure-sensitive labels are more expensive than glue-applied labels because they are pre-die cut and individually attached to a protective backing, which is thrown away after the label is applied (Hall, 1999). Although pressure-sensitive labels are one of the more expensive types of labels, they are the easiest to apply and make up approximately 45 percent of all labels (Bruno, 1995). They are the fastest growing segment of the label market (Bruno, 1995) and are expected to grow in the drug packaging market at the expense of heat-sealed systems because of their simplicity and efficiency (Jenkins and Osborn, 1993). Pressure-sensitive labels are composed of either plastic or paper and are usually printed with flexography (Bruno, 1995).

Heat-Sealed and In-Mold

Heat-sealed labels are printed on a special type of paper, then coated with a latent adhesive. When the label is to be applied to the package, a heated platen activates the adhesive just before it is attached. Two types of heat-sealed labels are currently used—an

instant form that becomes tacky immediately upon contact with the heated platen and a delayed heat-sealed form that has a few seconds' delay between contact with the platen and activation of the adhesive. Instant heat-sealed labels take longer to apply and are generally used for packaging perishable goods such as meats, cheeses, and bakery goods (Bruno, 1995). Delayed heat-sealed labels are used for heat-sensitive products like food and drugs so the heating equipment does not come near the product (Jenkins and Osborn, 1993). Heat-sealed labels are cleaner to apply than other types of labels and therefore are attractive for industries concerned with sanitary and hygienic processing, such as pharmaceuticals (Bruno, 1995). Heat-sealed labels are also more securely attached to the package than other labeling types because they have a strong bond to the container wall (Jenkins and Osborn, 1993). However, heat-sealed labels cannot be stored for more than 6 months because premature activation of the adhesive could occur (Bruno, 1995).

In-mold labels are a type of heat-sealed label for blow-molded plastic bottles. These types of labels become part of the bottle during the molding operation (Bruno, 1995). Because rotogravure is used to print in-mold labels, they tend to be more costly than other types of labels. They also tend to be more costly to apply because, if an error occurs in the label application process, the whole container must be scrapped (Freedonia Group, 1999).

Heat-Transfer

Heat-transfer labels are printed on a lacquer film rather than a paper or plastic substrate (Bruno, 1995). In the application process, a heated platen presses the printed ink area against a heated container, transferring the entire lacquer/ink image to another surface (Bruno, 1995). This is a very costly process because of the slow speed and high operating costs. Also, if there is any printing mistake, the whole container must be scrapped (Freedonia Group, 1999). Heat-transfer labels are usually printed with rotogravure and are typically used on squeeze bottles and tubes, like toothpaste and frosting (Bruno, 1995).

Sleeve (or Shrink)

Sleeve labels are made from plastic that is formed into a continuous tube that slips over a container. No adhesive is used because the label clings by its elastic nature. A more common type of sleeve labeling is the PVC or PP (types of plastic) sleeve that is slipped over the container and passed through a heat tunnel to shrink it. This type of label is often referred to as a shrink label. Often the sleeve label is applied to soft drink bottles and other irregular shaped containers. Flexography or rotogravure is usually used to print plastic sleeve labels (Bruno, 1995).

2.2 PRINTING METHODS

We describe each of the three main printing methods (rotogravure, offset, flexography) used on food and beverage packaging below. Each method has advantages and disadvantages for certain types of printing based on run lengths, cost, printing substrate, and image quality.

2.2.1 Rotogravure

The rotogravure printing method is used for long print runs and is the most costly printing method.

Rotogravure is an intaglio printing process in which the image area is below the nonimage area (Bruno, 1995). Rotogravure printing can be done using traditional printing methods or by direct digital-to-plate. In a traditional rotogravure process, proofs of the images for each printing plate are generated for use in the engraving process. In a digital-to-plate rotogravure process, the images are transmitted digitally for use in the engraving process.

From the proofs or a digital file, an engraving machine cuts cells into a copper cylinder using either electromechanical (diamond) engraving or chemical etching. Chemical etching, or conventional rotogravure, creates cells with equal areas but varying depths, while diamond engraving creates cells with varying areas as well as depths. The cylinder is then coated with chrome for durability. Rotogravure plates are the longest lasting of all of the printing methods and are capable of printing runs that go for millions of impressions (Bruno, 1995).

During the printing process, rotogravure cylinders are dipped in ink and a doctor blade scrapes off the excess ink. Rotogravure has unyielding plates that come in direct contact with the label or

package (Hawley, 2000). Rotogravure is the most expensive of the printing processes because of the costly copper cylinders, the required solvent recovery systems, the time required for engraving the cylinders, and a longer downtime during changeover from one printing run to the next. Because of the expensive cost and unyielding plates, rotogravure is ideally suited for long runs using inexpensive paper, but it is also used for approximately 10 percent of the flexible packaging market (Mykytiuk, 1999). Many manufacturers prefer rotogravure because it can reproduce high quality graphics.

2.2.2 Offset Lithography

The offset printing method is typically used on cartons, aluminum cans, and paper labels.

Offset lithography, which is commonly referred to as offset, is a planographic process in which the image and nonimage areas exist on the same plane. Offset plates are easier to produce and less costly than rotogravure (Bruno, 1995). Offset plates are mostly created using a photographic process from film, but the use of digital-to-plate methods is on the rise (Hawley, 2000).

In making offset plates, a water-receptive solution is coated on the nonimage area of the plate, and an ink-receptive solution is coated onto the image area of the plate (Bruno, 1995). These coatings are applied to ensure that, when the plate is dipped into the ink, only the image areas will pick up the ink and the ink will be repelled from the water-receptive nonimage areas. During the printing process, the plate is first dipped into the ink and then the image is transferred to a rubber blanket wrapped around a cylinder. The blanket, in turn, transfers the image to the substrate. The rubber cylinder allows the image to be printed on a wide range of substrates (Speirs, 1998). However, the one-dimensional blanket does not conform to unusual substrates as well as a two-dimensional flexographic plate (Hawley, 2000).

Another type of offset called dry (or waterless) offset is used for direct printing of two-piece aluminum cans. In the dry offset process, instead of coating the image and nonimage areas of the plate with special solutions, silicone rubber is placed in the nonprinting areas. The silicone rubber material is not ink-receptive so only the area not coated with the rubber material picks up the ink.

Offset is commonly used for printing paper materials, such as paperboard cartons and paper labels. Although the offset process is not able to print on many of the new packaging films, it is still the most common printing method today (Hawley, 2000). It is the most common printing method for glue-applied labels, paperboard cartons, metal cans, and paper labels (Bruno, 1995; Brody, 2000a).

2.2.3 Flexography

The flexography printing method is the least costly printing method.

Flexography is a relief printing process where the image area is raised above the nonimage area (Bruno, 1995). The plates are made from soft rubber-like sheets, which are then wrapped around a cylinder (Hawley, 2000). Flexographic plates are less expensive than both offset and rotogravure plates (Mykytiuk, 1999). The flexibility of the plates allows them to print on a variety of substrates, but it can also cause shifting during printing, which lowers the quality of the image. Flexography is used on substrates to which the one-dimensional blanket used in the offset printing process cannot conform (Hawley, 2000). These substrates include pressure-sensitive nonpaper labels and flexible packages (Bruno, 1995). However, flexography is also increasingly being used for printing paperboard cartons (Demetrician, 1996).

In the flexography process, a graphic image is burned onto a thin rubber-like sheet by placing the film, which is created from the proofs generated in the prepress process, on top of the rubber sheet and exposing it to a light source. The rubber sheet is washed in a machine with brushes that wipe away the nonimage areas. Because the image areas had been hardened by the light source, they remain. The sheet is then dried with heat. Creating plates for designs with process color is more complicated than with line colors because process color requires small cells to be burned into the rubber rather than solid areas. Therefore, the brushes need to wipe away small areas between the cells, which is more difficult than brushing away a large solid area as with designs using line colors.

Color separation is different for flexography than any other type of print. If the same color is going to be used in a design as both line color and process color, then they need to have separate plates, even though it is the same color. This is done to achieve better color-saturation of line colors without bleeding. Sometimes a

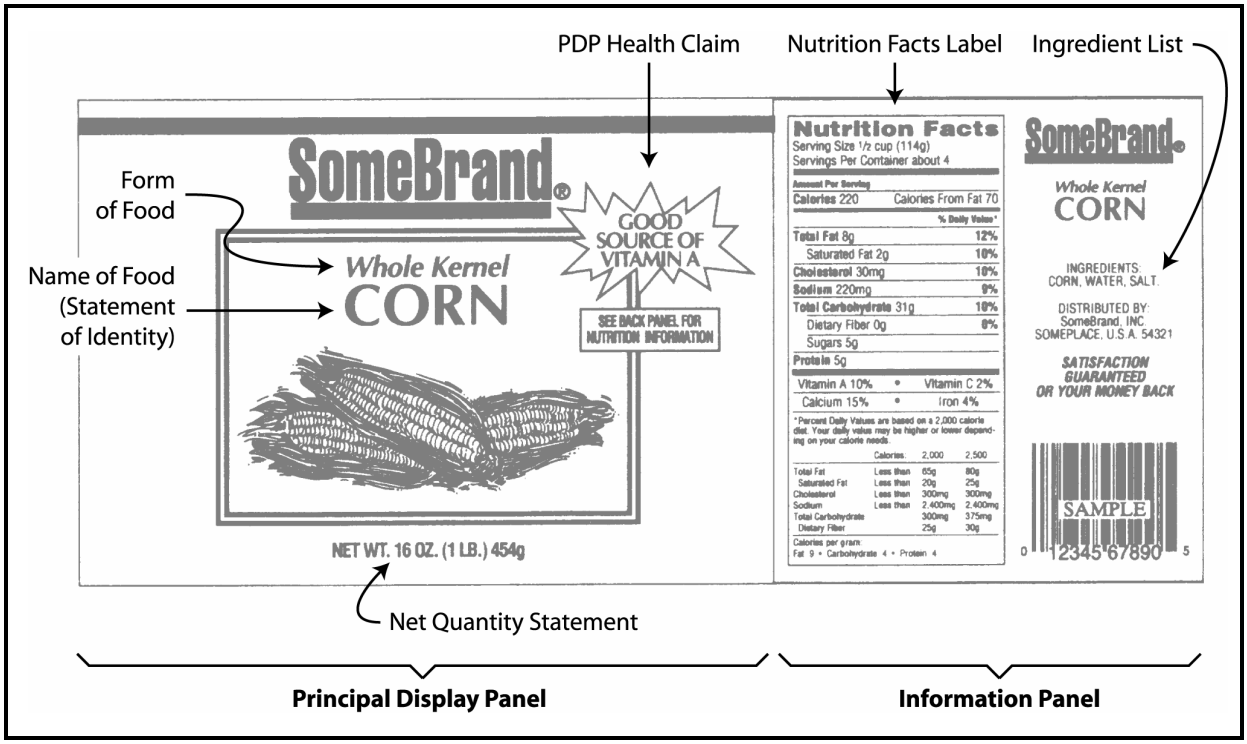
combination plate can be created for a color that is going to be used for both line and process, but the area of the images must be very small.

Flexography normally prints six to eight colors on a label or package. After printing, the printed substrate may be laminated with up to five layers of materials. The packages or labels are then slit and rolled or are made into preformed packages for delivery to the manufacturer.

2.3 LABEL CONTENTS

The two sections of the labeling information on a food or dietary supplement package are the Principal Display Panel (PDP) and the information panel (IP). As indicated in an example of a food product label in Figure 2-1, the PDP is the portion of the package label that faces the consumer when the package sits on a store shelf. The IP is the panel located immediately to the right of the PDP. Each panel must contain specific information about the product.

Figure 2-1. Examples of Parts of Food Labels that May Change as a Result of a Regulation
Which part of the label is affected determines the number of colors that must be changed and thus the complexity of making the change.



In the example product in Figure 2-1, a labeling regulation may affect the following parts of the PDP: the name of the food (the statement of identity or fanciful name), the form of the food or dietary supplement, the net quantity statement, or a nutrient content or health claim. Other parts of the PDP such as the brand name or vignette are unlikely to be affected by a labeling regulation. On the IP, a labeling regulation may affect, for example, the Nutrition Facts label or the ingredient list. If the product had or was required to have a caution statement or health claim on the PDP or IP, it might also be affected by a labeling regulation. Other parts of the IP such as the manufacturer information or the universal product code (UPC) are unlikely to be affected by a labeling regulation.

As discussed in more detail in Sections 3 and 4, the component(s) of the labeling that are changed determines how many colors on the labeling will have to be changed. Depending on the method of packaging and labeling and on the method of printing, as discussed in this section, the cost of making the change to each component of the labeling varies substantially. In particular, the cost of discarded inventory varies among the methods of packaging and labeling, and the cost of cutting or engraving new printing plates varies among the printing methods.

2.4 REFERENCES

Brody, Aaron L. 2000a. Offset on Plastic Yields High-Quality Short Runs. Brand Packaging (May/June). <http://www.packaginginfo.com>

Brody, Aaron L. 2000b. "Gable-Top Paperboard Cartons Move to the Food Aisles." *Food Technology* 54(10):101-103.

Brody, Aaron L. October 3, 2001. Personal communication with Mary Muth, RTI.

Bruno, Michael H., ed. 1995. *Label Industry Facts & Guidelines*, 2nd edition. Arlington, VA: Label Printing Industries of America.

Can Manufacturers Institute. Metal Can Shipments 1995: Material/Technology. <http://www.cancentral.com/mcsmt.cfm>. As obtained October 18, 2001.

Demetrician, Robert. 1996. *Label and Package Graphic Design.* Plainview, NY: Jelmar Publishing Co., Inc.

Freedonia Group. 1999. World Labels to 2003—Market Share, 1.5.1 Cost Considerations. <http://www.profound.com>.

Hall, Ian H. 1999. *Labels and Labelling*, 2nd edition. Surrey, U.K.: Pira International.

Hawley, R. Printbid Tutorial: Pre-Press. <http://www.printbid.com/styles/resources-tutorialprepress.htm>. As obtained on September 22, 2000.

Jenkins, Wilmer A., and Kenton R. Osborn. 1993. *Packaging Drugs and Pharmaceuticals*. Basel, Switzerland: Technomic Publishing Company, Inc.

Mykytiuk, Andrew. October 1999. Printing for Flexible Packaging. Flexible Packaging. <http://www.packaginginfo.com>.

NPES—The Association for Suppliers of Printing, Publishing, and Converting Technologies. The Packaging Study, Executive Summary. <http://www.npes.org/research/index.htm>. As obtained on December 11, 2000.

Speirs, Hugh M. 1998. *Introduction to Printing and Finishing* Surrey, U.K.: Pira International.

University of California at Davis. Reduce. <http://r4.ucdavis.edu/aboutR4/reduce/Reduce.htm>. As obtained August 2001.

3 The Process of Changing Food and Dietary Supplement Labeling

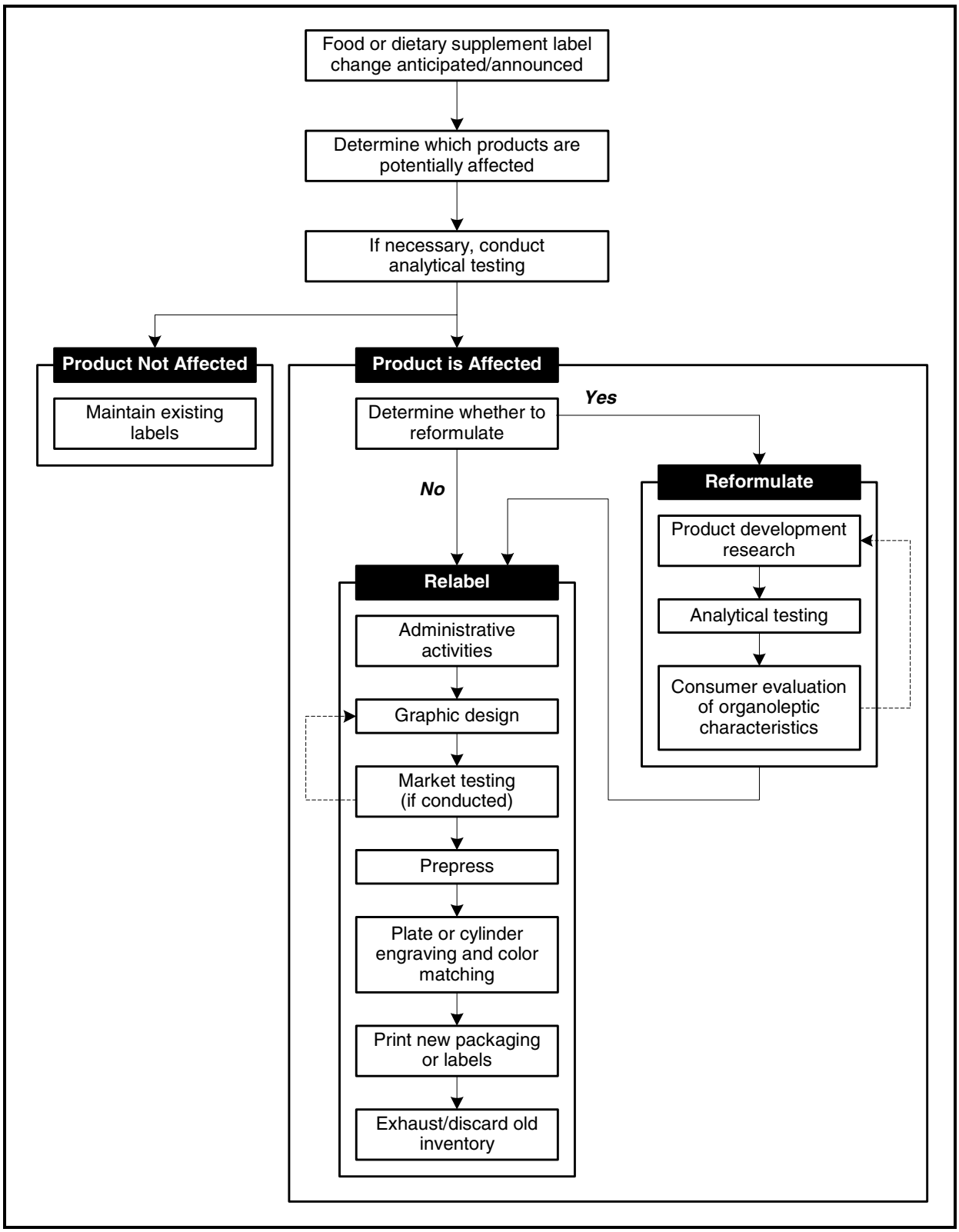
The overview of the process of changing labeling information provides the framework for understanding the cost estimates in Section 4.

To understand the process by which labeling information is changed, RTI visited packaging converters that use the rotogravure, offset lithography, and flexography printing methods; interviewed several food manufacturers about the steps in the process; and obtained detailed information from an industry packaging consultant. Based on our site visits and interviews, we developed a brief overview of the process of making changes to food and dietary supplement packaging. In general, the process is similar for all three primary printing methods. In this section, we describe the process step-by-step and discuss how the process differs depending on the compliance period.

3.1 OVERVIEW OF THE CHANGE PROCESS

Figure 3-1 provides an overview of the process by which the labeling information and graphics on food and dietary supplement products may be changed as a result of regulation. Once a food or dietary supplement manufacturer has determined that a product may be affected, the manufacturer may conduct analytical testing of the product. Results of the analytical tests would then influence the manufacturer's decision to reformulate the product. However, in many cases, reformulation would not be a likely response to the regulatory requirements, or the company may choose not to

Figure 3-1. Overview of the Label Change Process in Response to Regulation
The complexity of a labeling change determines which steps are required to make the change.



reformulate. Estimating the costs of reformulation is beyond the scope of the labeling costs model; thus, we focus on the process that occurs assuming either no reformulation or that the reformulation has already occurred. In either case, the manufacturer would change the labeling information on the product.

Labeling changes involve several internal departments within the company and as many as four outside entities.

Whether or not the manufacturer conducts analytical testing, it will follow a number of steps to initiate the change process. In general, the steps are as follows:

- conduct administrative activities,
- conduct analytical testing (in some cases),
- alter the graphic design,
- conduct market testing (in some cases),
- conduct prepress activities,
- conduct color matching (in some cases),
- engrave plates or cylinders, and
- print and manufacture (convert) labels and packaging material.

Several departments within the manufacturing firm (e.g., purchasing, marketing, legal, and regulatory) are involved in the process of making a labeling change. In this report, we refer to the combined set of activities conducted by these departments as administrative activities.

In addition to the departments within the manufacturing firm, several outside entities may be involved. In some cases, the food manufacturer may handle one or more of the steps in the process internally; however, it is more likely that these activities are outsourced to the following entities:

- a graphic designer,
- a prepress company,
- a plate or cylinder engraver, and
- a packaging converter (the company that manufactures and prints labels and/or packaging material).

In some cases, the packaging converter may do all of the above activities.

3.1.1 Administrative Activities

Throughout the process of making a change, several administrative activities on the part of the food or dietary supplement manufacturer must occur. Whether manufacturers devote separate departments to each of these activities depends on the size of the company. These departments might include the following:

- purchasing—work with outside vendors to supply graphic design, prepress and engraving, and package printing and conversion services;
- marketing—develop initial redesigned graphics and, if conducted, conduct or contract out market testing;
- legal—approve labeling information from a viewpoint of limiting liability;
- regulatory—approve labeling information from a viewpoint of satisfying FDA requirements;
- environmental—if changed, approve packaging materials from an environmental standpoint; and
- test kitchen—verify information corresponds to a reformulated product recipe.

Manufacturers have a routing sheet for each department to sign-off on the changed labeling as it is approved. In the other steps of the process described below, the departments listed above are involved in working with outside vendors to complete each activity.

3.1.2 Analytical Testing

A food or dietary supplement manufacturer may conduct analytical testing prior to changing its labeling.

As mentioned above, prior to initiating a labeling change, a food or dietary supplement manufacturer may conduct analytical testing of affected or potentially affected food products. For example, the manufacturer may test for total or specific nutrients, caffeine, allergens, pathogens, genetic modification, and botanical content (in the case of dietary supplements). To conduct analytical testing, a manufacturer will usually prepare a composite sample made up of several samples of the product. Based on information provided by the manufacturers we contacted, they usually test one composite sample but may test up to three samples. Many manufacturers already have some idea of the levels of the particular substance in their product from their routine quality control checks. In particular, some manufacturers told us they test products approximately every 2 years to verify initial test results. However, even if the manufacturer has data on a particular substance, if a

regulation involves that substance, the manufacturer would generally retest to confirm its data.

Testing may be done in-house, or samples may be sent to outside labs. Although larger food and dietary supplement manufacturers may have in-house labs, smaller manufacturers would rarely have in-house labs. To submit samples to an outside lab, manufacturers first notify the lab that the samples are coming. In the package, manufacturers label and identify the samples and, if the product is perishable, pack the product with ice packs. They also include specific written instructions for the tests to be performed and in some cases the expected levels of the substance for which they are testing. Once the tests are performed, the results are delivered to the manufacturer, who then can use the information in determining its method of compliance with a regulation.

3.1.3 Graphic Design

In most cases, an external graphic design firm creates the labeling design.

Once the food or dietary supplement manufacturer has determined that the information on a product's labeling must be changed, it develops its specifications for the change. Larger manufacturers may develop a mock-up of the changed design in-house prior to initiating contact with a graphic design company. Smaller manufacturers are more likely to rely entirely on the graphic design company for making a change according to its specifications. In either case, a representative from the marketing or purchasing department will initiate contact with the graphic design company. If the change requires changes in the colors used in the design, the manufacturer may include color swatches from the PANTONE® system of colors or another type of color sample.

If the graphic design company has digital files of the original labeling design, a required change can be made directly to the existing digital file. However, many graphic design companies still work with hand-prepared designs that must be redrawn to incorporate a change. If a required change is minor, the manufacturer may bypass the graphic design company and make the change directly at the prepress stage discussed below. Also, in some cases, the packaging converter may conduct the graphic design and prepress activities all in one shop.

3.1.4 Market Testing

Food and dietary supplement manufacturers only rarely conduct market testing for labeling purposes.

Once the preliminary new graphic design and labeling information have been created, manufacturers may conduct market testing of the new design. Most manufacturers do not conduct market testing; however, if they do, what they do is fairly limited.[1] The two general types of market testing that might be conducted include "qualitative studies," which are generally focus group studies, and "quantitative studies" in which individuals assess and rank attributes (also referred to as "controlled location studies"). For manufacturers that do conduct market testing, the type of market testing conducted and the number of studies conducted depend on whether they consider the change to be minor or major.

