PLACE IN RETURN BOX to remove this checkout from your record.
TO AVOID FINES return on or before date due.

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CONSUMER ATTITUDES ABOUT OPEN DATING TECHNIQUES FOR PACKAGED FOODS AND NON-PRESCRIPTION DRUGS

By

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

School of Packaging

1996

ABSTRACT

CONSUMER ATTITUDES ABOUT OPEN DATING TECHNIQUES FOR
PACKAGED FOODS AND NON-PRESCRIPTION DRUGS

By

Jongkyoung Kim

The purpose of this study was to reveal consumer attitudes about various open
dating techniques for packaged foods and non-prescription drugs. Two hundred shoppers
were surveyed. Major findings included the following:

1) Open dates and spoilage indicators are valuable consumer information and can
give a marketing advantage, especially for perishable meat and dairy products.

2) On average, female shoppers think that open dates are a more important piece
of information than do males.

3) Almost half responded that they would not serve food after sell-by date.

4) Over two-thirds would not use a non-prescription drug after the expiration
date because of safety concerns.

5) Respondents said that spoilage indicators and "use-by" dates are the most
useful techniques.

6) Reducing confusion through consumer education about open dates and shelf
life of foods and non-prescription drugs will be a very important step to reduce
unnecessary food wastes and health risks.

DEDICATION

This thesis is dedicated to my lovely family, whose faith in me and endurance kept me going in time of doubt and stress. To Hyunhye, Eunhee and Jongmoo, whose understanding of this process ensured the successful completion of this study. To my parents, who encouraged me with endless love.

ACKNOWLEDGMENTS

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CHAPTER I

STATEMENT OF THE PROBLEM

The ability to satisfy consumers' demands for quality and freshness is a strategic advantage in today's increasingly competitive food and non-prescription drug retail markets. Consumer demands related to quality continue to grow, providing an opportunity for manufacturers to develop better product processing, packaging and distribution technology. Improved packaging systems ensure that food is microbiologically sound, make it easy to handle, retain sensory characteristics of food, and convey useful information to consumer. Advanced packaging systems also provide that the non-prescription drug packaging has clear instruction, tamper evident and child resistant features. Packaging plays a vital role in maintaining the quality of products.

The quality of packaged foods and drugs depends on their freshness. Likewise, consumers' perceptions of quality depend on perceived freshness. Foods that are not fresh may even be a safety risk, and pharmaceuticals that are not fresh may lose efficacy. Thus, providing adequate information about the freshness of these products is very important to both consumers and manufacturers.

Consumers' perceptions of the freshness of products should be enhanced by providing effective information on the package. For food and pharmaceutical

manufacturers, effective and clear information about the freshness of their products can be a powerful marketing tool.

From the viewpoint of consumers, there are several ways to identify the "freshness" of food products, for instance, visual appearance, smell, open date, etc.. For non-prescription drugs, however, the freshness can only be indicated by the expiration date. The prime purpose of open shelf-life dating is to inform the consumer about the shelf-life of the product. The proper open dating on the packages gives very useful information and helps consumers make informed purchase decisions.

Purpose of the Study

The purpose of this study was to provide an assessment of open date usefulness and understanding, as perceived by shoppers. An open date is a date which is displayed on the package in a legible, easily readable form (Labuza 1982). To achieve this purpose, a survey was administered. It was designed to achieve five goals related to the shoppers' attitudes on open dates, which are as follows:

1. To analyze consumer demands for open date information on various packaged foods and pharmaceuticals with differing shelf-life characteristics, including perishable, semi-perishable, and shelf-stable products.

2. To determine consumer awareness and understanding of the open date systems.

3. To investigate whether demographic variables affect shoppers' perceptions about open dates and shelf life.

4. To predict the marketing effects of providing effective open date information.

5. To identify needs for consumer education regarding the shelf life of food and non-prescription drug products.

Need for the Study

More than a decade ago, the Office of Technology Assessment (1979) conducted a nationwide survey of consumers to determine their attitude about open date information, usefulness and understanding of dates, and preference among dates. However, there has been little in the way of consumer' education about open dates on packages.

A recent survey (Consumers Rate Packaging Traits 1995) supports the need for more research and consumer education. More than four-fifths of the surveyed households indicated that they would like more information about open dates relative to product usage. They point out that it is difficult to figure out when a product goes bad because the current open dates are used in different ways.

Not only is this study necessary, it is long overdue. Tremendous improvement in food processing, distribution and packaging technologies have led to an enormous change in shoppers' life styles. Consumers demand more information on package labels now. The nutritional labeling law that went into effect on May 8, 1994 seems to have satisfied the shoppers' need for the nutritional information. This now appears on all food packaging and labeling, and is both informative and effective at attracting consumers.

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No investigation or survey into shoppers' perceptions about expiration dates on non-prescription drug packages was found in any of the literature. But it can be assumed that there is also great confusion about expiration dates on non-prescription drugs.

There is an obvious need for consumer education and research in the area of perceived food and drug shelf life. This study aims to identify specific concerns with respect to open dates on packages.

Research Questions

The research questions posed in this study were based on consumer perceptions about open dates on packages. Responses were sought to the following four research questions:

1. How important is a date when shoppers are deciding to buy food or non-prescription drugs?

2. How do shoppers interpret a date without any explanation on the different kinds

of foods and non-prescription drugs?