Food and dietary supplement manufacturers would generally consider a change to the information on the label's IP (e.g., Nutrition Facts panel or ingredients list) to be a minor change. For these types of minor changes, the graphic designer, if one is involved, would submit a proof to the manufacturer for approval by the various departments within the company. In this case, the reviews are primarily conducted internally, and the food manufacturer would almost never conduct an external market evaluation.

In comparison, food and dietary supplement manufacturers would generally consider most changes to the label's PDP as a major change requiring a redesign. In addition, any additions or changes to a health claim or caution statement, whether on the IP or PDP, might in some cases be considered a major change requiring a redesign. If food manufacturers redesign the label, they are more likely to conduct qualitative or quantitative market testing.

Prior to conducting market testing, the graphic designer may create several design options from which the food manufacturer chooses. After conducting an internal evaluation, the food manufacturer narrows the choices and may have the graphic designer create "dummy" packages by printing the redesigned labeling on a printer with good color reproducibility and manually mounting the labeling on a shape that is approximately the same dimensions of the final packaging. Using either the labeling design by itself or the

[1] Market testing is more often done when the form of the packaging itself is changing rather than just the graphic design or labeling information.

"dummy" packages, the food manufacturer then conducts or contracts out the market testing activities. The manufacturers we interviewed reported conducting between two and eight focus groups, some with regional dispersion, and conducting quantitative studies with approximately 150 individuals.

Once market testing has been conducted, the manufacturer selects its final choice and then routes the final design through the various departments discussed in Section 3.1.1 for internal approvals.

3.1.5 Prepress Activities

During prepress operations, the design created by the graphic designer is converted into the film or files used to prepare the printing cylinders or plates.

Once the various departments within the manufacturing company have approved the labeling design, the manufacturer contracts with a prepress trade shop or directly with the converter to conduct prepress activities. The role of prepress operations is to convert the design created by the designer into the film or files that are used to engrave or etch the printing plates or cylinders. In converting the design, the prepress operator separates the colors of the design into each of the colors that will be printed by each individual plate or cylinder. Depending on the design, the colors may be generated by the four-color process (also called "screen") that combines yellow, magenta, cyan, and black in the combinations necessary to achieve a particular shade, or the colors may be special or "line" colors that are premixed ink colors. Photographic images on packages or labels are usually generated by the four-color process, while brand-specific colors are usually line colors. Many labels and packages will have a combination of process color and line colors. The total number of colors is limited by the actual printing press that is used for printing the packaging or labeling with the maximum number generally ranging from six to nine colors.[2]

The operator then "traps" the design so that, as each color is printed onto the packaging or labeling substrate, the colors overlap slightly. This step is necessary because, as each color is printed individually, some slippage may occur in the printing process; thus, trapping prevents white or blank spaces from occurring between the colors.

At this stage, the designer will generate proofs, which are also sometimes referred to as color keys. The proofs are sent to the food

[2]At least one color station on a printing press is usually used for finishing varnishes. Thus, a 10-station press can print a maximum of nine colors.

manufacturer for final approval prior to engraving or etching the printing plates or cylinders. The proofs may also be used later in the process for verifying the actual printed packaging and labeling materials as they are generated. In some types of printing processes, the proofs are used to create the films that are used to etch the printing plates or cylinders. In comparison, in the digital-to-plate printing process, the proofs are used only for approval and verification of the process, and the actual engraving of the cylinders is directed by a computer program.

Once the proofs have been generated, all changes in the graphic design must be made manually or the graphic design and prepress operations must be repeated. If the films are used for etching the printing plates or cylinders, a new film would have to be generated to make a change. In the digital-to-plate process, the computer file used to engrave the plate or cylinder must be manually altered. However, at this stage, all of the text in the computer file is captured as "graphical elements" rather than commonly used fonts on the computer. Thus, even minor changes to the graphic design at this stage are difficult, if not impractical, to make.

3.1.6 Cylinder and Plate Engraving

The cylinders or plates are engraved using the film or files prepared during prepress.

Once the film or computer file of the image has been generated, the plates or cylinders are engraved or etched. The engraving or etching may be done by an outside engraving shop or in-house by the packaging converter. As described in Section 2.2, each printing type has a different method of engraving. In the rotogravure process, small ink cells are cut into copper-plated cylinders using either mechanical engraving or acid etching, and then the cylinders are chrome-plated. In the offset lithography process, the image area of the plate is coated with an ink-receptive liquid and the nonimage area is coated with a liquid that will repel ink. Finally, in the flexography process, a rubber-like sheet is etched by exposing the nonimage areas to a light source to harden the material. The exposed sheet is washed with a solution that removes the nonimage areas, and then it is attached to a cylinder for mounting on the printing machine.

3.1.7 Color Matching

Color matching is necessary to match ink colors to specific brand or product colors.

Food manufacturers may specify that certain color inks used to print the packaging and labeling match the specific colors in the graphic design, especially if the colors are associated with a particular well-known brand. (For process color, color matching is not necessary because industry standard colors are used for cyan, magenta, yellow, and black.) The color-matching process is performed either by an outside ink supplier or by the converter. In general, it takes a color specialist about 1 to 2 hours to match a color. The food manufacturer receives a sample of the matched color to approve prior to printing. Once approved, the specifications for the color match are then used to prepare the ink to be used in the printing process.

3.1.8 Label and Package Printing

The final step in the process is printing the labels and packaging and, depending on the intended use, coating application, laminating, creasing, folding, and cutting.

Once the cylinders or plates have been engraved or etched, color matching has been completed, and the label or packaging material has been delivered, the packaging converter can begin the label or package printing job. If the job is the first run using new cylinders or plates, a representative from the food manufacturer may be present to observe the initial run.

To prepare for the job, the cylinders or plates are mounted sequentially on the printing machine, and the printing inks are connected to the associated cylinder or plate. The substrate may be either sheet fed, where the substrate moves through the machine in individual sheets, or web-fed where it moves as one long sheet to be cut into individual sheets at the end. Whether sheet-fed or web-fed is used depends on the type of substrate.

Once the substrate enters the machine, each color is printed individually as the substrate passes through each cylinder or plate. Between each color, the substrate passes through an oven that dries the ink before the next color is applied. While the substrate is moving through the printing machine, a worker continually verifies that the colors are printing within the tolerances of the design traps. After all of the colors have been printed on the substrate, varnishes may be applied to provide glossiness and protection from moisture. Following the printing process, flexible packaging and labels may be laminated with other substrates such as plastic or metallic inner and outer coatings.

Once packaging or labels have been printed, coated with varnishes, and laminated, they are cut and formed to the manufacturer's specifications. In the case of flexible packaging, the roll of packaging material is run through a cutter to cut it into single rolls of packaging. The material may then be rolled onto a smaller cylinder to fit on the machinery used by the manufacturers to package food, or the packaging converter may form the material into preformed pouches. For cartons, each carton is cut, creased for folds, and then stacked for delivery to the manufacturer. Depending on the type, labels may either be delivered on rolls or banded together for delivery to the manufacturer.

The plates or cylinders used in the printing process are then stored for later use. Because they are plated with chrome, rotogravure cylinders are the most durable and can print millions of impressions. In comparison, offset plates are less durable. Finally, because of the rubber-like material used in flexography cylinders, they are the least durable.

3.2 EFFECTS OF DIFFERENCES IN THE COMPLIANCE PERIOD

Because of the number of steps involved in changing the information on food and dietary supplement packaging and labeling, the entire process generally takes several months. Although some food manufacturers of branded products may change their labeling information several times a year, other food manufacturers, particularly for private label products, may change their labeling information every few years. In this section, we discuss differences in the process for 12-, 24-, and 36-month compliance periods and what food manufacturers might do if the compliance period were extremely short.

3.2.1 Differences for 12-, 24-, and 36-Month Compliance Periods

FDA periodically announces uniform compliance dates for new food labeling requirements (FDA, 2000).[3] The purpose of the uniform compliance date is to allow sufficient lead time for food

[3]The uniform compliance date applies only to food products and not to dietary supplement products.

manufacturers to develop new labeling materials, deplete existing inventories, and coordinate multiple labeling changes. For labeling regulations issued between January 1, 2001, and December 31, 2002, the next uniform compliance date is January 1, 2004. Thus, food manufacturers have a minimum of 12 months to comply with a regulation but may have as much as 36 months to comply.

Compliance costs decrease as the length of the compliance period increases primarily because more manufacturers can coordinate required changes with scheduled changes.

In developing the labeling cost model, we assessed the differences in the effects of regulations with 12-, 24-, and 36-month compliance periods. The compliance period affects the following:

- whether food manufacturers can coordinate a change required by a regulation with a scheduled change,
- whether food manufacturers would likely incur overtime or rush charges, and
- the volume of packaging or labeling inventory that must be discarded.

Depending on when the required labeling change is announced, food manufacturers may or may not be able to coordinate the change with a scheduled labeling change. If they can coordinate, then the incremental costs of making the required change would be less than if they made the change separately. In many cases, the incremental costs may be zero. However, if the required change affects a key part of the labeling design, the incremental costs may be substantial. Because food manufacturers redesign labeling for branded products on a more frequent basis than for private label products, they can coordinate a greater percentage of required changes with scheduled changes. In Section 4.2.1, we describe our specific assumptions for branded and private label products under each of the compliance period scenarios.

Differences in the effects of 12-, 24-, and 36-month compliance periods also occur because of the length of time it takes to coordinate the various steps in the process of changing labeling information (e.g., graphic design, prepress services, plate and cylinder engraving). Some of the companies we interviewed said that they cannot coordinate all of these activities in 1 year, particularly if a large number of products are affected. They also indicated that they might incur overtime or upcharges for rushing the steps in the process. One company we interviewed cited expected upcharges of 5 to 10 percent with a compliance period of 12 months. In addition, in the comments submitted to FDA on

trans fatty acid labeling, one company said that overtime charges alone would increase the costs of producing new labels by 20 percent if the compliance period were only 1 year (Angele, 2000). To account for upcharges and overtime charges for the 12-month compliance period, we increased the costs of administrative, graphic design, prepress, and engraving activities by 10 percent relative to the 24-month and 36-month compliance periods.

Finally, differences in the effects of the compliance period occur because of differences in the volume of packaging or labeling inventory that must be discarded. Manufacturers of private label products may order more than 1 year's inventory and potentially up to 3 years' inventory of packaging or labels at a time. Manufacturers of branded products, in comparison, generally do not order more than 1 year's inventory of packaging or labels at a time because they frequently update the labeling information for marketing reasons. Both private label and branded manufacturers using the bulkiest packaging materials such as egg cartons and coffee cans are unlikely to have more than a few months' inventory at a time. In Section 4.2.5, we discuss the assumptions we used for 12-, 24-, and 36-month compliance periods to calculate the costs of discarded inventory. The percentages of remaining inventory for each of the compliance periods depend on the bulkiness of the packaging and whether the product is branded or private label.

3.2.2 Responses to Very Short Compliance Periods

In reaction to a very short compliance period, manufacturers might comply by applying a pressure-sensitive sticker.

A compliance period of less than 1 year would be generally considered a very short compliance period by most food and dietary supplement manufacturers. In these situations, some manufacturers may respond by placing a preprinted, pressure-sensitive sticker on each package. The pressure-sensitive stickers that would be used would likely be printed in one or two colors and cost between 1 and 2 cents each (Brody, 2001). Some manufacturers already use stickers on promotional and imported items, but they generally do so on very few products. For some types of products, such as case-ready meats, manufacturers already routinely apply stickers to every product. However, most other types of manufacturers are unlikely to have the type of equipment necessary to apply stickers.

The difficulty in using stickers as a short-term solution for a very short compliance period arises because of the logistics of applying a sticker and because of the time involved in applying the sticker, which may cause bottlenecks and thus delay shipments. In addition to the logistical issues, the manufacturer may incur upcharges in the process of changing its permanent packaging and labeling information. If manufacturers speed up this process, the costs of graphic design, prepress, and conversion would likely be escalated, particularly if a lot of their own products are affected or a lot of other manufacturers' products are affected. Furthermore, if they do not apply a sticker to all of their existing packaging or labeling, they may have substantial discarded inventory costs (both the value of the material and the cost of landfill disposal).

To apply a sticker on each package, manufacturers may choose to buy a piece of machinery that applies pressure-sensitive stickers, or they may choose to hire workers to apply the stickers manually. If they choose to purchase the machinery, they would need to purchase one machine for each line and would need the necessary floor space to install and operate the machine. At a cost of approximately $10,000 for a machine that can apply approximately 200 stickers in an hour, most manufacturers would need between one and five machines and thus incur costs in the range of $10,000 to $50,000 (Brody, 2001). The line operator would usually be responsible for manning the sticker applicator; thus, the manufacturer would not incur substantially increased labor costs.

Alternatively, as we assumed in the labeling cost model, the manufacturer may choose to apply a sticker using manual labor. A worker would remove each sticker from its backing and apply it to each individual package. In addition, the manufacturer would need to set up a quality control check to ensure that each package has a sticker. If the packages are on a conveyor belt, a worker would take approximately 1 second to apply each sticker (Brody, 2001). If the packages are not on a conveyer belt, a worker would take 2 to 4 seconds to apply a sticker (Brody, 2001). In either case, the process of applying the sticker would create bottlenecks prior to the shipping process, and the manufacturer would incur substantially increased labor costs. Some manufacturers reported that they would not be able to meet their orders in this situation and would likely lose sales.

3.3 REFERENCES

Angele, S.M., Nabisco, Inc. April 17, 2000. "Re: (Docket No. 94P-0036) Food Labeling: Trans Fatty Acids in Nutrition Labeling, Nutrient Content Claims and Health Claims." Dockets Management Branch, Food and Drug Administration, Rockville, Maryland.

Brody, A., Rubbright-Brody, Inc. August 1, 2001. Personal communication with Mary Muth, RTI.

Food and Drug Administration, Department of Health and Human Services. November 20, 2000. "Uniform Compliance Data for Food Labeling Regulations." *Federal Register* 65(224):69666-69667.

4 Labeling Cost Model Assumptions, Data, and Calculations

In this section, we describe the assumptions used in developing the labeling cost model, present the data for the model, and explain the calculations that underlie the cost estimates. This information provides the background that a user of the model may need to select the model inputs (as described in Section 5).

4.1 LABELING COST MODEL ASSUMPTIONS

The labeling cost model includes food and dietary supplement products under FDA's jurisdiction.

The labeling cost model provides estimates of the costs of making labeling changes for the range of food and dietary supplement products under FDA's jurisdiction. Thus, the model explicitly excludes alcoholic beverages and meat and poultry products. In addition, some types of products are excluded because the products do not have scannable UPC codes. Because they do not have UPC codes, they are not part of the scanner data available from IRI, which is the source of the product information in the model. These products include, for example, bulk cheeses cut and packaged in the store, bulk foods put into bags by the consumer, and fresh produce. However, in general, the labeling information for these products is provided at point-of-sale and is currently voluntary.

The key assumptions used in developing the labeling cost model are as follows:

- **Depending on the compliance period, some food and dietary supplement manufacturers will be able to coordinate a labeling change required as a result of an FDA regulation with a scheduled labeling change.** If the labeling change could be coordinated with a scheduled labeling change, it is unlikely the regulatory requirements would result in additional incremental costs. According to our industry contacts, the pricing for graphic design services does not differ substantially if additional changes are made because of a regulatory requirement at the same time as a scheduled labeling change. Costs for activities other than graphic design would similarly not be affected. Our assumptions about the proportion of SKUs that could be changed with a scheduled label change are presented in Table 4-1. Because these estimates are based on limited information from manufacturers and because the true proportions vary by product category, the labeling cost model allows the user to alter these values.[1]
- **Manufacturers make the labeling change required as a result of an FDA regulation by itself and do not at the same time make changes unrelated to the regulatory requirements.** In selecting the model inputs, the user chooses which parts of the labeling information will likely be affected. Thus, the cost estimates are generated based on these inputs and do not account for the fact that some manufacturers may take the opportunity to make other changes that would normally be part of the next scheduled labeling change.
- **The administrative costs associated with making a labeling change are on an SKU basis rather than a product-level or company-level basis.**[2] Each individual product may have several SKUs associated with different sizes or types of packaging. The administrative costs of making a labeling change include the costs associated with contracting out aspects of the labeling change work and then approving the changes in the various manufacturing departments (described in Section 3.1). We assumed that the costs depend on the number of SKUs affected rather than a fixed amount per company because each individual SKU must go through the same contracting and approval process.

[1] We recommend that, when FDA requests comments on a proposed rule that requires a labeling change, it specifically asks what proportion of private label and branded labeling changes could be coordinated with a scheduled labeling change for the minimum expected compliance period.

[2] This assumption differs from the 1990 labeling cost model in which administrative costs were calculated on a per-company basis.

Table 4-1. Proportion of SKUs that Could Be Coordinated with a Scheduled Labeling Change (default values)
The user of the model may accept these default values or change them based on other information.

Compliance Period	Proportion of SKUs	
	Branded	Private Label
6-month	5%	0%
12-month	33%	5%
24-month	67%	33%
36-month	100%	67%

- **The costs associated with redesigning a label, conducting prepress operations, and engraving or etching the plates or cylinders are on an SKU basis.** Manufacturers incur the costs associated with all of the activities for preparing to print new labels or packaging on an SKU basis because each is treated separately throughout the process.
- **The costs of administrative, redesign, prepress, and engraving or etching activities are 10 percent higher under the 6- or 12-month compliance period than under the 24- or 36-month compliance period.** When manufacturers must coordinate labeling changes to many products at once, they may incur overtime charges internally or rush charges for design, prepress, and engraving or etching activities conducted by outside companies.
- **The costs associated with analytical testing and market testing are on a product basis.** The composite sample submitted for analytical testing is the same regardless of how the product is packaged and sold; thus, manufacturers incur costs on a product (or formula) basis. Similarly, manufacturers conduct market testing on a product (or formula) basis.
- **The differences in the costs of making changes to private label and branded products occur primarily because of differences in the frequency for redesigning labels and the amount of inventory typically held.** We assumed that the other costs associated with making changes are the same for both private label and branded products.
- **Manufacturers are, on average, halfway through their order of packaging or label inventory at the time the labeling change is required to be completed.** Although some manufacturers may have recently ordered new packaging or label material, an equal number will be nearing the end of their existing inventories.

Additional specific assumptions were required for particular data elements in the model. These assumptions are described as part of the discussion of the model data in Section 4.2.

4.2 LABELING COST MODEL DATA

In this section, we present the data that underlie the cost calculations for the model. These include the product categories and types, the number of colors associated with each part of the label affected by a regulation, the SKU-level costs, the product-level costs, and discarded inventory costs.

4.2.1 Product Categories and Types

Using scanner data obtained through FDA from IRI, we collapsed and reorganized approximately 700 food and dietary supplement product categories into approximately 140 product categories based on similarity of use of the products and storage requirements (e.g., shelf stable, refrigerated, and frozen). These 140 product categories form the core of the labeling cost model and are the product categories that the user chooses while executing the model. Table 4-2 lists each of the product categories, organized by type of product, with a description of a representative product for the product category and the number of SKUs and annual units sold.[3] These 140 product categories represent approximately 354,000 SKUs and $192.5 billion dollars in sales in grocery stores, drug stores, and mass merchandise stores in 1999.

Because of the complexity of determining the costs of changing the labeling on each individual product, we based our cost estimates on a representative product within each category. We determined the representative product indicated in Table 4-2 using a three-step process. First, within each product category, we sorted the individual IRI SKU-level records by annual sales volume and then

[3]Appendix Table A-1 categorizes these product categories by NAICS code. Appendix Table A-2 lists the IRI categories included in each product category.

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002)
The cost estimates for making a labeling change are based on the printing and packaging method for a representative product.

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Baked Goods								
Bakery Snacks—Non-Rfg	Little Debbie Swiss Cake Rolls	13 oz	Knock down carton	Offset Lithography	4,988	2,817	1,098.4	172.9
Bakery Snacks—Rfg	Entenmann's Ultimate Crumb Cake	1 lb 3 oz	Flat blank carton	Offset Lithography	43	65	1.3	1.2
Bread/Rolls—Non-Rfg	Sunbeam Bread	24 oz	Plastic bag/pouch	Flexography	13,822	9,245	3,076.0	2,057.3
Bread/Rolls—Rfg & Fz	Lender's Bagels	12 oz	Plastic bag/pouch	Flexography	1,236	198	354.9	47.9
Breadcrumbs/Batters/ Croutons	Shake n' Bake	6 oz	Knock down carton	Offset Lithography	1,013	147	204.5	29.7
Cookies	Oreos Cookies	1 lb 4 oz	Plastic bag/pouch	Flexography	7,383	1,415	2,148.2	348.0
Crackers	Ritz	1 lb	Knock down carton	Rotogravure	2,898	622	1,676.9	210.4
Snack & Granola Bars	Sunbelt Granola Bar	10 oz	Knock down carton	Offset Lithography	1,184	109	600.8	34.9
Baking Ingredients								
Baking Ingredients	Nestle Tollhouse Morsels	12 oz	Plastic bag/pouch	Flexography	1,495	303	613.3	121.4
Baking Ingredients—Powders	Arm & Hammer Baking Soda	1 lb	Knock down carton	Rotogravure	149	24	151.8	17.9
Baking Mixes	Duncan Hines Cake Mix	18.25 oz	Knock down carton	Offset Lithography	1,612	313	1,115.1	55.5
Dough—Rfg & Fz	Pillsbury Crescent Rolls	8 oz	Spiral wound container	Rotogravure	507	220	777.3	230.4
Flour/Meal	Gold Medal Flour	5 lb	Paper bag	Flexography	1,468	278	330.8	62.6

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Baking Ingredients (continued)								
Nuts—Baking Nuts	Diamond Chopped Walnuts	8 oz	Plastic bag/pouch	Flexography	1,113	228	109.5	22.4
Pizza—Crust/Dough	Pillsbury Pizza Crust	10 oz	Spiral wound container	Rotogravure	132	40	38.5	6.4
Beverages								
Bottled Water	Poland Water	1 gallon	Label—pressure sensitive	Flexography	2,850	1,465	1,095.5	563.1
Carbonated Beverages—Regular[b]	Coca-Cola	2 liter	Label—cut & stack	Flexography	2,188	440	3,207.2	476.0
Carbonated Beverages—Regular[c]	Coca-Cola	12 pack carton	Knock down carton	Offset Lithography	1,633	329	2,394.9	355.5
		12 oz can	Metal can	Offset Lithography				
Carbonated Beverages—Sugar Substitute[b]	Diet Coke	2 liter	Label—cut & stack	Flexography	461	108	1,129.7	100.4
Carbonated Beverages—Sugar Substitute[c]	Diet Coke	12 pack carton	Knock down carton	Offset Lithography	419	99	1,025.8	91.2
		12 oz can	Metal can	Offset Lithography				
Carbonated Beverages—Water/Club Soda	Canada Dry Club Soda	1 liter	Label—cut & stack	Flexography	1,083	720	360.5	239.8
Coffee—Ground	Folgers Classic Roast Ground Coffee	13 oz	Label—shrink wrap	Flexography	2,183	338	567.7	63.7
Coffee—Instant	Folgers Classic Roast Instant Coffee	8 oz	Label—cut & stack	Rotogravure	486	139	189.8	14.7

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Beverages (continued)								
Coffee—Whole	Folgers French Roast Whole Bean Coffee	11 oz	Plastic bag/pouch	Rotogravure	1,460	276	43.5	7.0
Creamer/Coffee Additives—Non-Rfg	Coffee-Mate	16 oz	Label—shrink wrap	Flexography	487	360	90.9	67.2
Creamer—Rfg & Fz	Coffee-Mate	16 oz	Gable top carton	Rotogravure	989	492	455	226.2
Drink Mixes—Cocktail Mixes	Jose Cuervo Margarita Mix	33.8 oz	Label—cut & stack	Offset Lithography	561	19	32.3	0.8
Drink Mixes—Milk/Cocoa Dry Mixes	Swiss Miss	10 oz (10 1-oz packets)	Knock down carton	Offset Lithography	449	165	164.4	27.3
Drink Mixes—Other	Kool-Aid Grape	14 oz (makes 2 qt)	Paper/foil packet	Rotogravure	439	186	1,188.1	56.3
Isotonic Drinks	Gatorade Lemon-Lime	32 oz	Label—cut & stack	Flexography	811	71	517.9	12.7
Juices—Aseptic[c]	10-pack Hi-C Grape	10 pack wrapper	Flat blank carton	Offset Lithography	579	48	379.4	13.6
		6.75 oz box	Aseptic box	Offset Lithography				
Juices—Bottled	Motts Apple Juice	64 oz	Label—cut & stack	Offset Lithography	4,837	1,169	1,791.2	432.8
Juices—Canned	Dole Pineapple Juice	46 oz	Label—cut & stack	Offset Lithography	962	203	469.8	99.2
Juices—Concentrate, Rfg & Fz	Minute Maid Frozen Orange Juice Concentrate	12 oz	Spiral wound container	Rotogravure	469	283	531.2	320.6
Juices—Rfg	Tropicana Orange Juice	2 qt	Gable top carton	Offset Lithography	3,303	825	1,409.6	352.2
Milk—Condensed	Carnation Evaporated Milk	12 oz	Label—cut & stack	Offset Lithography	91	78	200.2	172.4
Milk—Flavored/Substitutes	Nestle Nesquik Chocolate Milk	32 oz	Label—shrink wrap	Rotogravure	2,239	633	312.9	88.4

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Beverages (continued)								
Milk—Powdered	Kroger Dry Milk	9.6 oz	Plastic bag/pouch	Flexography	61	68	6.6	7.3
Milk—Rfg	Kroger Low-Fat Milk	1 gallon	Label—pressure sensitive	Flexography	3,855	6,902	1,529.3	2,738.0
Non-Fruit Drinks	Mocha Frappuccino	9.5 oz	Label—cut & stack	Offset Lithography	433	4	150.6	1.2
Tea—Canned/Bottled	Snapple Diet Peach Tea	16 oz	Label—cut & stack	Offset Lithography	1,099	85	429.7	20.9
Tea—Instant	Lipton Ice Tea	26.5 oz	Label—cut & stack	Rotogravure	169	191	63.0	22.5
Tea—Loose	Lipton Tea Bags	8 oz (100 bags)	Flat blank carton	Offset Lithography	2,226	248	269.2	30.0
Breakfast Foods								
Breakfast Food—Frozen	Eggo Waffles	12.3 oz	Knock down carton	Offset Lithography	437	78	413.2	34.9
Breakfast Food—Instant[c]	Carnation Instant Breakfast	10 packet carton	Knock down carton	Offset Lithography	57	32	30.4	1.9
		1.26 oz packet	Paper/foil packet	Offset Lithography				
Breakfast Food—Ready to Eat	Kelloggs Pop Tart	14.7 oz	Knock down carton	Offset Lithography	197	94	259.0	64.3
Cereal	General Mills Cereal-Cheerios	15 oz	Knock down carton	Offset Lithography	1,773	961	2,657.1	343.7
Candy & Gum								
Chocolate Candy—Single Serve	Snickers	2.07 oz	Plastic bag/pouch	Flexography	1,100	29	1,712.7	0.35
Chocolate Candy—Snack	Hershey's Kisses	13 oz	Plastic bag/pouch	Flexography	2,338	217	1,193.4	6.0

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Candy & Gum (continued)								
Gum—Regular Gum	Wrigley Gum	17 sticks	Plastic bag/pouch	Rotogravure	910	68	743.6	3.2
Gum—Sugarless Gum	Extra Gum	15 sticks	Plastic bag/pouch	Rotogravure	156	1	528.0	<0.1
Nonchocolate Candy—Diet	Lifesavers Delites	2.75 oz	Plastic bag/pouch	Rotogravure	559	97	46.4	5.0
Nonchocolate Candy—Kits	Marzetti's Caramel Apple Dip	18 oz	Plastic tub	Offset Lithography	219	24	31.4	1.4
Nonchocolate Candy—Pkg & Roll	Lifesavers	6.25 oz	Plastic bag/pouch	Rotogravure	2,618	535	895.2	28.0
Nonchocolate Candy—Single Serve	Skittles	2.17 oz	Plastic bag/pouch	Rotogravure	3,306	420	750.0	12.2
Nonchocolate Candy—Snack	Twizzlers Strawberry	16 oz	Plastic bag/pouch	Flexography	3,122	837	562.5	90.5
Seasonal Candy	Reese's Peanut Butter Cup	1.6 oz	Plastic bag/pouch	Flexography	5,491	383	1,257.6	19.3
Condiments/Dips/Spreads								
Condiments—Non-Rfg	Heinz Ketchup	24 oz	Label—cut & stack	Rotogravure	1,345	383	439.7	125.2
Condiments—Rfg	Atheno's Hummus	7 oz lid	Plastic tub	Offset Lithography	584	33	25.8	0.9
		7 oz tub	Label—pressure sensitive	Flexography				
Dips—Dry Mixes	Hidden Valley Ranch	1.0 oz	Paper/foil packet	Rotogravure	147	37	36.2	2.6
Dips—Rfg & Fz	Kroger French Onion Dip	16 oz	Plastic tub	Offset Lithography	1,188	317	155.9	41.6
Dips—Shelf Stable	Frito Lay Dip	9 oz	Label—cut & stack	Offset Lithography	397	40	81.3	3.4
Jams/Jellies/Preserves	Welch's Jelly	32 oz	Label—cut & stack	Offset Lithography	4,106	1,581	291.0	112.0

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Condiments/Dips/Spreads (continued)								
Mayonnaise	Kraft Miracle Whip	32 oz	Label—cut & stack	Offset Lithography	314	95	461.5	63.4
Peanut Butter	Jif Creamy Peanut Butter	18 oz	Label—cut & stack	Offset Lithography	455	118	289.3	75.0
Pickles/Relish/Olives	Vlasic Pickle Spears	24 oz	Label—cut & stack	Offset Lithography	6,742	2,789	702.2	290.4
Salad Toppings	French's French Fried Onion Rings	2.8 oz	Spiral wound container	Rotogravure	165	42	90.4	3.0
Salt/Salt Substitutes	Morton Salt	26 oz	Label—cut & stack	Offset Lithography	668	209	197.1	61.7
Spices/Seasonings	Kroger Garlic Powder	3 oz	Label—cut & stack	Offset Lithography	10,122	2,021	570.8	113.9
Dairy Foods								
Butter	Land O' Lakes Butter	1 lb	Knock down carton	Rotogravure	355	315	235.8	208.9
Cheese—Grated	Kraft Grated Parmesan Cheese	8 oz	Label—cut & stack	Rotogravure	331	176	72.5	38.5
Cheese—Imitation	Kroger "For Maximum Value"	10 2/3 oz (16 slices)	Plastic bag/pouch	Flexography	154	25	19.9	3.2
Cheese—Natural Cheese	Kraft Cheddar	8 oz	Plastic bag/pouch	Flexography	3,029	1,863	558.3	343.3
Cheese—Processed Cheese	Kraft Singles	12 oz (16 slices)	Plastic bag/pouch	Flexography	1,577	547	647.0	224.3
Cheese—Ricotta/Cream/Cottage	Breakstone Cottage Cheese	16 oz	Plastic tub	Offset Lithography	1,600	907	597.9	339.0
Cheese—Shredded	Kraft Shredded Cheddar	8 oz	Plastic bag/pouch	Rotogravure	749	519	367.3	254.3
Frozen Novelties[c]	Klondike Bars	6 pack container	Flat blank carton	Offset Lithography	5,704	1,434	686	172.4
		5 oz bar wrapper	Paper/foil packet	Rotogravure				

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Dairy Foods (continued)								
Ice Cream & Ice Milk	Breyer's Vanilla Ice Cream	half gallon	Flat blank carton	Offset Lithography	7,927	3,009	864	327.9
Sour Cream	Breakstone Sour Cream	16 oz	Plastic tub	Offset Lithography	577	320	273.6	151.7
Yogurt	Yoplait	6 oz	Plastic tub	Offset Lithography	2,160	554	1,884.7	483.8
Desserts								
Desserts—Toppings	Cool Whip	8 oz	Plastic tub	Offset Lithography	407	115	280.4	79.2
Gelatin/Pudding—Mixes	Jello Instant Pudding-Vanilla	3.4 oz	Knock down carton	Offset Lithography	554	336	623.4	68.1
Gelatin/Pudding—Regular	Hunt's Snack Pack	14 oz (4 3.5-oz cups)	Knock down carton	Offset Lithography	1,007	245	450.1	18.7
Pies & Cakes—Non-rfg	Entenmann's Loaf (Pound) Cake	12 oz	Flat blank carton	Offset Lithography	2,353	3,681	96.0	80.7
Pies & Cakes—Rfg & Fz	Pillsbury Toaster Struedel	11.5 oz	Knock down carton	Offset Lithography	1,201	760	248.6	10.3
Dietary Supplements								
Dietary Supplements—Liquid[c]	Poly Vi Sol	1 2/3 oz container	Knock down carton	Offset Lithography	1,642	102	20.3	1.3
		1 2/3 oz bottle	Label—cut & stack	Flexography				
Dietary Supplements—Pills[c]	Centrum Silver	100 tablet container	Flat blank carton	Offset Lithography	17,874	9,896	599.8	332.0
		100 tablet bottle	Label—pressure sensitive	Flexography				

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Dressings & Sauces								
Gravy/Sauce—Canned/Bottled	Kraft BBQ Sauce	18 oz	Label—cut & stack	Offset Lithography	7,344	673	1,312.6	120.3
Gravy/Sauce—Mixes	Taco Bell Taco Seasoning	1.25 oz	Paper/foil packet	Rotogravure	1,666	357	565.6	121.1
Gravy/Sauce—Rfg & Fz	DiGiorno Marinara Sauce	15 oz	Label—pressure sensitive	Offset Lithography	865	106	40.0	4.2
Salad Dressing—Bottled, non-rfg	Kraft Ranch Dressing	16 oz	Label—pressure sensitive	Offset Lithography	2,206	372	624.7	52.0
Salad Dressing—Dry Mix	Hidden Valley Ranch	.4 oz	Paper/foil packet	Rotogravure	87	15	58.6	1.2
Salad Dressing—Rfg	Marie's Blue Cheese Dressing	12 oz	Label—pressure sensitive	Offset Lithography	504	50	57.6	1.4
Vinegar	Kroger White Vinegar	32 oz	Label—cut & stack	Offset Lithography	1,134	975	78.4	67.4
Eggs								
Processed Eggs	Egg Beaters	16 oz	Gable top carton	Flexography	42	8	51.1	8.1
Shell Eggs	Private Label Eggs	1 dozen	Egg carton	Flexography	1,294	4,431	391.8	1,341.7
Entrees								
Entrées—Fz	Banquet Salsbury Steak Dinner	9.5 oz	Knock down carton	Offset Lithography	3,949	596	2,686.0	63.1
Entrées—Rfg	Lloyds BBQ Pork	24 oz	Flat blank carton	Offset Lithography	1,361	680	154.7	39.2
Entrées—Shelf Stable	SpagettiOs	15 oz	Label—cut & stack	Offset Lithography	1,051	290	1,030.8	108.5
Lunches—Rfg	Oscar Mayer Lunchables	4.6 oz	Knock down carton	Offset Lithography	147	90	325.0	16.9
Pizza—Pizza/Kits/Mixes, Rfg & Fz	Totino's Party Pizza	10.2 oz	Knock down carton	Offset Lithography	1,555	591	819.8	67.8

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Fats & Oils								
Lard/Shortening	Crisco	48 oz	Spiral wound container	Rotogravure	152	36	76.3	18.2
Margarine	Blue Bonnet	1 lb	Knock down carton	Offset Lithography	332	87	924.6	123.1
Oil	Crisco Oil	48 oz	Label—cut & stack	Offset Lithography	1,686	768	358.0	163.0
Fruits & Vegetables								
Beans—Canned	Van Camps Pork & Beans	15 oz	Label—cut & stack	Offset Lithography	477	102	705.5	75.4
Fruit—Canned/Bottled	Del Monte Fruit-Peaches	15.25 oz	Label—cut & stack	Offset Lithography	1,247	761	1,127.8	403.6
Fruit—Dried	Sun Maid Raisins	6 1.5-oz boxes	Knock down carton	Offset Lithography	1,724	313	203.5	36.9
Fruit—Dry Fruit Snacks[c]	Fruit by the Foot	6 packet container	Knock down carton	Offset Lithography	303	34	244.2	17.8
		.75 oz packet	Plastic bag/pouch	Flexography				
Fruit—Fz	Private Selection Frozen Strawberries	16 oz	Plastic bag/pouch	Flexography	364	761	32.6	68.1
Fruit—Sauce[c]	Motts Apple Sauce	6 pack container	Flat blank carton	Offset Lithography	420	177	189.9	79.9
		4 oz cup lid	Paper/foil packet	Flexography				
Tomato Products—Canned/Bottled	Del Monte Tomato	14.5 oz	Label—cut & stack	Offset Lithography	645	343	412.9	219.7
Tomato Products—Sauce	Ragu	1 lb 10 oz	Label—cut & stack	Offset Lithography	1,911	1,806	431.3	407.5

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Fruits & Vegetables (continued)								
Vegetables—Canned/Bottled	Del Monte Corn	14 2/3 oz	Label—cut & stack	Offset Lithography	3,438	2,023	2,386.5	1,404.3
Vegetables—Dried	Goya Pinto Beans	16 oz	Plastic bag/pouch	Flexography	1,944	2,299	103.6	122.5
Vegetables—Fresh Cut Salad	Dole Lettuce	11 oz	Plastic bag/pouch	Flexography	319	145	563.6	63.4
Vegetables—Frozen	Bird's Eye	1 lb	Plastic bag/pouch	Flexography	2,071	1,507	1,003.9	730.5
Infant Foods								
Baby Food	Gerber Bananas	4 oz	Label—cut & stack	Offset Lithography	684	1	1,404.9	<0.1
Baby Formula—Liq Concentrate	Enfamil with Iron Concentrated	13 oz	Label—cut & stack	Offset Lithography	41	0	309.6	0
Baby Formula—Powder	Enfamil with Iron Instant Formula	1 lb	Label—cut & stack	Offset Lithography	91	10	141.4	0.8
Baby Formula—Ready to Drink	Enfamil (LactoFree) Ready to Use	1 qt	Label—cut & stack	Offset Lithography	109	30	109.0	6.4
Baby Juice	Gerber Apple Juice	4 oz	Label—cut & stack	Offset Lithography	121	0	136.4	0
Seafood								
Seafood—Canned	Starkist	6 oz	Label—cut & stack	Rotogravure	2,279	273	1,429.2	171.3
Seafood—Fz	Mrs. Paul's Fish Sticks	24.6 oz	Knock down carton	Offset Lithography	2,606	474	191.8	33.2
Seafood—Rfg	Louis Kemp Crab Delights	8 oz	Knock down carton	Offset Lithography	1,062	125	51.2	6.0
Side Dishes & Starches								
Instant Potatoes	Betty Crocker Scalloped Potatoes-Au Gratin	5.25 oz	Knock down carton	Offset Lithography	285	110	195.0	30.1

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Side Dishes & Starches (continued)								
Pasta—Dry	Muellers Macaroni Noodles	16 oz	Knock down carton	Offset Lithography	4,984	1,252	1,057.2	265.7
Pasta—Rfg & Fz	DiGiorno Linguini	9 oz	Label—pressure sensitive	Offset Lithography	1,239	271	144.2	13.5
Rice	Rice-a-Roni Chicken	6.9 oz	Knock down carton	Offset Lithography	1,875	361	625.1	120.4
Side Dishes—Fz	Bagel Bites	7 oz	Knock down carton	Offset Lithography	1,576	266	347.4	12.1
Side Dishes—Kits/Mixes	Kraft Macaroni & Cheese	7.25 oz	Knock down carton	Offset Lithography	2,150	478	1,576.1	282.9
Side Dishes—Rfg	Kroger Coleslaw	16 oz	Label—pressure sensitive	Flexography	1,659	683	154.4	63.6
Side Dishes—Shelf Stable	La Choy Chop Suey	14 oz	Label—cut & stack	Offset Lithography	429	51	64.3	7.7
Stuffing	Stove Top Stuffing	6 oz	Knock down carton	Offset Lithography	244	87	146.9	24.5
Snack Foods								
Nuts—Snack Nuts	Kroger Cashew Halves	9.5 oz	Label—cut & stack	Offset Lithography	3,003	864	337.7	97.2
Salty Snacks—Bagged	Lay's Chips	12.25 oz	Plastic bag/pouch	Flexography	8,333	857	3,575.7	320.3
Salty Snacks—Other	Pringles	6 oz	Spiral wound container	Rotogravure	2,949	205	934.0	17.0
Salty Snacks—Unpopped Popcorn	Orville Reddenbacher Popcorn	10.5 oz	Knock down carton	Offset Lithography	593	166	303.7	77.3
Seeds—Snack	David Sunflower Seeds	5.75 oz	Plastic bag/pouch	Flexography	696	95	80.1	7.5

(continued)

Table 4-2. Products Included in the Labeling Cost Model (revised April 2002) (continued)

Product Category	Representative Product				No. of SKUs		Annual Units Sold (millions)	
	Description	Product Size	Package/Label	Printing Method	Branded	Private[a]	Branded	Private
Soups								
Soup—Canned	Campbell Soup	10.75 oz	Label—cut & stack	Offset Lithography	1,388	215	2,496.5	340.3
Soup—Dry	Lipton Onion Soup Mix	2 oz	Knock down carton	Offset Lithography	1,463	179	285.6	28.6
Soup—Ramen	Maruchan Ramen	3 oz	Plastic bag/pouch	Rotogravure	390	40	1,368.9	49.8
Sweeteners								
Sugar	Domino Sugar	5 lb	Paper bag	Flexography	321	371	356.9	412.2
Sugar Substitutes[c]	Sweet N Low	3.5 oz (100 packets)	Flat blank carton	Offset Lithography	152	47	86.6	12.5
		1 packet	Paper/foil packet	Offset Lithography				
Syrup/Molasses	Aunt Jemima Regular Syrup	24 oz	Label—cut & stack	Offset Lithography	1,226	373	189.7	57.7
Weight Control Foods								
Weight Control Liq/Powder	Ultra Slim-Fast	11 oz	Label—shrink wrap	Flexography	1,203	65	230.2	12.4

[a]Private label SKUs are estimated based on the number of SKUs for branded products (see Section 4.2.1).

[b]Carbonated Beverages—Regular and Carbonated Beverages—Sugar Substitute each have two representative products (2 liter bottles and 12-pack cartons).

[c]These product categories have labeled inner and outer packaging.

Source: Based on scanner data obtained from IRI for calendar year 1999.

selected the highest volume branded product.[4] We then verified the list with Dr. Aaron Brody (2001), a food industry packaging consultant. Finally, we visited a Kroger grocery store in Durham, North Carolina, and verified that the representative product did indeed have a substantial amount of shelf space (including different flavors of the product). So that we would be able to determine and verify the printing method and packaging method for each of the representative products, we purchased each of the representative products. In some cases, the package size had changed since 1999, so we purchased the closest currently available package size. Furthermore, in a handful of cases, we were not able to find the selected branded product, so we substituted a similar size Kroger private label product.

Once we purchased each of the representative products, with the assistance of Dr. Aaron Brody, we

- identified the printing method for each package or label using a magnifying glass,
- counted the number of colors used in the printing process,
- recorded the type of package or label (including inner and outer packaging), and
- obtained estimates of the range of costs for each package or label.

The printing method for each product affects the costs of prepress operations and plate or cylinder engraving (discussed in Section 4.2.3).[5] The information on the number of colors provided us with an understanding of the number of colors typically used on packages and labels. The type of package or label and the cost estimates for each are used in estimating the costs of discarded inventory (discussed in Section 4.2.5).

Within each of the approximately 140 product categories, we subdivided the SKUs and calculated the annual units sold for private label and branded products. The IRI dataset includes each

[4]For most product types, we were able to choose what we believe to be a representative product. However, for the Carbonated Beverage—Regular and Carbonated Beverages—Sugar Substitute categories, both 2-liter bottles and 12-pack cans are significant portions of the categories. For these categories, we created a composite representative product and based the calculations in the model on a weighted average for these two packaging methods. We determined the weights based on the unit volumes in the IRI dataset.

[5]We use the term engraving to mean any of the various methods for preparing a cylinder or plate for printing a specific design (as described in Section 2).

branded SKU as a separate record with its associated annual units sold. For private label products, however, the IRI dataset combines into a single record all SKUs for similar sizes and flavors produced by all manufacturers. Therefore, we estimated the number of SKUs for private label products within each product category. First, we calculated the ratio of SKUs to annual units sold for branded products (B) and then multiplied the ratio by the annual units sold for private label products (PL) as follows:

$$\text{Estimated SKUs}_{PL} = (\text{SKUs}_{B} / \text{Units}_{B}) * (\text{Units}_{PL})$$

This calculation tends to underestimate the number of SKUs for private label products because branded products generally sell in higher volumes (more units sold for each SKU) than do private label products. For categories in which a large proportion of the products sold are branded (e.g., aseptic juices, baby formula, and candy), this calculation results in a lower estimate of the number of SKUs than simply using the number of private label SKU-level records in the IRI dataset. In these cases, we used the number of private label SKU-level records as the estimate instead of using the calculation described above.

We made an additional adjustment to the data obtained from the IRI dataset to account for dietary supplements other than vitamins and minerals. Based on data published in *Nutrition Business Journal* (2000), we calculated that approximately half of all dietary supplements sold in 1999 were vitamin and mineral products. Thus, we scaled up the number of SKUs and units sold for vitamins and minerals in the IRI dataset by doubling both numbers. However, this number likely underestimates the total SKUs for dietary supplements because other types of supplements (e.g., botanicals, amino acids, and proteins) generally sell fewer units per SKU than do vitamins and minerals. Furthermore, the IRI dataset includes only sales in grocery stores, drug stores, and mass merchandisers, but many dietary supplements are sold through other outlets and thus are not represented.

The process we used to estimate the number of unique formulas per product category is the same as for the reformulation cost model (White, et al., 2002). To derive these counts, we used information in the product name field from the IRI data set. First, we eliminated the size of the package from the product name; then we grouped

products with the same product name. For each product category, we counted each set of grouped products as a unique formula. Because we believe the counting process may have overstated the number of unique formulas, we adjusted the final number of formulas downward by multiplying by 0.94. We derived the adjustment factor by reviewing in detail a sample of product categories. This factor combines an adjustment for mid-year manufacturer name changes for the same branded product (approximately 1.3 percent of formulas) and for multiproduct packaging bundles (approximately 4.7 percent of formulas).

Once we derived a final estimate of the number of private label SKUs, we then adjusted the initial count of private label formulas as follows:

$$\text{Estimated Formulas}_{PL} = \left(\frac{\text{Estimated SKUs}_{PL}}{\text{Counted SKU}_{PL}}\right) * \text{Counted Formulas}_{PL}$$

Table 4-3 lists the final number of formulas and SKUs per formula for branded and private label products.

4.2.2 Parts of the Label and the Associated Number of Colors

As a result of a regulation, one or more parts of food or dietary supplement labeling may be affected. Depending on which parts of the labeling are affected, manufacturers will need to change one or more printing plates. Based on our discussions with food manufacturers, we developed assumptions about the number of colors (i.e., plates or cylinders) that would typically be affected for each part of the labeling that would have to be changed. Table 4-4 lists each potentially affected part of the labeling on the PDP and IP and our assumptions about the typical number of colors that would be affected.

In general, most changes on the PDP will require a complete redesign, in which case we assumed six colors will be affected. Although some products may have up to nine colors used in the labeling design, we found in our review of products described above that few products have more than six colors, and many products have fewer. The number of colors may be made up of all special ink colors, all process color (maximum of four colors), or a combination of special ink colors and process color.

Table 4-3. Numbers of Formulas and SKUs per Formula for Food Product Categories

Product Category	Number of Formulas		SKUs per Formula	
	Branded	Private[a]	Branded	Private
Baked Goods				
Bakery Snacks—Non-Rfg	4,162	1,698	1.2	1.7
Bakery Snacks—Rfg	39	49	1.1	1.3
Bread/Rolls—Non-Rfg	7,373	4,998	1.9	1.8
Bread/Rolls—Rfg & Fz	807	96	1.5	2.1
Breadcrumbs/Batters/Croutons	816	87	1.2	1.7
Cookies	5,055	664	1.5	2.1
Crackers	2,395	381	1.2	1.6
Snack & Granola Bars	898	80	1.3	1.4
Baking Ingredients				
Baking Ingredients	973	194	1.5	1.6
Baking Ingredients—Powders	124	13	1.2	1.8
Baking Mixes	1,324	181	1.2	1.7
Dough—Rfg & Fz	359	111	1.4	2.0
Flour/Meal	961	147	1.5	1.9
Nuts—Baking Nuts	779	87	1.4	2.6
Pizza—Crust/Dough	112	22	1.2	1.9
Beverages				
Bottled Water	1,956	545	1.5	2.7
Carbonated Beverages—Regular	2,320	381	1.6	2.0
Carbonated Beverages—Sugar Substitute	493	136	1.8	1.5
Carbonated Beverages—Water/Club Soda	875	542	1.2	1.3
Coffee—Ground	1,622	187	1.3	1.8
Coffee—Instant	389	86	1.2	1.6
Coffee—Whole	1,262	169	1.2	1.6
Creamer/Coffee Additives—Non-Rfg	343	194	1.4	1.9
Creamer—Rfg & Fz	644	257	1.5	1.9
Drink Mixes—Cocktail Mixes	442	16	1.3	1.2

(continued)

Table 4-3. Numbers of Formulas and SKUs per Formula for Food Product Categories (continued)

Product Category	Number of Formulas		SKUs per Formula	
	Branded	Private[a]	Branded	Private
Drink Mixes—Milk/Cocoa Dry Mixes	317	82	1.4	2.0
Drink Mixes—Other	327	132	1.3	1.4
Isotonic Drinks	485	43	1.7	1.6
Juices—Aseptic	444	42	1.3	1.1
Juices—Bottled	3,231	531	1.5	2.2
Juices—Canned	768	136	1.3	1.5
Juices—Concentrate, Rfg & Fz	346	200	1.4	1.4
Juices—Rfg	1,910	475	1.7	1.7
Milk—Condensed	68	55	1.3	1.4
Milk—Flavored/Substitutes	1,294	318	1.7	2.0
Milk—Powdered	38	25	1.6	2.7
Milk—Rfg	1,811	2,234	2.1	3.1
Non-Fruit Drinks	292	3	1.5	1.4
Tea—Canned/Bottled	679	42	1.6	2.0
Tea—Instant	132	81	1.3	2.4
Tea—Loose	1,849	124	1.2	2.0
Breakfast Foods				
Breakfast Food—Frozen	227	30	1.9	2.6
Breakfast Food—Instant	41	11	1.4	2.8
Breakfast Food—Ready to Eat	126	46	1.6	2.0
Cereal	1,345	528	1.3	1.8
Candy & Gum				
Chocolate Candy—Single Serve	838	26	1.3	1.1
Chocolate Candy—Snack	1,818	161	1.3	1.4
Gum—Regular Gum	669	17	1.4	4.0
Gum—Sugarless Gum	103	1	1.5	1.1
Nonchocolate Candy—Diet	439	54	1.3	1.8
Nonchocolate Candy—Kits	161	22	1.4	1.1

(continued)

Table 4-3. Numbers of Formulas and SKUs per Formula for Food Product Categories (continued)

Product Category	Number of Formulas		SKUs per Formula	
	Branded	Private[a]	Branded	Private
Nonchocolate Candy—Pkg & Roll	1,653	132	1.6	4.1
Nonchocolate Candy—Single Serve	2,340	157	1.4	2.7
Nonchocolate Candy—Snack	2,098	252	1.5	3.3
Seasonal Candy	2,451	118	2.2	3.2
Condiments/Dips/Spreads				
Condiments—Non-Rfg	1,018	155	1.3	2.5
Condiments—Rfg	444	22	1.3	1.5
Dips—Dry Mixes	128	19	1.1	2.0
Dips—Rfg & Fz	825	168	1.4	1.9
Dips—Shelf Stable	360	25	1.1	1.6
Jams/Jellies/Preserves	2,812	797	1.5	2.0
Mayonnaise	215	58	1.5	1.6
Peanut Butter	267	44	1.7	2.7
Pickles/Relish/Olives	4,289	1,441	1.6	1.9
Salad Toppings	140	15	1.2	2.8
Salt/Salt Substitutes	565	105	1.2	2.0
Spices/Seasonings	8,552	1,145	1.2	1.8
Dairy Foods				
Butter	284	217	1.3	1.5
Cheese—Grated	237	74	1.4	2.4
Cheese—Imitation	120	17	1.3	1.5
Cheese—Natural Cheese	1,807	841	1.7	2.2
Cheese—Processed Cheese	823	244	1.9	2.2
Cheese—Ricotta/Cream/ Cottage	1,049	468	1.5	1.9
Cheese—Shredded	448	283	1.7	1.8
Frozen Novelties	3,574	782	1.6	1.8
Ice Cream & Ice Milk	5,642	2,347	1.4	1.3
Sour Cream	384	161	1.5	2.0

(continued)

Table 4-3. Numbers of Formulas and SKUs per Formula for Food Product Categories (continued)

Product Category	Number of Formulas		SKUs per Formula	
	Branded	Private[a]	Branded	Private
Yogurt	1,867	442	1.2	1.3
Desserts				
Desserts—Toppings	331	68	1.2	1.7
Gelatin/Pudding—Mixes	474	191	1.2	1.8
Gelatin/Pudding—Regular	755	154	1.3	1.6
Pies & Cakes—Non-Rfg	2,152	1,670	1.1	2.2
Pies & Cakes—Rfg & Fz	964	433	1.2	1.8
Dietary Supplements				
Dietary Supplements—Liquid	376	23	4.4	4.4
Dietary Supplements—Pills	6,536	2,833	2.7	3.5
Dressings & Sauces				
Gravy/Sauce—Canned/Bottled	5,880	411	1.2	1.6
Gravy/Sauce—Mixes	1,441	198	1.2	1.8
Gravy/Sauce—Rfg & Fz	685	78	1.3	1.4
Salad Dressing—Bottled, Non-rfg	1,798	233	1.2	1.6
Salad Dressing—Dry Mix	74	11	1.2	1.3
Salad Dressing—Rfg	416	38	1.2	1.3
Vinegar	817	404	1.4	2.4
Eggs				
Processed Eggs	25	3	1.7	2.8
Shell Eggs	758	1,041	1.7	4.3
Entrees				
Entrées—Fz	3,323	412	1.2	1.4
Entrées—Rfg	1,137	446	1.2	1.5
Entrées—Shelf Stable	826	233	1.3	1.2
Lunches—Rfg	81	26	1.8	3.4
Pizza—Pizza/Kits/Mixes, Rfg & Fz	1,215	212	1.3	2.8

(continued)

Table 4-3. Numbers of Formulas and SKUs per Formula for Food Product Categories (continued)

Product Category	Number of Formulas		SKUs per Formula	
	Branded	Private[a]	Branded	Private
Fats & Oils				
Lard/Shortening	101	23	1.5	1.6
Margarine	241	63	1.4	1.4
Oil	1,129	354	1.5	2.2
Fruits & Vegetables				
Beans—Canned	300	48	1.6	2.1
Fruit—Canned/Bottled	997	378	1.3	2.0
Fruit—Dried	1,360	218	1.3	1.4
Fruit—Dry Fruit Snacks	249	28	1.2	1.2
Fruit—Fz	310	502	1.2	1.5
Fruit—Sauce	306	70	1.4	2.5
Tomato Products—Canned/Bottled	469	166	1.4	2.1
Tomato Products—Sauce	1,590	1,113	1.2	1.6
Vegetables—Canned/Bottled	2,523	768	1.4	2.6
Vegetables—Dried	1,428	1,191	1.4	1.9
Vegetables—Fresh Cut Salad	265	82	1.2	1.8
Vegetables—Frozen	1,599	894	1.3	1.7
Infant Foods				
Baby Food	609	1	1.1	1.1
Baby Formula—Liq Concentrate	28	0	1.5	0.0
Baby Formula—Powder	55	8	1.7	1.3
Baby Formula—Ready to Drink	72	14	1.5	2.1
Baby Juice	94	0	1.3	0.0
Seafood				
Seafood—Canned	1,356	117	1.7	2.3
Seafood—Fz	1,833	277	1.4	1.7
Seafood—Rfg	607	55	1.7	2.3

(continued)

Table 4-3. Numbers of Formulas and SKUs per Formula for Food Product Categories (continued)

Product Category	Number of Formulas		SKUs per Formula	
	Branded	Private[a]	Branded	Private
Side Dishes & Starches				
Instant Potatoes	220	64	1.3	1.7
Pasta—Dry	4,257	792	1.2	1.6
Pasta—Rfg & Fz	1,002	192	1.2	1.4
Rice	1,301	219	1.4	1.6
Side Dishes—Fz	1,344	215	1.2	1.2
Side Dishes—Kits/Mixes	1,229	219	1.7	2.2
Side Dishes—Rfg	1,067	361	1.6	1.9
Side Dishes—Shelf Stable	363	41	1.2	1.2
Stuffing	212	57	1.2	1.5
Snack Foods				
Nuts—Snack nuts	2,095	358	1.4	2.4
Salty Snacks—Bagged	4,299	289	1.9	3.0
Salty Snacks—Other	1,842	118	1.6	1.7
Salty Snacks—Unpopped Popcorn	331	73	1.8	2.3
Seeds—Snack	531	46	1.3	2.1
Soups				
Soup—Canned	1,113	126	1.2	1.7
Soup—Dry	1,183	97	1.2	1.8
Soup—Ramen	294	23	1.3	1.8
Sweeteners				
Sugar	203	161	1.6	2.3
Sugar Substitutes	86	17	1.8	2.8
Syrup/Molasses	979	232	1.3	1.6
Weight Control Foods				
Weight Control Liq/Powder	648	42	1.9	1.5

[a]Private label formulas are estimated based on the number of formulas for branded products.

Source: Based on scanner data obtained from IRI for calendar year 1999.

Table 4-4. Number of Colors Typically Affected by Changes to Various Parts of the Label
The number of colors affected by a labeling change depends on which part of the labeling must be changed.

Panel	Part of Label	Typical Number of Colors Affected
Principal Display Panel	Name of product	Full redesign (assumed six colors)
	Standard of identity or fanciful name	Full redesign (assumed six colors)
	Net quantity statement	Two colors
	Form of product	Full redesign (assumed six colors)
	Nutrient or health claim	Full redesign (assumed six colors)
	Caution statement	Two colors
Information Panel	Nutrition or supplement facts	One color
	Ingredient list	One color
	Nutrient or health claim	Two colors
	Caution statement	Two colors
	Dietary supplement disclaimer	Two colors

In comparison to the PDP, most changes on the IP will require one or two color changes. Many manufacturers print the Nutrition Facts panel and ingredient list in one color so that, if an FDA regulation requires these to be changed, only one plate or cylinder will be affected.[6] As an upper bound, we assumed that changes to other parts of the IP would require two color changes, but in many cases, they may require only one color change.

Based on our conversations with industry members, it is unlikely that food and dietary supplement manufacturers would make a change to their labeling that affected more than two colors but was not a full redesign. In many cases, even two color changes are infeasible and would require a full redesign because, as more parts of the labeling are changed, the more likely it is that the change will interfere with other parts of the design.

[6]Depending on the format of the labeling for a particular product, a change to the Nutrition Facts panel or ingredient list that increases the space needed for these items could require a two-color change or a complete redesign.

4.2.3 Costs Incurred on an SKU Basis

Labeling costs that are generally incurred on an SKU basis include internal administrative costs, graphic design costs, prepress costs, and plate or cylinder engraving or etching costs. Based on our discussions with industry representatives, administrative and graphic design costs are generally similar for all three printing methods. In contrast, prepress costs and cylinder and plate engraving costs differ for each of the printing methods because of differences in the preparation required and in the materials used and processes for cylinder and plate engraving. For products with both inner and outer packaging, changes to the labeling require all of these activities to be conducted for both.

For the 6- and 12-month compliance periods, administrative and graphic design costs are assumed to be 10 percent higher than the estimates provided in Table 4-5.

Table 4-5 lists our low, medium, and high cost administrative and graphic design cost estimates for one-color changes, two-color changes, and full redesigns. Each of the low, medium, and high cost estimates is a composite of the individual estimates we received from packaging converters and food manufacturers. In some cases, they provided us with typical cost ranges and in others, a single cost estimate. If they provided us with a cost range, we took the lower number as a low cost estimate and the higher number as a high cost estimate. If they provided us with a single estimate, we took this number as a medium cost estimate. Our low cost estimate is the lowest low cost estimate, and our high cost estimate is the highest high cost estimate. Our medium cost estimate is the midpoint of the low and high cost estimates, which we verified against the single cost estimates we received.

Table 4-5. Administrative and Graphic Design Cost Estimates
Administrative and graphic design costs are on an SKU basis and are assumed the same for all methods of printing and packaging.

	One-Color Change			Two-Color Change			Full Redesign[a]		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Administrative	$120	$280	$440	$240	$450	$660	$360	$620	$880
Graphic Design	$300	$450	$600	$900	$1,350	$1,800	$1,500	$2,250	$3,000

[a]A full redesign is assumed to affect six colors.

Administrative costs include the internal company costs associated with contracting for packaging and labeling services and routing a changed labeling design through the entire internal approval process (as described in Section 3.1). The food manufacturers we contacted provided us with estimates of the number of hours required for each individual SKU that must be changed. For the preliminary draft of the model, we multiplied these hours by $40 to obtain a total dollar estimate for administrative costs. This estimate was based on average total compensation (wages and benefits) for "professional specialty and technical" workers in manufacturing industries (U.S. Department of Labor, 2001). In general, we believe that the lower estimates are more relevant for small companies because they are less likely to have as many departments that would need to approve a labeling change, while the higher estimates are more relevant for large companies.

Graphic design costs are the costs associated with contracting out the graphic design work for making changes to food and dietary supplement labeling. In developing these cost estimates, we used information from the packaging converters that also provide graphic design services and from the food manufacturers we contacted. We combined these cost estimates across all printing methods because the graphic design process is usually not affected by the printing method used. In contrast to administrative costs, we do not have any specific beliefs about which costs are more applicable for small versus large companies. Although larger companies may be able to obtain volume discounts, they are also likely to have more elaborate or sophisticated labeling that would cost more to design than labeling for products produced by smaller companies. Although some of our industry contacts said that graphic design costs for private label products tend to cost less than for branded products, others said that the costs are approximately the same.

For the 6- and 12-month compliance periods, prepress and engraving costs are assumed to be 10 percent higher than the estimates provided in Table 4-6.

Table 4-6 lists our low, medium, and high cost prepress and engraving cost estimates for one-color changes, two-color changes, and full redesigns.[7] As with the administrative and graphic design costs, each of the low, medium, and high cost estimates are

[7]We revised the high cost estimates in Table 4-6 from the estimates provided in the draft report based on comments we received from 15 food and beverage manufacturers. The majority said that the estimates were representative of their costs, but a few cited significantly higher costs.

Table 4-6. Prepress and Etching/Engraving Cost Estimates
Prepress and engraving costs are on an SKU basis and differ by printing method.

	One-Color Change			Two-Color Change			Full Redesign		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
Flexography									
Prepress	$245	$260	$550	$490	$520	$1,100	$1,470	$1,560	$3,300
Engraving	$150	$200	$500	$300	$400	$1,000	$900	$1,200	$3,000
Offset Lithography									
Prepress	$200	$215	$400	$400	$430	$800	$1,200	$1,290	$2,400
Engraving	$180	$290	$600	$360	$580	$1,200	$1,080	$1,740	$3,600
Rotogravure									
Prepress	$500	$550	$800	$1,000	$1,100	$1,600	$3,000	$3,300	$4,800
Engraving	$900	$1,350	$1,800	$1,800	$2,700	$3,600	$5,400	$8,100	$10,800

composites of the individual estimates we received from packaging converters and food manufacturers. Both prepress and engraving costs are lowest for the flexography printing method, followed by offset lithography and then rotogravure. Because of the materials used in producing flexographic printing cylinders, these are less expensive to produce than the other printing methods; however, the cylinders are not as durable. In contrast, rotogravure cylinders are made of copper and plated with chrome for durability through long printing runs. Thus, engraving costs, and the associated costs for preparing the design to engrave the cylinders, are much higher than for the other printing methods. In general, for both prepress and engraving costs, we believe that the low cost estimates are more applicable for large companies that may be able to obtain volume discounts, and the high cost estimates are more applicable for small companies.

4.2.4 Costs Incurred on a Per-Formula Basis

The costs of making a labeling change that are usually incurred on a formula basis include analytical testing costs and market testing costs.

The analytical testing cost estimates are provided in Table 4-7 for the most common types of tests that might be conducted as part of a labeling regulation. To develop these cost estimates, we obtained price quotes in spring 2001 from 12 companies that test food and dietary supplement products.[8] In some cases, as many as 10 of these companies conduct each type of test, but in others, only two or three of the companies conducted a particular test. Based on the available estimates, we determined the low, medium, and high cost estimates for each type of test.

Table 4-7. Analytical Testing Cost Estimates
Analytical testing costs are incurred on a per-formula basis. In the model, these costs are multiplied by two tests, and labor and shipping costs are added.

Type of Test	Low	Medium	High
NLEA Panel	$485	$560	$650
Fatty Acid Profile	$75	$125	$275
Trans Fatty Acids	$110	$125	$165
Sugar Profile	$50	$73	$300
Soluble Fiber	$80	$133	$190
Insoluble Fiber	$80	$100	$185
Vitamins	$32	$72	$260
Minerals	$12	$33	$85
Iodine	$45	$60	$90
Pathogens	$8	$26	$85
Bioengineered—PCR Test	$245	$300	$355
Bioengineered—ELISA Lab Test	$50	$60	$70
Bioengineered—ELISA Strip Test	$5	$7.50	$10
Caffeine	$65	$103	$110
Allergens	$70	$85	$100
Dietary Supplement—Vitamins	$32	$72	$260
Dietary Supplement—Minerals	$12	$33	$85
Dietary Supplement—Amino Acids	$100	$160	$260
Dietary Supplement—Botanicals	$110	$205	$400
Dietary Supplement—Other Ingredients	$125	$225	$450

[8]These companies included Warren, Industrial, Medallion, Food Products, Eurofins, Anresco, MVTL, Barrow-Agee, Midwest, Ralston, TPC Labs, and Strasburger and Siegel.

In the labeling cost model, the user may select one or more of these tests or enter a separate cost estimate for an analytical test not included as an option in the model. When the user chooses to include an analytical testing cost, the model multiplies the number of affected formulas by the cost per formula tested. The total analytical test cost calculation includes

- the cost of testing two samples,
- 1 hour of labor to prepare and package the samples ($14.73), and
- delivery charges for one 2-pound package delivered overnight ($26.30).

The labor cost estimate was based on average total compensation (wages and benefits) for "handlers, equipment cleaners, helpers, and laborers" in manufacturing industries (U.S. Department of Labor, 2001). The delivery charge estimate was based on the average charge for delivery of a 2-pound package overnight by FedEx (FedEx, 2001).

The market testing cost estimates are provided in Table 4-8 for the two types of tests that companies may conduct as part of a labeling regulation. However, as mentioned in Section 3, companies rarely conduct outside market testing of changes to labeling that would result from regulation.[9] Because few companies conduct outside market testing for labeling changes, we had little information on which to base the estimates used in the labeling cost model. Based on this limited information, we assumed that three, four, or six focus groups at a cost of approximately $5,000 each would be conducted for the low, medium, and high cost estimates respectively. In addition, we assumed that 100, 150, or 200 consumers at a cost of approximately $100 per consumer would be included in a quantitative study for the low, medium, and high cost estimates, respectively.

4.2.5 Discarded Inventory Costs

Discarded inventory costs are the costs associated with disposing unused labeling and packaging material. The amount of inventory that might be discarded because of a labeling regulation depends

[9]In most cases, the internal marketing department within the company would be involved in evaluating any labeling change, but their activities are included as part of the administrative costs of a labeling change.

Table 4-8. Market Testing Costs
Market testing costs are incurred on a per-formula basis.

Type of Test	Low	Medium	High
Focus Groups	$15,000	$20,000	$30,000
Quantitative Studies	$10,000	$15,000	$20,000

on the bulkiness of the packaging, whether the product is branded or private label, and the length of the compliance period. In Table 4-9, we list types of labeling and packaging by low, medium, and high bulkiness and our assumptions about the amount of annual inventory usage that would be remaining for 12-, 24-, and 36-month compliance periods. These assumptions are based on the additional assumption that manufacturers are halfway through their existing inventory at the time the change must be implemented.

Based on information provided by our industry contacts and Dr. Aaron Brody, we assumed that manufacturers order greater quantities of labels on the least frequent basis because they are the least bulky and therefore require the least amount of storage space. In comparison, packaging that can be folded or compressed is moderately bulky; therefore, manufacturers order smaller quantities on a more frequent basis. Finally, the bulkiest packaging is containers that cannot be compressed, such as egg cartons and preprinted metal cans; therefore, manufacturers order the smallest quantities on the most frequent basis.

Because manufacturers change the labeling for branded products more frequently than for private label products for marketing reasons, we assumed they order smaller portions of their annual inventory with each order. Our industry contacts said that manufacturers of well-known brands of products sold in bulky packaging may order packaging as often as every month. They may also change the graphic design on the packaging multiple times a year. In comparison, manufacturers of private label products may order up to 3 years' worth (or more in some cases) of labeling or packaging inventory to obtain volume discounts. However, for the bulkiest packaging, even private label manufacturers are not likely to have more than 12 months' inventory on hand. As indicated in Table 4-9, we assumed that manufacturers rarely hold more than 3

Table 4-9. Remaining Inventory Assumptions by Type of Package
The volume of discarded inventory is calculated by multiplying these percentages by the annual units sold.

	Percentage of "Annual Units Sold" Remaining for…					
	12-Month Compliance		24-Month Compliance		36-Month Compliance	
Package Type	Branded	Private Label	Branded	Private Label	Branded	Private Label
Low Bulkiness • Label—cut and stack • Label—pressure sensitive • Label—shrink wrap	10%	150%	0%	50%	0%	10%
Medium Bulkiness • Flat blank carton • Paper bag • Paper/foil packet • Plastic bag/pouch	0%	10%	0%	0%	0%	0%
High Bulkiness • Aseptic box • Egg carton • Gable top carton • Knock down carton • Metal can • Spiral wound container • Plastic tub	0%	0%	0%	0%	0%	0%

years' worth of labeling or packaging inventory. However, because manufacturers often order slightly more packaging and labeling inventory than their projected needs, we included a residual 10 percent remaining inventory for low bulkiness—branded, low bulkiness—private label, and medium bulkiness—private label.

Using the estimates of remaining inventory, we calculated the costs of discarded inventory by first estimating the remaining number of labeling and packaging units (i.e., by multiplying the percentages in Table 4-9 by the annual unit sales from the IRI dataset). We then multiplied the estimated remaining number of labeling and packaging units by the cost estimate for each. Table 4-10 lists the cost estimates for each product category based on the labeling or packaging type for the representative product. These cost estimates were obtained from Dr. Aaron Brody and verified against limited estimates we obtained from food manufacturers.

Table 4-10. Costs of Label or Package for Each Product Category Based on a Representative Product
The per-unit costs of labels and packages are used to calculate discarded inventory costs.

Product Type	Product Category	Package/Label Type	Low	Medium	High
Baked Goods	Bakery Snacks—Non-Rfg	Knock down carton	$0.050	$0.055	$0.060
	Bakery Snacks—Rfg	Flat blank carton	$0.090	$0.100	$0.110
	Bread/Rolls—Non-Rfg	Plastic bag/pouch	$0.030	$0.035	$0.040
	Bread/Rolls—Rfg & Fz	Plastic bag/pouch	$0.020	$0.025	$0.030
	Breadcrumbs/Batters/Croutons	Knock down carton	$0.040	$0.050	$0.060
	Cookies	Plastic bag/pouch	$0.050	$0.055	$0.060
	Crackers	Knock down carton	$0.090	$0.095	$0.100
	Snack & Granola Bars	Knock down carton	$0.030	$0.035	$0.040
Baking Ingredients	Baking Ingredients	Plastic bag/pouch	$0.030	$0.035	$0.040
	Baking Ingredients—Powders	Knock down carton	$0.025	$0.030	$0.035
	Baking Mixes	Knock down carton	$0.070	$0.075	$0.080
	Dough—Rfg & Fz	Spiral wound container	$0.070	$0.075	$0.080
	Flour/Meal	Paper bag	$0.040	$0.050	$0.060
	Nuts—Baking Nuts	Plastic bag/pouch	$0.040	$0.030	$0.050
	Pizza—Crust/Dough	Spiral wound container	$0.090	$0.095	$0.100
Beverages	Bottled Water	Label—pressure sensitive	$0.040	$0.050	$0.060
	Carbonated Beverages—Regular[a]	Label—cut & stack	$0.015	$0.020	$0.025
	Carbonated Beverages—Regular[a]	Knock down carton	$0.120	$0.130	$0.140
		Metal can	$0.070	$0.075	$0.080
	Carbonated Beverages—Sugar Substitute[a]	Label—cut & stack	$0.015	$0.020	$0.025
	Carbonated Beverages—Sugar Substitute[a]	Knock down carton	$0.120	$0.130	$0.140
		Metal can	$0.070	$0.075	$0.080

(continued)

Table 4-10. Costs of Label or Package for Each Product Category Based on a Representative Product (continued)

Product Type	Product Category	Package/Label Type	Low	Medium	High
Beverages (continued)	Carbonated Beverages—Water/Club Soda	Label—cut & stack	$0.040	$0.050	$0.060
	Coffee—Ground	Label—shrink wrap	$0.050	$0.055	$0.060
	Coffee—Instant	Label—cut & stack	$0.030	$0.035	$0.040
	Coffee—Whole	Plastic bag/pouch	$0.230	$0.250	$0.270
	Drink Mixes—Cocktail Mixes	Label—cut & stack	$0.060	$0.070	$0.080
	Drink Mixes—Milk/Cocoa Dry Mixes	Knock down carton	$0.040	$0.050	$0.060
	Drink Mixes—Other	Paper/foil packet	$0.030	$0.035	$0.040
	Isotonic Drinks	Label—cut & stack	$0.020	$0.030	$0.040
	Juices—Concentrate, Rfg & Fz	Spiral wound container	$0.030	$0.035	$0.040
	Juices—Rfg	Gable top carton	$0.120	$0.130	$0.140
	Juices—Aseptic	Flat blank carton	$0.025	$0.030	$0.035
		Aseptic box	$0.080	$0.085	$0.090
	Juices—Bottled	Label—cut & stack	$0.020	$0.025	$0.030
	Juices—Canned	Label—cut & stack	$0.040	$0.050	$0.060
	Milk—Condensed	Label—cut & stack	$0.013	$0.015	$0.018
	Milk—Powdered	Plastic bag/pouch	$0.150	$0.175	$0.200
	Milk—Rfg	Label—pressure sensitive	$0.013	$0.015	$0.018
	Milk—Flavored/Substitutes	Label—shrink wrap	$0.040	$0.045	$0.050
	Non-Fruit Drinks	Label—cut & stack	$0.050	$0.060	$0.070
	Creamer/Coffee Additives—Non-Rfg	Label—shrink wrap	$0.040	$0.045	$0.050
	Creamer—Rfg & Fz	Gable top carton	$0.040	$0.050	$0.060
	Tea—Canned/Bottled	Label—cut & stack	$0.020	$0.025	$0.030
	Tea—Instant	Label—cut & stack	$0.025	$0.028	$0.030
	Tea—Loose	Flat blank carton	$0.060	$0.070	$0.080

(continued)

Table 4-10. Costs of Label or Package for Each Product Category Based on a Representative Product (continued)

Product Type	Product Category	Package/Label Type	Low	Medium	High
Breakfast Foods	Breakfast Food—Frozen	Knock down carton	$0.070	$0.075	$0.080
	Breakfast Food—Instant	Knock down carton	$0.060	$0.065	$0.070
		Paper/foil packet	$0.030	$0.035	$0.040
	Breakfast Food—Ready to Eat	Knock down carton	$0.040	$0.050	$0.060
	Cereal	Knock down carton	$0.100	$0.110	$0.120
Candy & Gum	Chocolate Candy—Single Serve	Plastic bag/pouch	$0.015	$0.020	$0.025
	Chocolate Candy—Snack	Plastic bag/pouch	$0.025	$0.030	$0.035
	Gum—Regular Gum	Plastic bag/pouch	$0.020	$0.025	$0.030
	Gum—Sugarless Gum	Plastic bag/pouch	$0.020	$0.025	$0.030
	Nonchocolate Candy—Diet	Plastic bag/pouch	$0.050	$0.055	$0.060
	Nonchocolate Candy—Kits	Plastic tub	$0.040	$0.050	$0.060
	Nonchocolate Candy—Pkg & Roll	Plastic bag/pouch	$0.050	$0.055	$0.060
	Nonchocolate Candy—Single Serve	Plastic bag/pouch	$0.015	$0.020	$0.025
	Nonchocolate Candy—Snack	Plastic bag/pouch	$0.050	$0.055	$0.060
	Seasonal Candy	Plastic bag/pouch	$0.015	$0.020	$0.025
Condiments/Dips/Spreads	Condiments—Non-Rfg	Label—cut & stack	$0.015	$0.020	$0.025
	Condiments—Rfg	Plastic tub	$0.080	$0.085	$0.090
		Label—pressure sensitive	$0.050	$0.055	$0.060
	Dips—Dry Mixes	Paper/foil packet	$0.040	$0.045	$0.050
	Dips—Shelf Stable	Label—cut & stack	$0.008	$0.010	$0.013
	Dips—Rfg & Fz	Plastic tub	$0.070	$0.075	$0.080
	Jams/Jellies/Preserves	Label—cut & stack	$0.010	$0.015	$0.020
	Mayonnaise	Label—cut & stack	$0.030	$0.033	$0.035

(continued)

Table 4-10. Costs of Label or Package for Each Product Category Based on a Representative Product (continued)

Product Type	Product Category	Package/Label Type	Low	Medium	High
Condiments/Dips/Spreads (continued)	Peanut Butter	Label—cut & stack	$0.015	$0.020	$0.025
	Pickles/Relish/Olives	Label—cut & stack	$0.013	$0.015	$0.018
	Salad Toppings	Spiral wound container	$0.070	$0.075	$0.080
	Salt/Salt Substitutes	Label—cut & stack	$0.020	$0.025	$0.030
	Spices/Seasonings	Label—cut & stack	$0.005	$0.008	$0.010
Dairy Foods	Butter	Knock down carton	$0.030	$0.035	$0.040
	Cheese—Grated	Label—cut & stack	$0.020	$0.030	$0.040
	Cheese—Imitation	Plastic bag/pouch	$0.015	$0.020	$0.025
	Cheese—Natural Cheese	Plastic bag/pouch	$0.120	$0.125	$0.130
	Cheese—Processed Cheese	Plastic bag/pouch	$0.015	$0.020	$0.025
	Cheese—Ricotta/Cream/Cottage	Plastic tub	$0.060	$0.065	$0.070
	Cheese—Shredded	Plastic bag/pouch	$0.120	$0.130	$0.140
	Frozen Novelties	Flat blank carton	$0.015	$0.020	$0.025
		Paper/foil packet	$0.015	$0.020	$0.025
	Ice Cream & Ice Milk	Flat blank carton	$0.150	$0.175	$0.200
	Sour Cream	Plastic tub	$0.050	$0.060	$0.070
	Yogurt	Plastic tub	$0.070	$0.075	$0.080
Desserts	Desserts—Toppings	Plastic tub	$0.070	$0.080	$0.090
	Gelatin/Pudding—Mixes	Knock down carton	$0.020	$0.025	$0.030
	Gelatin/Pudding—Regular	Knock down carton	$0.025	$0.030	$0.035
	Pies & Cakes—Non-rfg	Flat blank carton	$0.120	$0.135	$0.150
	Pies & Cakes—Rfg & Fz	Knock down carton	$0.070	$0.075	$0.080

(continued)

Table 4-10. Costs of Label or Package for Each Product Category Based on a Representative Product (continued)

Product Type	Product Category	Package/Label Type	Low	Medium	High
Dietary Supplements	Dietary Supplements—Liquid	Knock down carton	$0.060	$0.065	$0.070
		Label—cut & stack	$0.008	$0.010	$0.013
	Dietary Supplements—Pills	Flat blank carton	$0.050	$0.055	$0.060
		Label—pressure sensitive	$0.020	$0.025	$0.030
Dressings & Sauces	Gravy/Sauce—Canned/Bottled	Label—cut & stack	$0.020	$0.025	$0.030
	Gravy/Sauce—Mixes	Paper/foil packet	$0.030	$0.035	$0.040
	Gravy/Sauce—Rfg & Fz	Label—pressure sensitive	$0.035	$0.040	$0.045
	Salad Dressing—Bottled, non-rfg	Label—pressure sensitive	$0.020	$0.025	$0.030
	Salad Dressing—Dry Mix	Paper/foil packet	$0.030	$0.035	$0.040
	Salad Dressing—Rfg	Label—pressure sensitive	$0.020	$0.025	$0.030
	Vinegar	Label—cut & stack	$0.025	$0.030	$0.035
Eggs	Processed Eggs	Gable top carton	$0.090	$0.095	$0.100
	Shell Eggs	Egg carton	$0.090	$0.100	$0.110
Entrees	Entrées—Fz	Knock down carton	$0.060	$0.065	$0.070
	Entrées—Rfg	Flat blank carton	$0.030	$0.035	$0.040
	Entrées—Shelf Stable	Label—cut & stack	$0.015	$0.018	$0.020
	Pizza—Pizza/Kits/Mixes, Rfg & Fz	Knock down carton	$0.070	$0.080	$0.090
	Lunches—Rfg	Knock down carton	$0.050	$0.055	$0.060
Fats & Oils	Lard/Shortening	Spiral wound container	$0.200	$0.225	$0.250
	Margarine	Knock down carton	$0.030	$0.035	$0.040
	Oil	Label—cut & stack	$0.010	$0.015	$0.020

(continued)

Table 4-10. Costs of Label or Package for Each Product Category Based on a Representative Product (continued)

Product Type	Product Category	Package/Label Type	Low	Medium	High
Fruits & Vegetables	Beans—Canned	Label—cut & stack	$0.015	$0.020	$0.025
	Fruit—Canned/Bottled	Label—cut & stack	$0.013	$0.015	$0.018
	Fruit—Dried	Knock down carton	$0.045	$0.055	$0.065
	Fruit—Dry Fruit Snacks	Knock down carton	$0.040	$0.050	$0.060
		Plastic bag/pouch	$0.020	$0.025	$0.030
	Fruit—Fz	Plastic bag/pouch	$0.090	$0.100	$0.110
	Fruit—Sauce	Flat blank carton	$0.020	$0.025	$0.030
		Paper/foil packet	$0.005	$0.008	$0.010
	Tomato Products—Canned/Bottled	Label—cut & stack	$0.013	$0.015	$0.018
	Tomato Products—Sauce	Label—cut & stack	$0.015	$0.020	$0.025
	Vegetables—Canned/Bottled	Label—cut & stack	$0.006	$0.008	$0.011
	Vegetables—Dried	Plastic bag/pouch	$0.020	$0.025	$0.030
	Vegetables—Fresh Cut Salad	Plastic bag/pouch	$0.080	$0.085	$0.090
	Vegetables—Frozen	Plastic bag/pouch	$0.060	$0.065	$0.070
Infant Foods	Baby Food	Label—cut & stack	$0.005	$0.008	$0.010
	Baby Formula—Liq Concentrate	Label—cut & stack	$0.020	$0.023	$0.025
	Baby Formula—Powder	Label—cut & stack	$0.035	$0.038	$0.040
	Baby Formula—Ready to Drink	Label—cut & stack	$0.040	$0.050	$0.060
	Baby Juice	Label—cut & stack	$0.003	$0.005	$0.008
Seafood	Seafood—Canned	Label—cut & stack	$0.013	$0.015	$0.018
	Seafood—Fz	Knock down carton	$0.100	$0.110	$0.120
	Seafood—Rfg	Knock down carton	$0.040	$0.045	$0.050

(continued)

Table 4-10. Costs of Label or Package for Each Product Category Based on a Representative Product (continued)

Product Type	Product Category	Package/Label Type	Low	Medium	High
Side Dishes & Starches	Instant Potatoes	Knock down carton	$0.050	$0.055	$0.060
	Pasta—Dry	Knock down carton	$0.040	$0.050	$0.060
	Pasta—Rfg & Fz	Label—pressure sensitive	$0.040	$0.045	$0.050
	Rice	Knock down carton	$0.035	$0.040	$0.045
	Side Dishes—Fz	Knock down carton	$0.045	$0.050	$0.055
	Side Dishes—Rfg	Label—pressure sensitive	$0.015	$0.020	$0.025
	Side Dishes—Shelf Stable	Label—cut & stack	$0.013	$0.015	$0.018
	Side Dishes—Kits/Mixes	Knock down carton	$0.050	$0.060	$0.070
	Stuffing	Knock down carton	$0.050	$0.060	$0.070
Snack Foods	Nuts—Snack Nuts	Label—cut & stack	$0.025	$0.030	$0.035
	Salty Snacks—Bagged	Plastic bag/pouch	$0.100	$0.110	$0.120
	Salty Snacks—Other	Spiral wound container	$0.090	$0.100	$0.110
	Salty Snacks—Unpopped Popcorn	Knock down carton	$0.060	$0.065	$0.070
	Seeds—Snack	Plastic bag/pouch	$0.050	$0.055	$0.060
Soups	Soup—Canned	Label—cut & stack	$0.008	$0.010	$0.013
	Soup—Dry	Knock down carton	$0.030	$0.035	$0.040
	Soup—Ramen	Plastic bag/pouch	$0.015	$0.020	$0.025
Sweeteners	Sugar	Paper bag	$0.040	$0.050	$0.060
	Sugar Substitutes	Flat blank carton	$0.030	$0.035	$0.040
	Sugar Substitutes	Paper/foil packet	$0.003	$0.004	$0.005
	Syrup/Molasses	Label—cut & stack	$0.015	$0.020	$0.025
Weight Control Foods	Weight Control Liq/Powder	Label—shrink wrap	$0.020	$0.025	$0.030

[a]These product categories include two representative products.

In the case of a 6-month compliance period, we assumed that manufacturers would apply a sticker to half a year's worth of product inventory (see Section 3.2 for a discussion of responses to a very short compliance period). In addition, we assumed that manufacturers incur the same costs as under the 12-month compliance period, including discarded inventory costs, in addition to the costs of purchasing and applying the sticker. Based on information provided by Dr. Aaron Brody, and assuming total compensation of $15 per hour for workers to manually apply the stickers, we developed the cost estimates listed in Table 4-11.

Table 4-11. Sticker Application Cost Estimates for the 6-Month Compliance Period
The model assumes that half a year's worth of sales would require a sticker for a 6-month compliance period.

	Low	Medium	High
Sticker Cost	$0.010	$0.015	$0.020
Application Cost	$0.004	$0.011	$0.017
Total	$0.014	$0.026	$0.037

If companies are able to purchase and install a machine to apply the sticker, these cost estimates may overstate their actual costs. In comparison, if the process of applying the sticker slows down deliveries of products, these cost estimates may substantially understate the costs of a 6-month compliance period because the true cost would then include the value of lost sales.

4.3 LABELING COST MODEL CALCULATIONS

Using the data tables described in Section 4.2, the model calculates the costs of making a change based on the printing and packaging method of the representative product and the number of colors affected by the required change. Table 4-12 describes the variables used in the model calculations. The user makes the following selections in the model:

- affected product category, PC;
- affected part(s) of the labeling, which determines the number of colors, k;
- type(s) of analytical testing (optional), m;
- type(s) of market testing (optional), n; and
- compliance period (6-, 12-, 24-, and 36-months), c.

Table 4-12. Descriptions of Variables Used in the Labeling Cost Model Calculations
These variables are used to calculate the costs of complying with a labeling regulation.

Variable	Description
ADM	Administrative costs per SKU
DES	Redesign costs per SKU
PRE	Prepress costs per SKU
ENG	Engraving costs per SKU
ANT	Analytical testing costs per product
MKT	Market testing costs per product
PKG	Per-unit cost of the label or printed package
STK	Per-unit cost of sticker (6-month compliance period only)
INV^B	Percentage of label or packaging inventory remaining for branded products (relative to annual product sales)
INV^{PL}	Percentage of label or packaging inventory remaining for private label products (relative to annual product sales)
PC	Affected product category
x^B; y^B	Number of branded SKUs and formulas (respectively) for the product category
x^{PL}; y^{PL}	Number of private label SKUs and formulas (respectively) for the product category
x, y	Total number of affected SKUs and formulas (respectively) for the product category
p^B	Proportion of branded SKUs that cannot be coordinated with a scheduled labeling change
p^{PL}	Proportion of private label SKUs that cannot be coordinated with a scheduled labeling change
z^B	Annual branded units sold for the product category
z^{PL}	Annual private label units sold for the product category
i	Printing method for the representative product for the product category (flexography, offset lithography, and rotogravure)
j	Packaging method for the representative product for the product category
k	Number of color changes required (one, two, and six)
m	Type of market test
n	Type of analytical test
c	Compliance period (6, 12, 24, and 36)
a	Cost adjustment factor for 6- and 12-month compliance periods (assumed 0.1)

With these selections, the model calculates low, medium, and high cost estimates for the required changes.

The number of affected products is calculated as

$$x = p_c^B \bullet x^B + p_c^{PL} \bullet x^{PL},$$

and the number of affected formulas is calculated as

$$y = p_c^B \bullet y^B + p_c^{PL} \bullet y^{PL}.$$

Then, for the 12-, 24-, and 36-month compliance periods, the low, medium, and high costs for making a change to each product category, PC, are calculated as follows:

$$(1 + a) \bullet [(ADM_k + DES_k) + (PRE_{ik} + ENG_{ik})] \bullet x +$$
$$\left(\sum_n ANT_n + \sum_m MKT_m\right) \bullet y +$$
$$(INV_c^B \bullet p_c^B \bullet z^B + INV_c^{PL} \bullet p_c^{PL} \bullet z^{PL}) \bullet PKG_j.$$

If the representative product for the category has both inner and outer packaging with labeling information, the model calculates the costs individually for both parts of the packaging and then adds the two individual cost estimates together. Because the Carbonated Beverages—Regular and Carbonated Beverages—Sugar Substitute categories have two representative products (in 12-pack cartons and in 2-liter bottles), the cost estimates were constructed as weighted averages. The weights were derived from scanner data. For Carbonated Beverages—Regular, the weights are 0.57 for 2-liter bottles and 0.43 for 12-pack cartons. For Carbonated Beverages—Sugar Substitute, the weights are 0.52 for 2-liter bottles and 0.48 for 12-pack cartons.

As mentioned above, the costs for a 6-month compliance period are calculated by assuming a 12-month compliance period and adding on the costs of applying a sticker to 6 months' worth of unit sales. Thus, in addition to the calculation above, we also add the following:

$$STK \bullet 0.5 \bullet (p_c^B \bullet z^B + p_c^{PL} \bullet z^{PL}).$$

Finally, because the cost estimates used in the labeling cost model are based in 2001, the model allows the user to input a price

adjustment factor to account for inflation or discounting. If an adjustment factor is entered, all of the above costs are multiplied by the inflation factor.

4.4 REFERENCES

Brody, A., Rubbright-Brody, Inc. July 2, 2001. Personal communication with Mary Muth, RTI.

FedEx. February 1, 2001. "U.S. Rates: FedEx Priority Overnight®." Excel spreadsheets. <http://rate.dmz.fedex.com/us/rates/downloads/#eservice>.

Nutrition Business Journal. 2000. "U.S. Nutrition Industry, 1994-2000, Products & Channels."

U.S. Department of Labor, Bureau of Labor Statistics. June 29, 2001. "Employer Costs for Employee Compensation—March 2001." USDL: 01-194.

White, W.J., E.C. Gledhill, S.A. Karns, and M.K. Muth. July 2002. "Cost of Reformulating Foods and Cosmetics." Report prepared for FDA/CFSAN. Research Triangle Park, NC: RTI.

5 Instructions for Using the Labeling Cost Model

In this section, we describe the procedures for obtaining cost estimates using the labeling cost model. The data sets that form the core of the model are in Stata for Windows, and the interface is in Microsoft Excel. Once the user chooses the options for running the model, the program executes in Stata for Windows and returns the results in an Excel spreadsheet. The advantage to maintaining the data sets in Stata for Windows is that the user can conduct any additional types of desired analyses within Stata for Windows without converting the data sets from another format. While running the model, the user will not work directly in the Stata for Windows environment.

5.1 PREPARING TO RUN THE MODEL

Prior to running the labeling cost model, you must install the program files on your personal computer. To install the program files, you will need to do the following:

1. Create a folder on your hard disk called **C:\Labels**.
2. Copy the following files into the **C:\Labels** folder:
   - ✓ the Excel interface file: **label model.xls**
   - ✓ the Stata data files: **product.dta, inventory.dta, print.dta, market.dta, package.dta, label.dta, sticker.dta, and analytical.dta**
   - ✓ the Stata program file: **label.do**

In Section 5.2, we provide instructions for running the model. However, prior to running the model, it may be useful to review the process by which the model runs. The process is as follows:

- ➤ The user opens the Excel interface (**label model.xls**) and chooses the model inputs.
- ➤ The Excel interface outputs the model inputs into a text file in the **C:\Labels** folder, calls up the Stata for Windows program, and waits for an output file.
- ➤ The Stata for Windows program (**label.do**) reads the text file of user inputs, calculates the labeling cost estimates, and outputs a tab-delimited text file called **allcosts.out** into the **C:\Labels** folder.
- ➤ The Excel interface program opens the **allcosts.out** file and dumps the cost estimates into the **Data** sheet and dumps the user inputs into the **Inputs** sheet.
- ➤ The Excel program creates the following two pivot tables (each on a separate sheet):
  - ✓ **Aggregate Costs**, which displays the total low, medium, and high cost estimates by product category, and
  - ✓ **All Costs**, which displays the detailed low, medium, and high cost estimates for each product.

5.2 SELECTING MODEL INPUTS

Step 1: Open the file **label model.xls** by double-clicking on the file name.

To select the inputs for running the labeling cost model, open the Excel file **label model.xls**. Once the model has opened, click [**Start Labeling Cost Model**] and the Main Menu screen will appear (see Figure 5-1). This menu will guide you through the process of choosing the inputs for the model. You may click [**Cancel**] on the Main Menu to exit the model at any time, and you may click [**Reset All Selections**] to clear all of your selections on every menu. You may click the [**More Info**] buttons on the right side of the Main Menu or at the bottom of each input menu to learn more about each of the model inputs.

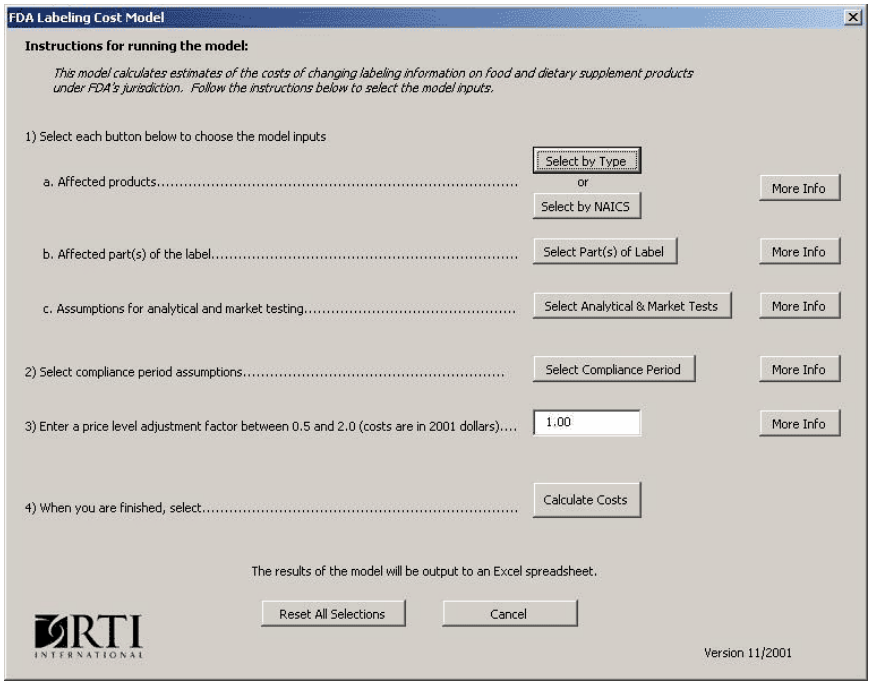
Step 2: Choose affected product categories sorted by either:
- ➤ Product types
- ➤ NAICS codes

You may select product categories sorted by Product Type OR by NAICS code. If you select categories sorted by one method, you will be able to view the other menu, but you will not be able to select by the other method unless you clear your previous choices.

To choose the affected product categories by Product Type:

- ➤ Click [**Select by Type**].

Figure 5-1. The Main Menu Screen for the Labeling Cost Model
Follow the steps on the Main Menu screen to select the model inputs.

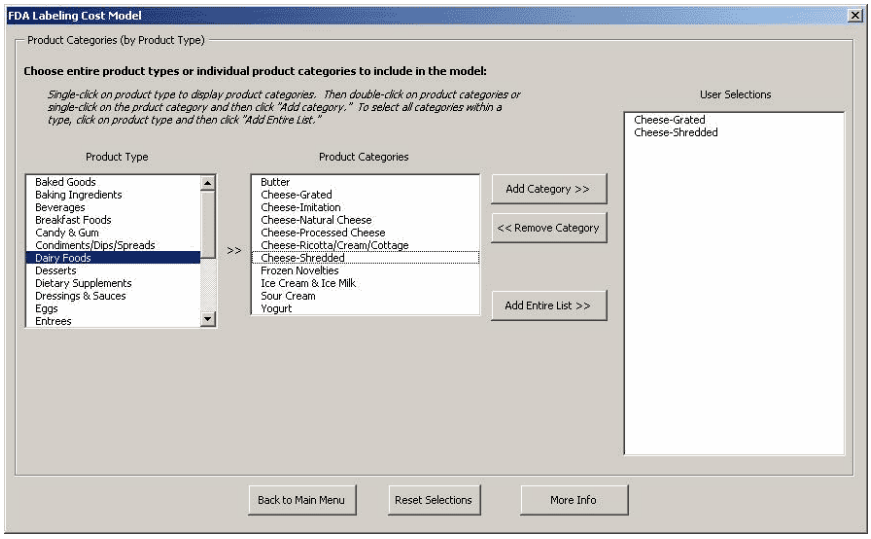


When you click [**Select by Type**], a new menu will open (see Figure 5-2). On this menu, you may choose individual product categories, all categories within a product type, or a combination of both to include in the model. To choose product categories by type:

- ➤ Click on a product type from the "Product Type" list on the far left of the menu. Once a product type is highlighted, all of the product categories within the type will display in the "Product Categories" list immediately to the right.
- ➤ To select all of the product categories within the product type:
  - ✓ Click [**Add Entire List**]. All of the categories that are displayed in the "Product Categories" list will then display in the "User Selections" list on the right.
- ➤ To select individual product categories within the selected type:
  - ✓ Double-click on the desired product category in the "Product Categories" list and it will display in the "User Selections" list.

  OR:
  - ✓ Click on the desired product category in the "Product Categories" list. Click [**Add Category**]. The selected category will then display in the "User Selections" list.

Figure 5-2. The Product Selection Screen for Choosing Product Categories by IRI-Based Product Types
You may choose product categories by product type or by NAICS codes (see Figure 5-3).



➤ To remove product categories from the "User Selections" list:

✓ Double-click on the product category to be deleted from the "User Selections" list.

OR:

✓ Click on the category to be deleted from the "User Selections" list and then click [**Remove Category**].

➤ If you would like to clear your selections on this screen only, click [**Reset Selections**].

➤ Once you have selected all of the desired product categories, click [**Back to Main Menu**].

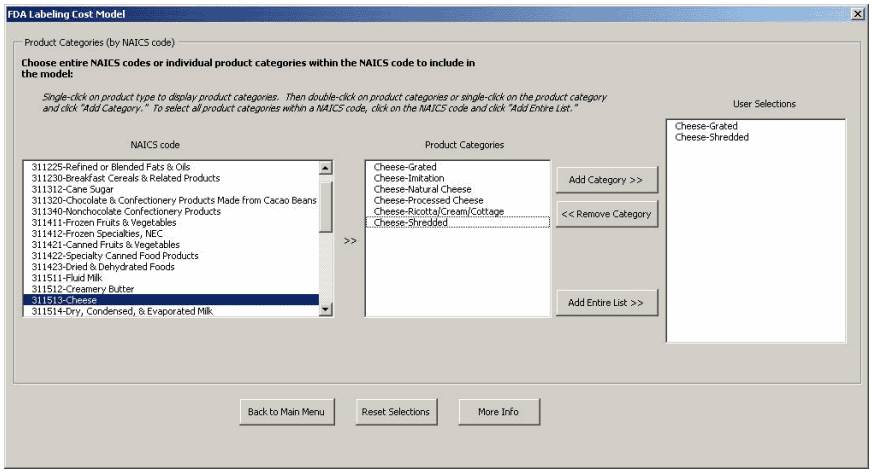
To choose the affected product categories by NAICS code:

➤ Click [**Select by NAICS**]

When you click [**Select by NAICS**], a new menu will open (see Figure 5-3). On this menu, you may choose individual product categories within a NAICS code, all categories within a NAICS code, or a combination of both to include in the model. To choose product categories organized by NAICS code:

➤ Click on a NAICS code in the "NAICS code" list on the far left of the screen. Once a NAICS code is highlighted, all of the product categories within that NAICS code will display in the "Product Categories" list located immediately to the right.

Figure 5-3. The Product Selection Screen for Choosing Product Categories by NAICS Codes
You may choose product categories by NAICS codes or by product types (see Figure 5-2).



➤ To select all of the product categories within the selected NAICS code:

✓ Click [**Add Entire List**]. All of the categories that are displayed in the "Product Categories" list will then display in the "User Selections" list on the right.

➤ To select individual product categories within the selected NAICS code:

✓ Double-click on the desired product category in the "Product Categories" list and it will display in the "User Selections" list.

OR:

✓ Click on the desired product category in the "Product Categories" list. Click [**Add Category**]. The selected category will then display in the "User Selections" list.

➤ To remove product categories from the "User Selections" list:

✓ Double-click on the product category to be deleted from the "User Selections" list.

OR:

✓ Click on the category to be deleted from the "User Selections" and then click [**Remove Category**].

➤ If you would like to clear your selections on this screen only, click [**Reset Selections**].

➤ Once you have selected all of the desired product categories, click [**Back to Main Menu**].

Step 3: Choose affected parts of the product label.

You will then be returned to the Main Menu and can choose the part or parts of the label that will be affected by the regulation. To choose the affected parts of the label or number of colors:

➤ Click [**Select Parts(s) of the Label**].

When you click [**Select Part(s) of the Label]**, a new menu will open (see Figure 5-4). On this menu, you may EITHER select one or more parts of the label that will be affected OR the number of colors (printing plates) that will be affected. Note that if you choose a part of the label that will be affected, you cannot then select the number of colors affected unless you first click [**Reset Selections**] or remove all of the label parts that have been selected from the "User Selections" list. Correspondingly, if you choose the number of colors affected, you cannot then select a part of the label that will be affected without first clicking [**Reset Selections**].

➤ To choose affected parts of the label:

✓ Double-click on the desired label part in the "Label Part" list and it will display in the "User Selections" list.

OR:

✓ Click on the label part in the "Label Part" list on the left of the screen and then click [**Add Label Part**]. The selected label part will then display in the "User Selections" list on the right.

➤ To remove parts of the label that you have selected:

✓ Click on the label part in the "User Selections" list and then click [**Remove Label Part**].

OR:

✓ Double-click on the label part to be deleted from the "User Selections" list.

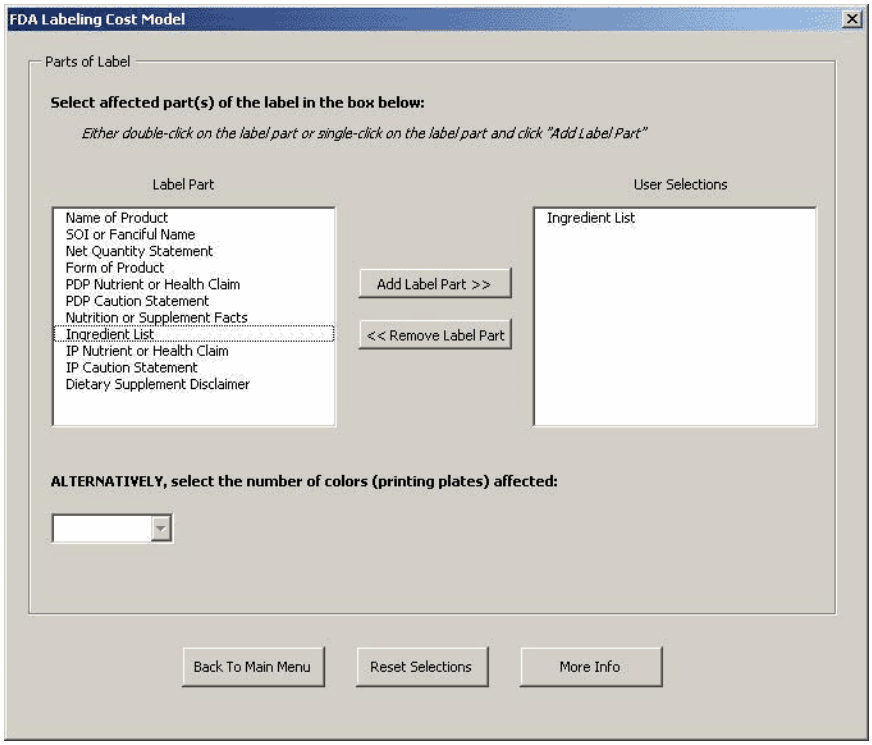
➤ To choose the affected number of colors:

✓ Click on the arrow in the drop-down box at the bottom of the screen and select **1 color**, **2 colors**, or **Full Redesign**.

➤ If you would like to clear your selections on this screen only, click [**Reset Selections**].

➤ Once you have selected the affected parts of the label or number of colors, click [**Back to Main Menu**].

Figure 5-4. The Affected Parts of Label Screen
You may choose one or more affected parts of the label or the number of affected colors.



Step 4: Choose analytical and market tests (optional).

You will again be returned to the Main Menu and can then select analytical or market tests. You may also enter a cost for any analytical tests that are not included in the "Analytical Tests" list. If these options are not applicable for the proposed regulation, you can skip this step.

To include analytical test or market test costs:

➤ Click [**Select Analytical and Market Tests**]

When you click [**Select Analytical and Market Tests]**, a new menu will open (see Figure 5-5). On this menu, you may choose individual or multiple analytical or market tests.

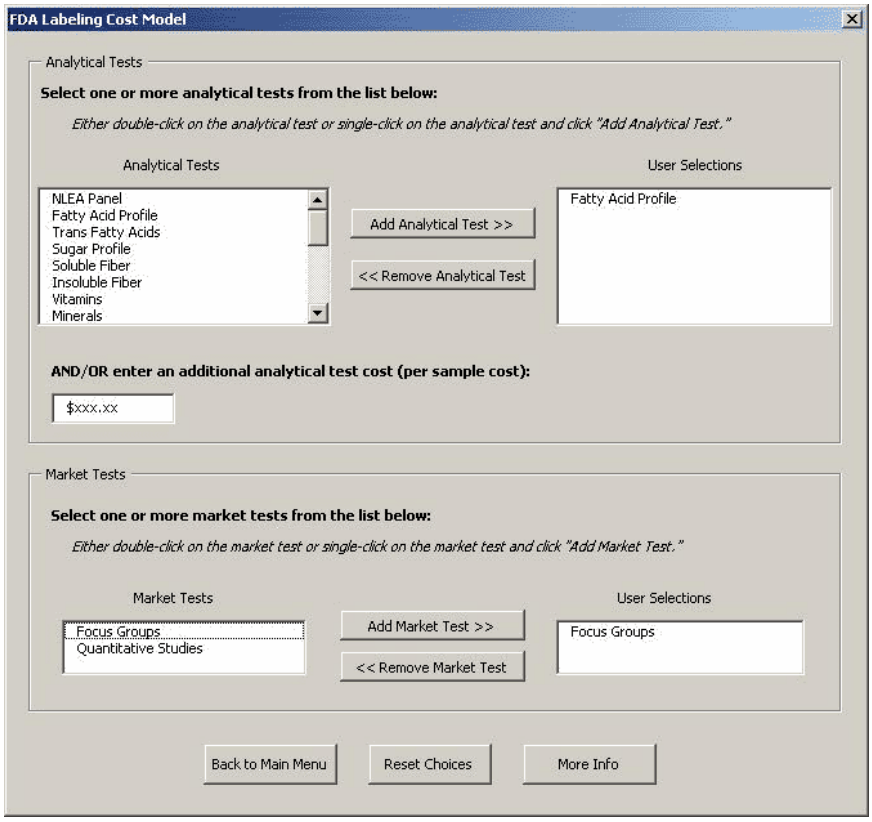
➤ To include analytical tests:

✓ Double-click on the desired test in the "Analytical Tests" list and it will display in the "User Selections" list.

OR:

✓ Click on the test in the "Analytical Tests" list and then click [**Add Analytical Test**]. The selected analytical test will then display in the "User Selections" list to the right.

Figure 5-5. The Analytical Test and Market Test Screen
If applicable, you may choose to include analytical tests or market tests in the cost estimates.



➤ To remove analytical tests you have selected:

✓ Double-click on the analytical test to be deleted from the "User Selections" list.

OR:

✓ Click on the test to be deleted from the "User Selections" list and then click [**Remove Analytical Test**].

➤ Alternatively, or in addition to any selected analytical tests, you may include a total dollar amount for additional analytical tests as follows:

✓ Click on the box below the "Analytical Tests" list and type in a total cost per sample in dollars.

➤ To include market test costs:

✓ Double-click on the desired test in the "Market Tests" list and it will display in the "User Selections" list.

OR:

✓ Click on the test in the "Market Tests" list and then click [**Add Market Test**]. The selected market test will then display in the "User Selections" list.

➤ To remove market tests you have selected:

✓ Double-click on the test to be removed from the "User Selections" list.

OR:

✓ Click on the test in the "User Selections" list and then click [**Remove Market Test**].

➤ If you would like to clear your selections on this screen only, click [**Reset Choices**].

➤ Once you have selected the analytical and market tests, click [**Back to Main Menu**].

Step 5: Choose a compliance period and coordination assumptions.

You will then be returned to the Main Menu and must choose a compliance period. To choose a compliance period:

➤ Click [**Select Compliance Period**]

When you click [**Select Compliance Period**], a new menu will open (see Figure 5-6). On this menu, you may select the time period that manufacturers have to comply with the regulation. You may also change the model's assumption about the percentage of private and branded label products that can coordinate a label change with a scheduled change.

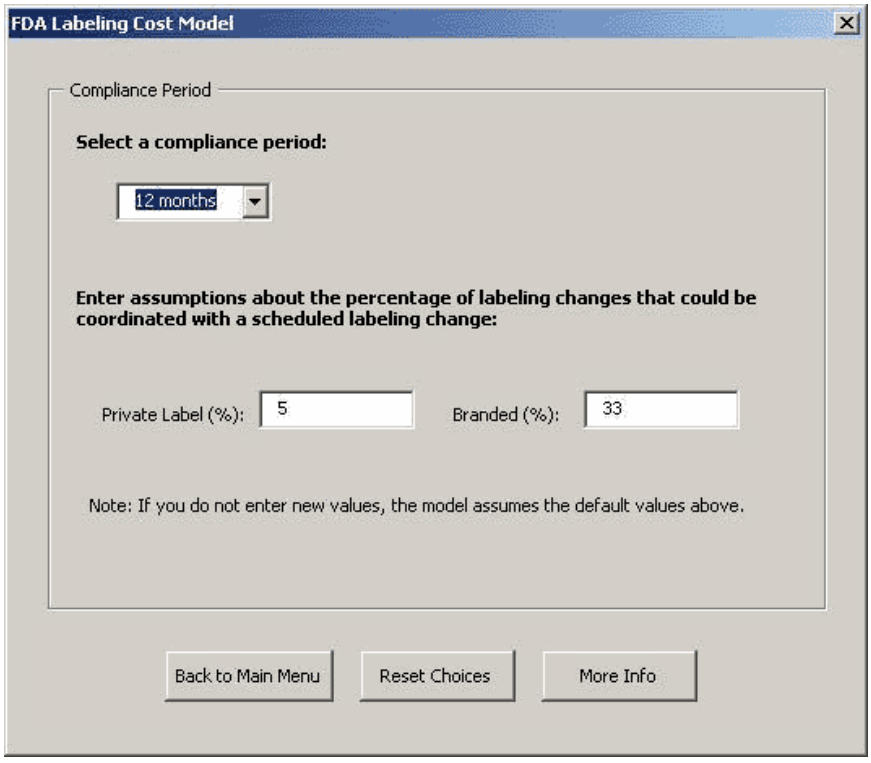


Figure 5-6. The Compliance Period Screen
Once you select a compliance period, the assumptions about the proportion of SKUs that could be coordinated with a scheduled labeling change will display.

- ➤ To select a compliance period, choose **6 months**, **12 months**, **24 months**, or **36 months** from the drop-down box.
- ➤ The coordination assumptions for the selected compliance period will then display. To change those assumptions click on each box and enter a new percentage for private and/or branded label products.
- ➤ If you would like to clear your selections on this screen only, click [**Reset Choices**].
- ➤ Once you have selected the compliance period, click [**Back to Main Menu**].

Step 6: Enter a price adjustment factor (optional).

You will again be returned to the Main Menu and may now select a price adjustment factor. If you are running the model to estimate costs in a year beyond 2001, you may wish to enter an inflation factor. To enter an inflation factor:

- ➤ Click on the price adjustment factor box and enter 1.xx where xx represents the total inflation factor beyond 2001. (By default, the inflation factor is set to 1.00.)

You may also wish to use the price adjustment factor to discount future changes back to the present. To enter a discount factor:

- ➤ Click on the price adjustment factor box and enter a value between 0.5 and 1.0

Step 7: Calculate costs.

Finally, once you have made all of your selections:

- ➤ Click [**Calculate Costs**] at the bottom of the screen.

The model will then calculate the cost estimates in Stata for Windows and return the output as described below.

5.3 OUTPUTS OF THE MODEL

Once you have run the labeling cost model, it generates four separate sheets in the file **allcosts.out**. We describe each of these sheets below.

The **Inputs** sheet displays the user's choices that were used to generate the cost estimates and also descriptive information about the representative products.

The **Inputs** sheet displays the user's choices in running the model. These inputs, described in Section 5.2, include the following (see Figure 5-7):

- ➤ product categories,
- ➤ compliance period and the proportion of private and branded label products that can coordinate a label change with a scheduled change,
- ➤ parts of the label changed (or number of colors affected),

Figure 5-7. The Inputs Sheet of the Labeling Cost Model Output
The Inputs sheet displays the user's selections and provides information on the representative products.

Labeling Cost Model
User Inputs - 11/9/2001

Product Category Inputs and Supporting Information

Product Category	Representative Product	Print Method	Package Type
Cheese-Grated	Kraft Grated Parmesan Cheese	Rotogravure	label-cut & stack
Cheese-Shredded	Kraft Shredded Cheddar	Rotogravure	plastic bag/pouch

Compliance Period Input and Industry Coordination Assumptions

Compliance Period	Private Label (%)	Brand Label (%)
12 months	5	33

Label Change Inputs and Associated Color Changes

Parts of Label Changed	Assoc. Color Change	Max Color Change
Ingredient List	1 color	1 color

Analytical Tests
Fatty Acid Profile
Additional Analytical Test Cost
None Added

Market Tests
Focus Groups

Price Adjustment Factor
1

- ➤ analytical tests and any additional analytical test costs, and
- ➤ market tests.

This sheet also displays information about the representative product for each category, including the printing method and packaging or labeling method.

The **Aggregate Costs** sheet displays the low, medium, and high cost estimates for private label and branded products within each product category.

The **Aggregate Costs** sheet displays the following results of the labeling cost model (see Figure 5-8):

- ➤ product types (if the user selected product categories by type);
- ➤ NAICS codes and NAICS descriptions;
- ➤ product categories;
- ➤ Small Business Administration (SBA) size for the applicable NAICS code;

Figure 5-8. The Aggregate Cost Sheet of the Labeling Cost Model Output
The Aggregate Costs sheet lists total low, medium, and high cost estimates for each product category. The product categories are displayed by product type (as shown) or by NAICS codes depending on how the user selected the product categories.

					Data				
Product Type	Product Category	NAICS Code	NAICS Description	Brand Type	SKUs	Formulas	Low Cost	Med Cost	High Cost
Dairy Foods	Cheese-Grated	311513	Cheese	Branded	222	159	$2,953,298	$4,009,289	$5,939,778
				Private	167	70	$2,499,457	$3,555,358	$5,013,604
	Cheese-Grated Total				389	229	$5,452,755	$7,564,647	$10,953,382
	Cheese-Shredded	311513	Cheese	Branded	502	300	$5,564,403	$7,542,350	$11,200,000
				Private	493	269	$7,970,070	$10,000,000	$13,600,000
	Cheese-Shredded Total				995	569	$13,534,473	$17,542,350	$24,800,000
Dairy Foods Total					1,384	798	$18,987,228	$25,106,997	$35,753,382
Grand Total					1,384	798	$18,987,228	$25,106,997	$35,753,382

- ➤ representative products;
- ➤ number of **affected** SKUs for branded and private label products;
- ➤ number of **affected** formulas for branded and private label products; and
- ➤ total low, medium, and high cost estimates for branded and private label products.

The **All Costs** sheet displays the disaggregated cost items within each product category.

The **All Costs** sheet displays the following disaggregated results of the labeling cost model (see Figure 5-9):

- ➤ product types (if the user selected product categories by type);

OR:

- ➤ NAICS codes and NAICS descriptions;
- ➤ product categories; and
- ➤ low, medium, and high cost estimates for branded and private label products disaggregated by type of costs (administrative, graphic design, prepress, engraving, analytical testing, market testing, and discarded inventory).

The **Totals by Cost Type** sheet displays the following results (see Figure 5-10):

- ➤ total low, medium, and high cost estimates for all product categories combined disaggregated by type of costs (administrative, graphic design, prepress, engraving, analytical testing, market testing, and discarded inventory).

The **Data** sheet contains the raw data used to generate the summary cost tables.

Finally, the **Data** sheet includes the raw cost data generated by the Stata for Windows program. The pivot tables in the **Aggregate Costs** and **All Costs** sheets are generated using these data. You should not need to alter any of the information on this sheet.

Figure 5-9. The All Costs Sheet of the Labeling Cost Model Output
The All Costs sheet lists disaggregated low, medium, and high cost estimates for each product category.

All Cost Types				Cost Level		
Product Type	Product Category	Brand Type	Cost Type	low	mid	high
Dairy Foods	Cheese-Grated	Branded	administrative	$29,274	$68,305	$107,337
			graphic	$73,184	$109,776	$146,368
			prepress	$121,974	$134,171	$195,158
			engraving	$219,552	$329,329	$439,105
			analytical	$30,334	$46,213	$93,850
			market	$2,381,850	$3,175,800	$4,763,700
			inventory	$97,131	$145,696	$194,261
		Branded Total		$2,953,298	$4,009,289	$5,939,778
		Private	administrative	$22,070	$51,498	$80,925
			graphic	$55,176	$82,764	$110,352
			prepress	$91,960	$101,156	$147,136
			engraving	$165,528	$248,292	$331,056
			analytical	$13,429	$20,459	$41,549
			market	$1,054,500	$1,406,000	$2,109,000
			inventory	$1,096,793	$1,645,189	$2,193,586
		Private Total		$2,499,457	$3,555,358	$5,013,604
	Cheese-Grated Total			$5,452,755	$7,564,647	$10,953,382
	Cheese-Shredded	Branded	administrative	$66,242	$154,564	$242,886
			graphic	$165,604	$248,406	$331,208
			prepress	$276,007	$303,607	$441,610
			engraving	$496,812	$745,218	$993,623
			analytical	$57,340	$87,356	$177,404
			market	$4,502,400	$6,003,200	$9,004,800
			inventory	$0	$0	$0
		Branded Total		$5,564,403	$7,542,350	$11,191,531
		Private	administrative	$65,083	$151,859	$238,636
			graphic	$162,707	$244,060	$325,413
			prepress	$271,178	$298,295	$433,884
			engraving	$488,120	$732,179	$976,239
			analytical	$51,358	$78,243	$158,898
			market	$4,032,750	$5,377,000	$8,065,500
			inventory	$2,898,875	$3,140,448	$3,382,021
		Private Total		$7,970,070	$10,022,085	$13,580,592
	Cheese-Shredded Total			$13,534,473	$17,564,435	$24,772,123
Dairy Foods Total				$18,987,227	$25,129,082	$35,725,505
Grand Total				$18,987,227	$25,129,082	$35,725,505

If you will be running additional cost estimate scenarios using the labeling cost model, you must first close the **allcosts.out** file. If you would like to save your results, save the file under a different name or the program will overwrite the file when you run the model again.

Figure 5-10. The Totals by Cost Type Sheet of the Labeling Cost Model Output
The Totals by Cost Type sheet lists low, medium, and high cost estimates by type of cost for all product categories combined.

Totals by Cost Type	Cost Level		
Cost Type	low	mid	high
administrative	$182,668	$426,226	$669,783
graphic	$456,671	$685,006	$913,341
prepress	$761,118	$837,229	$1,217,788
engraving	$1,370,012	$2,055,017	$2,740,023
analytical	$152,461	$232,271	$471,701
market	$11,971,500	$15,962,000	$23,943,000
inventory	$4,092,799	$4,931,333	$5,769,868
Grand Total	$18,987,227	$25,129,082	$35,725,505

Appendix A: Additional Product-Level Tables

Table A-1. Products in the Labeling Cost Model by NAICS Code

NAICS Code	NAICS Description	Product Type	Product Category	SBA Size[a]
311211	Flour & Other Grain Mill Products	Baking Ingredients	Flour/Meal	500
311212	Rice	Side Dishes & Starches	Rice	500
311225	Refined or Blended Fats & Oils	Fats & Oils	Lard/Shortening	1,000
		Fats & Oils	Margarine	1,000
		Fats & Oils	Oil	1,000
311230	Breakfast Cereals & Related Products	Breakfast Foods	Breakfast Food–Frozen	1,000
		Breakfast Foods	Breakfast Food–Instant	1,000
		Breakfast Foods	Breakfast Food–Ready to Eat	1,000
		Breakfast Foods	Cereal	1,000
311312	Cane Sugar	Sweeteners	Sugar	750
311320	Chocolate & Confectionery Products Made from Cacao Beans	Candy & Gum	Chocolate Candy–Single Serve	500
		Candy & Gum	Chocolate Candy–Snack	500
		Candy & Gum	Seasonal Candy	500
311340	Nonchocolate Confectionery Products	Candy & Gum	Gum–Regular Gum	500
		Candy & Gum	Gum–Sugarless Gum	500
		Candy & Gum	Nonchocolate Candy–Diet	500
		Candy & Gum	Nonchocolate Candy–Kits	500
		Candy & Gum	Nonchocolate Candy–Pkg & Roll	500
		Candy & Gum	Nonchocolate Candy–Single Serve	500
		Candy & Gum	Nonchocolate Candy–Snack	500

(continued)

Table A-1. Products in the Labeling Cost Model by NAICS Code (continued)

NAICS Code	NAICS Description	Product Type	Product Category	SBA Size[a]
311411	Frozen Fruits & Vegetables	Beverages	Juices–Concentrate, Rfg & Fz	500
		Fruits & Vegetables	Fruit–Fz	500
		Fruits & Vegetables	Vegetables–Frozen	500
311412	Frozen Specialties, NEC	Entrees	Entrées–Fz	500
		Entrees	Pizza–Pizza/Kits/Mixes, Rfg & Fz	500
		Side Dishes & Starches	Side Dishes–Fz	500
311421	Canned Fruits & Vegetables	Beverages	Juices–Rfg	500
		Beverages	Juices–Aseptic	500
		Beverages	Juices–Bottled	500
		Beverages	Juices–Canned	500
		Condiments/Dips/Spreads	Jams/Jellies/Preserves	500
		Condiments/Dips/Spreads	Pickles/Relish/Olives	500
		Fruits & Vegetables	Beans–Canned	500
		Fruits & Vegetables	Fruit–Canned/Bottled	500
		Fruits & Vegetables	Fruit–Sauce	500
		Fruits & Vegetables	Tomato Products–Canned/Bottled	500
		Fruits & Vegetables	Tomato Products–Sauce	500
		Fruits & Vegetables	Vegetables–Canned/Bottled	500
		Infant Foods	Baby Juice	500
311422	Specialty Canned Food Products	Entrees	Entrées–Shelf Stable	1,000
		Infant Foods	Baby Food	1,000
		Side Dishes & Starches	Side Dishes–Shelf Stable	1,000
		Soups	Soup–Canned	1,000

(continued)

Table A-1. Products in the Labeling Cost Model by NAICS Code (continued)

NAICS Code	NAICS Description	Product Type	Product Category	SBA Size[a]
311423	Dried & Dehydrated Foods	Fruits & Vegetables	Fruit–Dried	500
		Fruits & Vegetables	Fruit–Dry Fruit Snacks	500
		Fruits & Vegetables	Vegetables–Dried	500
		Soups	Soup–Dry	500
		Soups	Soup–Ramen	500
311511	Fluid Milk	Beverages	Milk–Rfg	500
		Beverages	Milk–Flavored/Substitutes	500
		Beverages	Creamer–Rfg & Fz	500
		Dairy Foods	Sour Cream	500
		Dairy Foods	Yogurt	500
311512	Creamery Butter	Dairy Foods	Butter	500
311513	Cheese	Dairy Foods	Cheese–Grated	500
		Dairy Foods	Cheese–Imitation	500
		Dairy Foods	Cheese–Natural Cheese	500
		Dairy Foods	Cheese–Processed Cheese	500
		Dairy Foods	Cheese–Ricotta/Cream/Cottage	500
		Dairy Foods	Cheese–Shredded	500
311514	Dry, Condensed, & Evaporated Milk	Beverages	Drink Mixes–Milk/Cocoa Dry Mixes	500
		Beverages	Milk–Condensed	500
		Beverages	Milk–Powdered	500
		Beverages	Creamer/Coffee Additives–Non-Rfg	500
		Infant Foods	Baby Formula–Liq Concentrate	500
		Infant Foods	Baby Formula–Powder	500

(continued)

Table A-1. Products in the Labeling Cost Model by NAICS Code (continued)

NAICS Code	NAICS Description	Product Type	Product Category	SBA Size[a]
311514	Dry, Condensed, & Evaporated Milk (continued)	Infant Foods	Baby Formula–Ready to Drink	500
		Weight Control Foods	Weight Control Liq/Powder	500
311520	Ice Cream & Frozen Desserts	Dairy Foods	Frozen Novelties	500
		Dairy Foods	Ice Cream & Ice Milk	500
311711	Seafood Canning Products	Seafood	Seafood–Canned	500
311712	Fresh & Frozen Seafood	Seafood	Seafood–Fz	500
		Seafood	Seafood–Rfg	500
311812	Commercial Bakery Products	Baked Goods	Bakery Snacks–Non-Rfg	500
		Baked Goods	Bakery Snacks–Rfg	500
		Baked Goods	Bread/Rolls–Non-Rfg	500
		Baked Goods	Bread/Rolls–Rfg & Fz	500
		Baked Goods	Breadcrumbs/Batters/Croutons	500
		Baked Goods	Snack & Granola Bars	500
		Desserts	Pies & Cakes–Non-rfg	500
311813	Frozen Bakery Products	Desserts	Pies & Cakes–Rfg & Fz	500
311821	Cookies & Crackers	Baked Goods	Cookies	750
		Baked Goods	Crackers	750
311822	Flour Mixes & Dough Made From Purchased Powder	Baking Ingredients	Baking Mixes	500
		Baking Ingredients	Dough–Rfg & Fz	500
		Baking Ingredients	Pizza–Crust/Dough	500
311823	Dry Pasta Manufacturing	Side Dishes & Starches	Pasta–Dry	500

(continued)

Table A-1. Products in the Labeling Cost Model by NAICS Code (continued)

NAICS Code	NAICS Description	Product Type	Product Category	SBA Size[a]
311911	Roasted Nuts or Seeds & Peanut Butter	Baking Ingredients	Nuts–Baking Nuts	500
		Condiments/Dips/Spreads	Peanut Butter	500
		Snack Foods	Nuts–Snack Nuts	500
		Snack Foods	Seeds–Snack	500
311919	Other Snack Foods	Snack Foods	Salty Snacks–Bagged	500
		Snack Foods	Salty Snacks–Other	500
		Snack Foods	Salty Snacks–Unpopped Popcorn	500
311920	Coffee & Tea Products	Beverages	Coffee–Ground	500
		Beverages	Coffee–Instant	500
		Beverages	Coffee–Whole	500
		Beverages	Tea–Instant	500
		Beverages	Tea–Loose	500
311941	Mayonnaise, Dressings, & Other Prepared Sauces	Condiments/Dips/Spreads	Condiments–Non-Rfg	500
		Condiments/Dips/Spreads	Condiments–Rfg	500
		Condiments/Dips/Spreads	Dips–Shelf Stable	500
		Condiments/Dips/Spreads	Dips–Rfg & Fz	500
		Condiments/Dips/Spreads	Mayonnaise	500
		Dressings & Sauces	Gravy/Sauce–Canned/Bottled	500
		Dressings & Sauces	Gravy/Sauce–Rfg & Fz	500
		Dressings & Sauces	Salad Dressing–Bottled, non-rfg	500
		Dressings & Sauces	Salad Dressing–Rfg	500
		Dressings & Sauces	Vinegar	500

(continued)

Table A-1. Products in the Labeling Cost Model by NAICS Code (continued)

NAICS Code	NAICS Description	Product Type	Product Category	SBA Size[a]
311942	Spices & Extracts	Condiments/Dips/Spreads	Dips–Dry Mixes	500
		Condiments/Dips/Spreads	Salt/Salt Substitutes	500
		Condiments/Dips/Spreads	Spices/Seasonings	500
		Dressings & Sauces	Gravy/Sauce–Mixes	500
		Dressings & Sauces	Salad Dressing–Dry Mix	500
311991	Perishable Prepared Food Manufacturing	Entrees	Entrées–Rfg	500
		Entrees	Lunches–Rfg	500
		Fruits & Vegetables	Vegetables–Fresh Cut Salad	500
		Side Dishes & Starches	Pasta–Rfg & Fz	500
		Side Dishes & Starches	Side Dishes–Rfg	500
311999	All Other Miscellaneous Food Preparations	Baking Ingredients	Baking Ingredients	500
		Baking Ingredients	Baking Ingredients–Powders	500
		Beverages	Drink Mixes–Cocktail Mixes	500
		Beverages	Drink Mixes–Other	500
		Condiments/Dips/Spreads	Salad Toppings	500
		Desserts	Desserts–Toppings	500
		Desserts	Gelatin/Pudding–Mixes	500
		Desserts	Gelatin/Pudding–Regular	500
		Eggs	Processed Eggs	500
		Eggs	Shell Eggs	500
		Side Dishes & Starches	Instant Potatoes	500
		Side Dishes & Starches	Side Dishes–Kits/Mixes	500

(continued)

Table A-1. Products in the Labeling Cost Model by NAICS Code (continued)

NAICS Code	NAICS Description	Product Type	Product Category	SBA Size[a]
311999	All Other Miscellaneous Food Preparations (continued)	Side Dishes & Starches	Stuffing	500
		Sweeteners	Syrup/Molasses	500
312111	Soft Drinks	Beverages	Carbonated Beverages–Regular	500
		Beverages	Carbonated Beverages–Sugar Substitute	500
		Beverages	Carbonated Beverages–Water/Club Soda	500
		Beverages	Isotonic Drinks	500
		Beverages	Non-Fruit Drinks	500
		Beverages	Tea–Canned/Bottled	500
312112	Bottled Water	Beverages	Bottled Water	500
325199	All Other Basic Organic Chemical Manufacturing	Sweeteners	Sugar Substitutes	1,000
325412	Pharmaceutical Preparations	Dietary Supplements	Dietary Supplements–Liquid	750
		Dietary Supplements	Dietary Supplements–Pills	750

[a]Small Business Administration size designation for the NAICS code (numbers of employees).

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Baked Goods	Bakery Snacks—Non-Rfg	Cupcakes/Brownies	10
		Doughnuts	14
		Muffins	14
		Pastry/Danish/Coffee Cakes	14
	Bakery Snacks—Rfg	Rfg Muffins	10
		Rfg Pastry/Danish/Coffee Cakes	10
		Rfg Snack Cakes/Doughnuts	10
	Bread/Rolls—Non-Rfg	English Muffins	10
		Bagels/Bialys	11
		Fresh Bread	11
		Fresh Bread—New Parents	11
		Fresh Rolls/Bun/Croissants	11
	Bread/Rolls—Rfg & Fz	Rfg Bagels/Bialys	11
		Rfg Bread	10
		Rfg Dinner/Sandwich Rolls/Croissants	10
		Rfg English Muffins	10
		Fz Bagels	12
		Fz Bread/Rolls/Biscuits	12
		Fz Muffins	12
		Rfg Egg Roll/Wonton Wrappers	14
		Rfg Tortillas	14
		Fz Tortilla/Egg Roll/Wonton Wrappers	13
		Fz Tortillas	13
	Breadcrumbs/Batters/Croutons	Croutons (No Stuffing Croutons)	1
		Breadcrumbs	1
		Breading/Batter/Coating Mixes	1

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Baked Goods (continued)	Cookies	Cookies	1
		Cookies Part II	1
		Ice Cream Cones	2
		Fz Cookies	12
	Crackers	All Other Crackers	6
		Breadsticks	6
		Crackers With Fillings	6
		Graham Crackers	6
		Matzoh Crackers	6
		Saltine Crackers	6
	Snack & Granola Bars	Snack Bars/Granola Bars	4
Baking Ingredients	Baking Ingredients	Chips/Baking Chocolate/Cocoa	5
		Coconut	5
		Graham Cracker Crumbs	5
		Maraschino Cherries	5
		Marshmallow Creme	5
		Pie/Pastry Filling	5
		Ready-To-Use Pie Crust	5
		Edible Cake Decorations	5
		Frosting/Frosting Mixes	6
	Baking Ingredients—Powders	Baking Powder/Soda	5
		Cooking Starches/Rennet	5
		Dry/Rfg Yeast	5

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Baking Ingredients (continued)	Baking Mixes	All Other Baking Mixes	1
		Brownie Mixes	1
		Cake/Cupcake/Pie Mixes	1
		Coffee Cake/Gingerbread/Pastry Mixes	1
		Cookie/Cookie Bar Mixes	1
		Muffin Mixes	1
		Piecrust Mixes	1
		Pancake/French Toast/Waffle Mixes	2
	Dough—Rfg & Fz	Rfg Biscuit Dough	10
		Rfg Cookie/Brownie Dough	10
		Rfg Dough (Bread/Rolls/Bun)	10
		Rfg Dough (Pastry/Dumpling)	10
		Fz Bread/Rolls/Pastry Dough	12
		Fz Cookie Dough	12
		Fz Pie/Pastry Shells	12
	Flour/Meal	Cornmeal/Baking Oat Bran	6
		Flour	6
		Hominy Grits	6
		Matzoh Meal	6
	Nuts—Baking Nuts	Cooking/Baking Nuts	1
	Pizza—Crust/Dough	Pizza Crust Mixes	7
		Fz Pizza Crusts/Dough	12
		Rfg Pizza Crust/Dough	14

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Beverages	Bottled Water	Distilled Water	5
		Noncarbonated Water Including Flavored	5
		Plu—All Brands Bottled Water	5
	Carbonated Beverages—Regular	Regular Soft Drinks	6
		Plu—All Brands Soda	6
		Plu Soft Drinks	6
	Carbonated Beverages—Sugar Substitute	Low Calorie Soft Drinks	6
	Carbonated Beverages—Water/Club Soda	Carbonated Water/Club Soda Inc Flavored	6
	Coffee—Ground	Ground Coffee	5
		Ground Decaffeinated Coffee	5
	Coffee—Instant	Instant Coffee	5
		Coffee Substitutes	5
		Rfg Ready-To-Drink Coffee	13
		Rfg Coffee Concentrate	12
		Instant Decaffeinated Coffee	5
	Coffee—Whole	Whole Coffee Beans	5
	Creamer/Coffee Additives—Non-Rfg	Coffee Creamer—Ss	5
		Coffee Additive/Flavoring	5
	Creamer—Rfg & Fz	Rfg Coffee Creamer	10
		Rfg Dairy Cream/Half & Half	10
		Rfg Nondairy Toppings	10
		Fz Coffee Creamer	12
	Drink Mixes—Cocktail Mixes	Liquid/Powder Cocktail Mixes	1
	Drink Mixes—Milk/Cocoa, Dry Mixes	Chocolate Milk Flavoring/Cocoa Mixes	1
		Milk Flavoring/Drink Mixes	2

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Beverages (continued)	Drink Mixes—Other	Breakfast Drink Mixes	2
		Flavored Hot Drink Mixes	2
		Frost/Whipped/Yogurt Drink Mixes	2
		Fruit Drink Mixes	2
	Isotonic Drinks	Ss Isotonic Drink Mix	2
		Ss Isotonic Drinks Aseptic	2
		Ss Isotonic Drinks Nonaseptic	2
	Juices—Aseptic	Aseptic Juice Drinks	1
		Aseptic Juices	1
	Juices—Bottled	Ss Bottled Aloe Vera Juice	5
		Ss Bottled Apple Juice	5
		Ss Bottled Apricot Juice	5
		Ss Bottled Cherry Juice	5
		Ss Bottled Cider	5
		Ss Bottled Cranberry Cocktail/Juice Drink	5
		Ss Bottled Cranberry Juice/Cranberry Juice Cktl	5
		Ss Bottled Fruit Drinks	5
		Ss Bottled Fruit Juice Blend	5
		Ss Bottled Fruit Nectar	5
		Ss Bottled Grape Juice	5
		Ss Bottled Grapefruit Cocktail	5
		Ss Bottled Grapefruit Juice	5
		Ss Bottled Lemon/Lime Juice	5

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Beverages (continued)	Juices—Bottled (continued)	Ss Bottled Lemonade	5
		Ss Bottled Orange Juice	5
		Ss Bottled Other Fruit Juice	5
		Ss Bottled Pineapple Juice	5
		Ss Bottled Prune/Fig Juice	5
		Ss Bottled Sparkling Juice	5
		Ss Bottled Tomato/Vegetable Juice/Cktl	5
		Ss Drinks Liquid Concentrate	2
		Ss Fruit Juice Liquid Concentrate	2
	Juices—Canned	Canned Fruit Juice	1
		Canned Juice Drinks	1
		Canned Vegetable Juice/Cocktail	1
	Juices—Concentrate, Rfg & Fz	Fz Apple Juice Concentrate	12
		Fz Blended Fruit Juice Concentrate	12
		Fz Cocktail Mixes	12
		Fz Drink/Cocktail Drink Concentrate	12
		Fz Grape Juice Concentrate	12
		Fz Grapefruit Juice Concentrate	12
		Fz Lemonade/Limeade Concentrate	12
		Fz Orange Juice Concentrate	12
		Fz Other Vegetable/Fruit Juice	12
		Rfg Fruit Juice Liquid Concentrate	12
		Rfg Drink Liquid Concentrate	12

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Beverages (continued)	Juices—Rfg	Rfg All Other Fruit Juice	13
		Rfg Apple Juice	13
		Rfg Blended Fruit Juice	13
		Rfg Cider	13
		Rfg Cocktail Mixes	13
		Rfg Cranberry Cocktail/Drink	13
		Rfg Cranberry Juice/Cranberry Juice Blend	13
		Rfg Fruit Drink	13
		Rfg Fruit Nectar	13
		Rfg Grape Juice	13
		Rfg Grapefruit Cocktail/Drink	13
		Rfg Grapefruit Juice	13
		Rfg Lemon/Lime Juice	13
		Rfg Lemonade	13
		Rfg Orange Juice	13
		Rfg Pineapple Juice	13
		Rfg Vegetable Juice/Cocktail	13
	Milk—Condensed	Evaporated/Condensed Milk	2
	Milk—Flavored/Substitutes	Rfg Flavored Milk/Eggnog/Buttermilk	14
		Rfg Kefir/Milk Substitutes/Soymilk	14
		Rfg Milkshakes/Nondairy Drinks	14
	Milk—Powdered	Powdered Milk	2
	Milk—Rfg	Rfg Skim/Lowfat Milk	14
		Rfg Whole Milk	14

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Beverages (continued)	Nonfruit Drinks	Ready-to-Drink Milk/Milk Substitutes	2
		Ss Nonfruit Drinks	2
		Yogurt/Yogurt Drinks	2
	Tea—Canned/Bottled	Canned and Bottled Tea	4
		Rfg Teas	13
	Tea—Instant	Instant Tea Mixes	4
	Tea—Loose	Tea—Bags/Loose	4
Breakfast Foods	Breakfast Food—Frozen	Fz Other Breakfast Food	12
		Fz Waffles	12
	Breakfast Food—Instant	Dried Breakfast Food	1
		Instant Breakfast	1
		Wheat Germ	1
		Ready-To-Drink Breakfast Meals	1
	Breakfast Food—Ready to Eat Cereal	Ss Toaster Pastries/Tarts	1
		Ready-To-Eat Cereal	1
		Hot Cereal/Oatmeal	2
Candy & Gum	Chocolate Candy—Single Serve	Chocolate Candy Bar <3.5oz	6
		Chocolate Covered Cookie/Wafer	6
	Chocolate Candy—Snack	Chocolate Candy Snack Size	6
		Chocolate Covered Salted Snack	2
		Chocolate Candy Box/Bag >3.5oz	6
		Gift Box Chocolates	6
	Gum—Regular Gum	Regular Gum (No Sugarless)	6
		Plu—All Brands Gum	6

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Candy & Gum (continued)	Gum—Sugarless Gum	Sugarless Gum	6
	Nonchocolate Candy—Diet	Diet Candy	8
	Nonchocolate Candy—Kits	Caramel/Taffy Apples	5
		Taffy/Candy Apple Kit	5
		Candy Making Mix/Kit/Mold	5
	Nonchocolate Candy—Pkg & Roll	Breath Freshener	8
		Plain Mints	7
		Hard Sugar Candy/Pkg & Roll Candy	7
	Nonchocolate Candy—Single Serve	Nonchocolate Chewy Candy Bar <3.5oz	7
		Novelty Candy	8
		Specialty Nut/Coconut Candy	7
	Nonchocolate Candy—Snack	Nonchocolate Chewy Snack Size	7
		Nonchocolate Chewy Box/Bag >3.5oz	7
		Licorice Box/Bag >3.5oz	7
		Marshmallows	2
	Seasonal Candy	All Other Seasonal Candy	8
		Christmas Candy	8
		Easter Candy	8
		Halloween Candy	8
		Plu—All Brands Candy	8
		Valentine Candy	8

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Condiments/Dips/Spreads	Condiments—Non-Rfg	Ketchup	2
		Ketchup/Mustard Combinations	2
		Mustard	2
		Horseradish/Horseradish Sauce	8
	Condiments—Rfg	Rfg Mustard	14
		Rfg Horseradish/Horseradish Sauce	15
		Rfg Flavored Spreads	15
	Dips—Dry Mixes	Dry Dip Mixes	3
	Dips—Rfg & Fz	Fz Dips	13
		Rfg Dips	14
	Dips—Shelf Stable	Dip—Ss	2
	Jams/Jellies/Preserves	Fruit Butter	2
		Ss Jam/Jelly/Preserves	2
		Fz Jams/Jellies/Preserves	13
		Ss Honey	2
		Rfg Honey	15
	Mayonnaise	Mayonnaise/Sandwich Spread	2
	Peanut Butter	Chunky Peanut Butter	2
		Creamy Peanut Butter	2
		Peanut Butter Combo	2
		Plu—Peanut Butter	2
		Specialty Nut Butter	2
		Rfg Peanut Butter	14

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Condiments/Dips/Spreads (continued)	Pickles/Relish/Olives	Chutney	3
		Marinated Vegetable/Fruit	3
		Olives	3
		Peppers/Pimentos	3
		Pickles	3
		Relish	3
		Rfg Marinated Vegetables/Fruit	14
		Rfg Peppers/Pimentos/Olives	14
		Rfg Pickles	14
		Rfg Relishes/Appetizer Relish	14
		Rfg Sauerkraut	11
	Salad Toppings	Salad Toppings	3
		Rfg Salad Topping/Bacon Bits	14
	Salt/Salt Substitutes	Salt/Seasoned Salt/Salt Substitute	9
	Spices/Seasonings	Extract/Flavoring/Food Coloring	9
		Fruit & Vegetable Preservative/Pectin	9
		Garlic Spread	9
		Pepper	9
		Spice/Seasoning—No Salt/Pepper	9
Dairy Foods	Butter	Plu—All Brands Butter	10
		Rfg Butter	10
	Cheese—Grated	Rfg Grated Cheese	10
		Ss Grated Cheese	10
	Cheese—Imitation	Imitation Cheese (All Forms)	10

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Dairy Foods (continued)	Cheese—Natural Cheese	Natural Cheese (No Shredded)	10
	Cheese—Processed Cheese	All Other Processed Cheese	10
		Aerosol/Squeezable Cheese Spreads	10
		Cheese Spreads/Balls	10
		American Cheese (All Forms)	10
		Processed Shredded Cheese	10
	Cheese—Ricotta/Cream/Cottage	Ricotta Cheese	10
		Cream Cheese/Cream Cheese Spread	10
		Cottage Cheese	10
	Cheese—Shredded	Natural Shredded Cheese	10
	Frozen Novelties	Fz Novelties	12
		Fz Yogurt/Tofu	13
		Plu—All Brands Ice Cream Novelties	12
		Ice Pop Novelties	12
		Sherbet/Sorbet/Ices	13
	Ice Cream & Ice Milk	Ice Cream Mixes	2
		Fz Ice Cream/Ice Milk Desserts	12
		Ice Cream	13
		Ice Milk	13
	Sour Cream	Sour Cream	15
	Yogurt	Rfg Yogurt	15
		Rfg Yogurt Drinks	15

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Desserts	Desserts—Toppings	Chocolate Syrup/Dessert Toppings	6
		Dry Whipped Topping Mixes	6
		Fz Whip Toppings	12
	Gelatin/Pudding—Mixes	Gelatin Dessert Mixes	6
		Pudding/Pie Filling/Mousse Mixes	6
	Gelatin/Pudding—Regular	Pudding/Gelatin	6
		Rfg Pudding/Mousse/Gelatin/Parfaits	10
		Fz Pudding/Mousse	12
	Pies & Cakes—Non-Rfg	Cakes (No Snack/Coffee Cakes)	15
		Pies (No Snack Pies)	15
	Pies & Cakes—Rfg & Fz	Rfg Cheesecakes	10
		Fz Cheesecakes	12
		Fz Sweet Goods—No Cheesecakes	12
		Fz Pies	12
		Rfg Cakes (No Snack/Coffee Cakes)	10
		Rfg Pies (No Snack Pies)	10
Dietary Supplements	Dietary Supplements—Liquid	Liquid Vitamins/Minerals	15
	Dietary Supplements—Pills	Mineral Supplements	15
		Multi-Vitamins	15
		1 & 2 Letter Vitamins	15
Dressings & Sauces	Gravy/Sauce—Canned/Bottled	Barbecue Sauce	8
		Chili/Hot Dog Sauce	8
		Dairy Sauce/Cheese Sauce	8
		Hollandaise/Béarnaise/Dill Sauce	8

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Dressings & Sauces (continued)	Gravy/Sauce—Canned/Bottled (continued)	Hot/Cajun Sauce	8
		Meat Sauce/Marinade/Glaze	8
		Seafood Sauce	8
		Steak/Worcestershire Sauce	8
		Tartar Sauce	8
		Mexican Sauce & Marinades	7
		Taco Sauce	7
		Ss Oriental Sauce/Marinade	7
		Liquid Gravy	2
		Sloppy Joe Sauce	2
	Gravy/Sauce—Mixes	All Other Dry Seasoning Mixes	2
		Dry Gravy Mixes	2
		Dry Meat/Seafood Seasoning Mixes	2
		Dry Sauce Mixes	2
	Gravy/Sauce—Rfg & Fz	Fz Meat/Seafood Seasoning Mixes	13
		Fz Sauce/Gravy/Marinade	13
		Rfg Meat/Seafood Seasoning Mixes	14
		Rfg Sauce/Gravy/Marinade Mixes	14
	Salad Dressing—Bottled, Non-Rfg	Ss Coleslaw Dressing	3
		Ss Pourable Salad Dressings	3
	Salad Dressing—Dry Mix	Salad Dressing Mixes	3
	Salad Dressing—Rfg	Rfg Pourable Salad Dressing	14
	Vinegar	Cooking Sherry/Wine	4
		Vinegar	4

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Eggs	Processed Eggs	Egg Substitutes	2
		Fz Egg Substitutes	13
		Rfg Egg Substitutes	14
	Shell Eggs	Fresh Eggs	11
		Plu—All Brands Eggs	11
Entrees	Entrées—Fz	Fz Dinners/Entrees	12
		Fz Handheld Entrees (Nonbreakfast)	12
		Fz Pot Pies	12
		Fz Chili	13
	Entrées—Rfg	Rfg Breakfast Entrees	11
		Rfg Chili	11
		Rfg Dinners/Entrees	11
		Rfg Handheld Nonbreakfast Entrees	11
		Rfg Pot Pies	13
	Entrées—Shelf Stable	Ss Microwaveable Package Dinner	1
		Ss Prepared Chili	1
		Ss Prepared Dinners/Entrees	1
		Ss Prepared Pasta Dishes	1
	Lunches—Rfg	Rfg Meat/Cheese/Cracker/Dessert	13
	Pizza—Pizza/Kits/Mixes, Rfg & Fz	Pizza Kits/Mixes	7
		Fz Pizza	12
		Pizza Kits/Toppings	12
		Rfg Pizza/Pizza Kits	14

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Fats & Oils	Lard/Shortening	Rfg Lard	12
		Shortening	4
	Margarine	Margarine/Spreads/Butter Blends	13
		Plu—All Brands Margarine	13
	Oil	Cooking & Salad Oils	4
		Microwave Browning/Pan Spray	4
		Olive Oil	4
		Oriental Cooking Oils	7
		Popcorn Oil	2
Fruits & Vegetables	Beans—Canned	Baked Beans	1
		Canned Bread	1
		Refried Beans	6
	Fruit—Canned/Bottled	All Other Fruit	1
		Canned/Bottled Apples	1
		Canned/Bottled Apricots	1
		Canned/Bottled Berries	1
		Canned/Bottled Cherries	1
		Canned/Bottled Citrus Fruit	1
		Canned/Bottled Diet Fruit	1
		Canned/Bottled Grapes	1
		Canned/Bottled Mixed Fruit	1
		Canned/Bottled Peaches	1
		Canned/Bottled Pears	1
		Canned/Bottled Pineapple	1

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Fruits & Vegetables (continued)	Fruit—Canned/Bottled (continued)	Canned/Bottled Prunes/Plum	1
		Cantaloupe/Melon	1
		Cranberry Sauce	1
		Pineapple Sauce	1
	Fruit—Dried	Dates	2
		Dried Prunes	2
		Glazed Fruit	2
		Other Dried Fruit	2
		Raisins	2
	Fruit—Dry Fruit Snacks	Fruit Rolls/Bars/Snacks	2
	Fruit—Fz	Fz Fruit	12
	Fruit—Sauce	Applesauce/Fruit Sauce	1
	Tomato Products—Canned/Bottled	Canned And Bottled Tomatoes	4
	Tomato Products—Sauce	Spaghetti/Italian Sauce	4
		Tomato Paste/Sauce/Puree	4
		Pizza Sauce	7
	Vegetables—Canned/Bottled	All Other Beans	8
		Canned All Other Vegetable	8
		Canned Mixed Vegetable	8
		Canned/Bottled Carrots	8
		Canned/Bottled Corn	8
		Canned/Bottled Green Beans	8
		Canned/Bottled Green Peas	8
		Canned/Bottled Mushrooms	8

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Fruits & Vegetables (continued)	Vegetables—Canned/Bottled (continued)	Canned/Bottled Sauerkraut	8
		Canned/Bottled Spinach	8
		Potato/Sweet Potato	8
		Ss Bamboo Shoots/Water Chestnuts	7
	Vegetables—Dried	Dried Beans/Grains	6
		Dried Vegetables (Except Beans)	6
	Vegetables—Fresh Cut Salad	Fresh Cut Salad	11
	Vegetables—Fz	Fz Corn On The Cob	12
		Fz Beans	12
		Fz Broccoli	12
		Fz Carrots	12
		Fz Corn	12
		Fz Mixed Vegetables	12
		Fz Onions	12
		Fz Other Plain Vegetables	12
		Fz Peas	12
		Fz Spinach	12
		Fz Squash/Zucchini	12
		Fz Prepared Vegetable (Sauce/Crumbs)	12
		Fz Onion Rings	12
		Fz Plain Potatoes/Fries/Hashbrowns	12

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Infant Foods	Baby Food	Baby Food/Snacks	1
		Fz Baby Food/Juice/Snacks	11
	Baby Formula—Liquid Concentrate	Baby Formula—Liquid Concentrate	1
	Baby Formula—Powder	Baby Formula—Powder	1
	Baby Formula—Ready to Drink	Baby Formula—Rtd	1
	Baby Juice	Baby Juice	1
Seafood	Seafood—Canned	All Other Fish/Seafood	3
		Canned Salmon	3
		Canned Tuna	3
		Clam Juice	3
	Seafood—Fz	Fz Fish/Seafood	13
	Seafood—Rfg	Rfg Fish/Herring/Seafood	15
Side Dishes & Starches	Instant Potatoes	Potato Pancake/Dumpling Mixes	2
		Ss Instant Potatoes	2
	Pasta—Dry	Noodles	7
		Spaghetti/Macaroni/Pasta (No Noodles)	7
	Pasta—Rfg & Fz	Rfg Pasta/Noodle	13
		Fz Pasta/Noodles	12
	Rice	Rice/Rice Mixes	2
	Side Dishes—Fz	Fz Side Dishes	12
		Fz Appetizers/Snack Rolls	11
		Fz Breaded Vegetables	11
		Fz Pretzels	11
		Fz Soup	13

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Side Dishes & Starches (continued)	Side Dishes—Kits/Mixes	Dry Dinner Mixes (Add Meat)	1
		Dry Dinner Mixes With Meat	1
		Dry Macaroni & Cheese Mixes	1
		Dry Salad/Side Dish Mixes	1
		Hard/Soft Tortillas/Taco Kits	6
	Side Dishes—Rfg	Rfg Side Dishes	11
		Rfg Appetizers/Snack Rolls	11
		Rfg Salad/Coleslaw	11
		Rfg Baked Beans	14
	Side Dishes—Shelf Stable	Ss Prepared Salads	1
		Mexican Food Items	6
		Ss Oriental Food Items	7
	Stuffing	Stuffing Mixes	4
		Fz Stuffing	13
Snack Foods	Nuts—Snack Nuts	Snack Nuts	4
	Salty Snacks—Bagged	Cheese Snacks	3
		Corn Snacks (No Tortilla Chips)	3
		Potato Chips	3
		Pretzels	3
		Ready-To-Eat Popcorn/Caramel Corn	3
		Toasted Corn Nut Snacks	3
		Tortilla/Tostado Chips	3
		Rice Cakes/Popcorn Cakes	2

(continued)

Table A-2. IRI Product Types Included in the Labeling Cost Model Product Categories (continued)

Labeling Cost Model Type	Labeling Cost Model Category	IRI Type	IRI Slice
Snack Foods (continued)	Salty Snacks—Other	Other Salted Snacks (No Nuts)	3
		Nutritional Snacks/Trail Mixes	2
		Carob/Yogurt Coated Snacks	2
		Chow Mein Noodles	7
	Salty Snacks—Unpopped Popcorn	Ss Microwave Popcorn	2
		Kernel Popcorn	2
		Fz Microwave Popcorn	13
	Seeds—Snack	Sunflower/Pumpkin Seeds	4
Soups	Soup—Canned	Wet Soup	4
	Soup—Dry	Bouillon	4
		Dry Soup	4
	Soup—Ramen	Ramen	4
Sweeteners	Sugar	Brown/Powder/Flavored Sugar	4
		White Granulated Sugar	4
		Corn/Crystal/White Syrup	4
		Fruit Flavored Syrup	4
		Maple/Pancake & Waffle Syrup	4
		Molasses	4
	Sugar Substitutes	Sugar Substitutes	4
Weight Control Foods	Weight Control Liquid/Powder	Rfg Weight Control/Nutritional Liquid/Powder	4
		Weight Control/Nutritionals Liquid/Powder	4

Appendix B: Stata Data Sets and Programming Code

In this appendix, we describe the contents of the data sets for the labeling cost model and provide instructions for viewing and editing the data. We also provide the Stata programming code that calculates the costs of labeling changes.

B.1 STATA FOR WINDOWS DATA SETS

The labeling cost model comprises eight separate data sets. In this appendix, we list the data sets, indicate the relationships among them, and provide the format for each. For information on how the data sets were compiled and how they are used in the model, please see Section 4.

The eight data sets in the Stata for Windows model are

- product.dta,
- package.dta,
- inventory.dta,
- print.dta,
- label.dta,
- analytical.dta,
- market.dta, and
- sticker.dta.

Tables B-1 through B-8 lists the variable names, variable formats, and relationships for each data set. The tables also indicate which variables are used by the Excel interface.

B.2 EDITING AND VIEWING DATA SETS

Stata for Windows provides a **Data Editor** to conveniently edit or view data sets. The Data Editor is a spreadsheet-style data editor for editing existing data. The Data Editor also has a browse mode that lets you view the data sets without the possibility of accidentally changing the data.

Before editing a data set, please familiarize yourself with the format and relationships of each table. If changes are made to fields that link to other tables, the Stata model will not work. Also, if changes are made to fields linked to the Excel interface, then the Excel interface will not work.

To **browse** data with the Data Editor:

- ➤ Load the data set that you wish to view:
  - ✓ Pull down **File** and choose **Open**. Then select the data set by double-clicking on the filename.
- ➤ Click on the **Data Browser** icon or type **browse** in the Command Window.

To **edit** data with the Data Editor:

- ➤ Load the data set that you wish to edit:
  - ✓ Pull down **File** and choose **Open**. Then select the data set by double-clicking on the filename.
- ➤ Click on the **Data Editor** icon or type **edit** in the Command Window.
- ➤ Click on the cell that you would like to change.
- ➤ Type the new value into the cell, then press **Tab** or **Enter**.
- ➤ When you exit the editor, a dialog box will ask you to confirm your changes.
  - ✓ To permanently save changes to the data set, click the **Save** button or pull down **File** and choose **Save**.

Please note that the changes are not permanent unless you save the file.

B.3 STATA PROGRAMMING CODE

The programming code for calculating the costs of labeling changes is provided in Exhibit B-1.

Table B-1. Product Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
prodtype	Char	24	Product type	
prodcat	Char	38	Product category	Excel interface
naiccode	Num	8	NAICS code	Excel interface
naicdes	Char	56	NAICS description	
sbasize	Num	8	NAICS SBA size	
repprod	Char	44	Representative product	package.dta
prodsize	Char	30	Product size	package.dta
outin	Char	4	Outside or inside packaging	
printid	Char	2	Print method	print.dta
packtype	Char	24	Package type	
pribrand	Char	2	Private or brand label indicator	combined package/inventory
formulas	Num	8	Number of formulas	
sku	Num	8	Number of SKUs	
units	Num	8	Number of units sold	

Table B-2. Package Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
repprod	Char	44	Representative product	product.dta
prodsize	Char	30	Product size	product.dta
packtype	Char	24	Package type	inventory.dta
costtype	Char	8	Cost type (package)	
costlev	Char	4	Cost level (low, mid, high)	
cost	Num	8	Cost	

Table B-3. Inventory Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
packtype	Char	24	Package type	package.dta
costtype	Char	10	Cost type (inventory)	
pribrand	Char	10	Private or brand label indicator	product.dta
compperd	Char	12	Compliance period	Excel interface
amtinv	Num	8	Percent remaining inventory	

Table B-4. Print Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
printid	Char	2	Print method indicator	product.dta
printname	Char	12	Print method name	
colors	Char	14	Number of color changes	label.dta
costlev	Char	4	Cost level (low, mid, high)	
costtype	Char	10	Cost type (admin, prepress, engraving, graphics)	
cost	Num	8	Cost	

Table B-5. Label Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
lablpart	Char	30	Part of label changed	Excel interface
colors	Char	14	Associated color change	print.dta

Table B-6. Analytical Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
analtest	Char	36	Analytical test	Excel interface
costtype	Char	10	Cost type (analytical)	product.dta
costlev	Char	4	Cost level (low, mid, high)	
cost	Num	8	Cost	

Table B-7. Market Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
mkttest	Char	20	Market test	Excel interface
costtype	Char	6	Cost type (market)	product.dta
costlev	Char	4	Cost level (low, mid, high)	
cost	Num	8	Cost	

Table B-8. Sticker Data Set

Variable Name	Variable Type	Variable Length	Description	Linked To:
stickcost	Char	20	Sticker cost labels	
costtype	Char	6	Cost type (sticker)	product.dta
costlev	Char	4	Cost level (low, mid, high)	
cost	Num	8	Cost	

Exhibit B-1. Stata Programming Code for the Labeling Cost Model

```
*******************************
*Labeling Cost Model           *
*November 12, 2001             *
*Revised April 22, 2002        *
*Revised October 8, 2002       *
*RTI                           *
*Stata version 7.0             *
*******************************

capture program drop labmodel
program define labmodel

set more off

tempfile prod results comp pack anal stick mark all costs soda

***Product Choices*********************************************
*Create a temporary product file based on User's choices.    *
*This temporary file will be used to build the results files.*
************************************************************

use c:\Labels\product.dta, clear
preserve

  keep if $Product

/*SKUs, Units, and Formulas based on % of industry that can't coordinate
change*/

  gen psku=sku*(1-$PChange)
  replace psku=sku*(1-$BChange) if pribrand=="B"

  gen punits=units*(1-$PChange)
  replace punits=units*(1-$BChange) if pribrand=="B"

  gen pformulas=formulas*(1-$PChange)
  replace pformulas=formulas*(1-$BChange) if pribrand=="B"

  drop sku units formulas

  sort printid
  save "`prod'", replace

***Print Costs (Color Change)**********************************
*Join temp product file with Print Table (join=printid)       *
*Keep records based on User's label change choices (# colors). *
*Start building the Results file.                             *
************************************************************

use c:\Labels\print.dta, clear
  sort printid
  save c:\Labels\print.dta, replace
```

```
use "`prod'", clear
  joinby printid using c:\Labels\print.dta
  keep if $Color
  drop colors
  save "`results'", replace

***Inventory Costs (Compliance
period)*****************************************************
*Join temp product file with Package Table (join=repprod) to bring in costs.
*
*Join above file with Inventory Table (join=packtype pribrand) to bring in
compliance period.*
*Keep records based on user's compliance period choice.
*
*Calculate inventory costs using (packagecost times amtofinventory).
*
*Save results as temp file, append onto results file.
*
************************************************************

use c:\Labels\package.dta, clear
  sort repprod prodsize
  save c:\Labels\package.dta, replace

/****Package table and costs****/

use "`prod'", clear
  sort repprod prodsize
  joinby repprod prodsize using c:\Labels\package.dta
  sort packtype pribrand
  drop costtype
  save "`comp'", replace

use c:\Labels\inventory.dta, clear
  sort packtype pribrand
  save c:\Labels\inventory.dta, replace

/****Inventory table, compliance period, and amt of inventory****/

use "`comp'", clear
  joinby packtype pribrand using c:\Labels\inventory.dta

  /****If Compliance=6 months use 12 months numbers else use User's
choice****/

    if $Comp==6 {
      keep if compperd=="12 months"}
    else {
     keep if $Comply}

  drop compperd
  replace cost=cost*amtinv
  save "`pack'", replace
```

```
use "`results'", clear
  append using "`pack'"
  save "`results'", replace

  /****If Compliance=6 months bring in additional sticker costs
****/
  /****Merge onto temp product file (join=costtype), append to results
file****/

    if $Comp==6 {
      use c:\Labels\sticker.dta, clear
      qui collapse (sum) cost, by(costtype costlev)
      save "`stick'", replace

      use "`prod'", clear
      gen str10 costtype="sticker"
      joinby costtype using "`stick'"
      save "`stick'", replace

      use "`results'", clear
      append using "`stick'"
      save "`results'", replace}

***Analytical Costs*********************************************************
*Get User's analytical choices.  Collapse (sum) the costs into one cost.*
*Add Additional Tests Costs (if applicable).                             *
*Merge onto temp product file (join=costtype).                           *
*Save results as temp file, append onto results table.                   *
****************************************************************************

/****Check if Analytical tests were chosen****/

if $TogAnal==1 {

  use c:\Labels\analytical.dta, clear
    keep if $Analyte
    qui collapse (sum) cost, by(costtype costlev)
    replace cost = cost + $AddTest
    save "`anal'", replace

  use "`prod'", clear
    gen str10 costtype="analytical"
    joinby costtype using "`anal'"
    save "`anal'", replace

  use "`results'", clear
    append using "`anal'"
    save "`results'", replace}

/****If No tests chosen but Additional Tests were added                 ****/
/****Collapse Analytical Table, replace costs with Additional Test Costs****/
/****Append onto results file                                           ****/

else if $TogAnal==0 & $AddTest>0 {
```

```
  use c:\Labels\analytical.dta, clear
    qui collapse (sum) cost, by(costtype costlev)
    replace cost = $AddTest
    save "`anal'", replace

  use "`prod'", clear
    gen str10 costtype="analytical"
    joinby costtype using "`anal'"
    save "`anal'", replace

  use "`results'", clear
    append using "`anal'"
    save "`results'", replace}

***Market Costs************************************************************
*Get User's market choices.  Collapse (sum) the costs into one cost.    *
*Merge onto temp product file (join=costtype).                          *
*Save results as temp file, append onto results table.                  *
****************************************************************************

if $TogMark==1 {

  use c:\Labels\market.dta, clear
    keep if $Market
    qui collapse (sum) cost, by(costtype costlev)
    save "`mark'"

  use "`prod'", clear
    gen str10 costtype="market"
    joinby costtype using "`mark'"
    save "`mark'", replace

  use "`results'", clear
    append using "`mark'"
    save "`results'", replace}

***Scaling Up All Costs using SKU or Units********
*Using results file                              *
*Calculations based on cost type                 *
*All costs multiplied by Price Adjustment factor *
**************************************************

/****Print and Admin Costs                                  ****/
/****If compliance= 6 or 12 months then multiply by 1.1 ****/

  gen newcost=cost*psku*$Inflate*$Adj if costtype=="admin" |
costtype=="engraving" | costtype=="graphic" | costtype=="prepress"

/***Analytical costs
****/
/***Two tests per product and additional shipping and handling costs (41.03)
**/

  replace newcost=((cost*2)+41.03)*(pformulas)*$Inflate if
costtype=="analytical" & outin=="out"
```

```
/****Market, Inventory, Sticker Costs****/

  replace newcost=(cost*(pformulas)*$Inflate) if costtype=="market" &
outin=="out"
  replace newcost=cost*punits*$Inflate if costtype=="inventory"
  replace newcost=cost*(punits/2)*$Inflate if costtype=="sticker" &
outin=="out"

  drop cost
  rename newcost cost
  sort prodtype prodcat pribrand costtype costlev
  save "`results'", replace

***Costs by Cost
Type*************************************************************************
*Some products have 2 packages (in and out). Need to collapse to one.
*
*Exception=Carbonated Beverages which has 3 packages
*
*Collapse costs by product type, product category, private/branded, cost type
*
*Join with temp product table (join=prodtype prodcat pribrand) to bring in
descriptor fields*
*Save results as a permanent dataset then output as tab-delimited file
*
*************************************************************************
****

use "`results'", clear
  collapse (sum) cost, by(prodtype prodcat pribrand costtype costlev)
  sort prodtype prodcat pribrand
  save"`costs'",replace

  if $Coke==1 {

    use "`prod'", clear
    keep if prodcat=="Carbonated Beverages-Regular" | prodcat=="Carbonated
Beverages-Sugar Substitute"
    keep if outin=="out"
    sort prodcat pribrand
    collapse (sum) psku punits, by(prodcat pribrand)
    save "`soda'", replace

    use "`prod'", clear
    sort prodtype prodcat pribrand
    drop if outin=="in"
    drop if repprod=="Coca-Cola" & printid=="F"
    drop if repprod=="Diet Coke" & printid=="F"
    sort prodcat pribrand
    merge prodcat pribrand using "`soda'", update replace
    sort prodtype prodcat pribrand
    tabulate _merge
    drop _merge}
```

```
  else {
    use "`prod'", clear
    sort prodtype prodcat pribrand
    drop if outin=="in"}

  joinby prodtype prodcat pribrand using "`costs'"
  rename psku sku
  rename punits units
  rename pformulas formulas
  drop outin
  save c:\Labels\allcosts.dta, replace
  outsheet using c:\Labels\allcosts.out, replace

/***Create Aggregate Cost File***/

  use "C:\Labels\allcosts.dta", clear
  sort prodtype prodcat naiccode naicdes pribrand sku units formulas costlev
  collapse (sum) cost, by(prodtype prodcat naiccode naicdes pribrand sku
units formulas costlev)

  reshape wide cost, i(prodtype prodcat pribrand) j(costlev) string

  save "C:\Labels\labelcostag.dta", replace
  outsheet using "C:\Labels\labelcostag.out", replace

end
```