3. How do shoppers perceive a date after sell-by, use-by, or expiration date?

4. What is the most useful type of open date for shoppers?

Methodology

The first step in conducting the study was to review the literature. The literature revealed very few studies concerning open dating techniques on food packages and the

effect on shoppers' buying decisions. There was no literature about shoppers' perception about expiration dates on non-prescription drugs. Therefore, the review of literature underscores the need for this study. The literature review is presented in Chapter II.

As the literature was reviewed, a survey was developed and refined. The interview method for data collection was chosen. The researcher and two trained assistants conducted individual interviews with a random sample of 200 shoppers. Chapter III contains a detailed discussion of the procedures followed in conducting the survey.

Definition of Terms

Although there were different definitions of terms in the literature, the following definitions were used for purposes of this study.

<u>Open date</u>: a date on a can or package of food that gives the consumer an indication of when a product was packed or should be sold or used.

<u>Shelf life</u>: the length of time that a product in a container, will remain in a salable or acceptable condition under specified conditions of storage.

<u>Date of manufacture</u>: the date on which the product becomes the product as described.

<u>Date packaged</u>: the day, month, and year the product was processed or packaged for retail sale.

<u>Sell-by date</u>: the last date a product should be sold in order to allow a "reasonable" length of time for consumer use.

Best-if-used-by date (use-by date, recommended last consumption date, expiration date): the date after which the food or drug is no longer at its most acceptable level of quality.

An expiration date (for drugs): the date to assure that "a drug product meets applicable standards of identity, strength, quality, and purity at the time of use" (FDA 1993, 92).

Combination dates: a date providing both of date information such as a sell-by and best-if-used-by combination.

Spoilage Indicator (Time Temperature Indicators, TTIs): a simple, inexpensive device that can show an easily measurable, time and temperature-dependent change that reflects the full or partial temperature history of the food product to which it is attached (Taoukis 1991).

An Unexplained Date: a date code marked on the package needs to be explained or written clearer.

CHAPTER II

REVIEW OF THE LITERATURE

While public concern about the safety and freshness of foods and non-prescription

drugs has markedly grown, relatively little research on open dating systems has been

conducted since the early 1980s. This discussion of the literature focuses on shoppers'

perceptions of open dating systems. This chapter is divided into the following six topics:

determining the shelf life of foods, the history of open date studies, open dating

techniques, expiration dating for non-prescription drugs, government regulation of open

dating systems, and a summary.

Determining the Shelf Life of Foods

The shelf life of foods and drugs varies, and shelf life information helps the

consumer to purchase foods of high enough quality, safety and nutrition to meet his or her

needs. Therefore, establishing a fairly accurate shelf life for a particular food or non-

prescription drugs is critical. Incorrect shelf life can potentially bring about legal, safety

or financial problems while failing to meet consumer expectation (Ellis 1994).

Gnanasekharan (1993) describes three general methods to predict the shelf life of

a packaged food. Traditionally, shelf life evaluation consisted of extended or accelerated

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storage studies. While extended shelf life studies might take years to complete depending on products, accelerated shelf life tests attempt to reduce testing time by accelerating deterioration mechanisms through exposure to abusive environmental conditions like high temperature or humidity. Mathematical modeling of the shelf life of packaged foods predicts shelf life considering food degradation mechanisms, environmental factors on packaged food, and properties of packaging materials.

The general criteria to establish a date will depend on what the date is meant to imply. For example, a sell-by date should mean that there is still high quality life for a reasonable time period after the date. Office of Technology Assessment (1979) explains three alternative criteria for setting up an open shelf life date: sensory quality, nutrient loss and perishability of products.

Sensory quality is the most important characteristic for consumers and processors alike, especially for shelf-stable products. Manufacturers define their own quality standards through elaborate product development studies. Consumer reaction is the key to sensory quality standards.

Another measure of shelf life could be the loss of a certain percentage of a critical nutrient, for example, vitamin C. This factor would be much easier to measure than overall quality since it can be analyzed accurately and rapidly in the laboratory. However, it is difficult to determine levels, below which a loss in nutrients is of significance to the overall product quality.

Finally, some states in the United States with open shelf life dating requirements use perishability time categories to establish an open shelf-life date such as perishable

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foods, semi-perishable foods, and non-perishable foods. Perishable foods have a short shelf life, usually less than 30 days. Semi-perishable foods can be defined as those foods with a shelf life of between 1 and 6 months. Non-perishable or shelf-stable foods have a shelf life of more than 6 months (US Congress 1979).

The History of Open Date Studies

An open date on a food product is defined as a legible and easily readable date which is displayed on the package. Open dates are one of the most important pieces of information on food labels. The Food Marketing Institute's 1990 trends survey shows that 72 percent of consumers read labels for expiration dates (Mueller 1991). A survey by the Office of Technology Assessment (OTA) in 1978 found that 91 percent of consumers think that the open date is the most important piece of information on the package label for fresh meat and 50 percent think that it is important for frozen vegetables (US Congress 1979). In 1979, the US Food and Drug Administration (FDA) also conducted a survey, and three-quarters of the consumers responded that they had used an open date in making their purchase decision (Open Shelf-life Dating of Food 1981).

The OTA survey (1979) found that the highest consumer preference among single dates and combination dates were "last day used" and "sell-by and use-by date" respectively. Consumers want to have clear and accurate usage information from the package.

However, the open dating system cannot guarantee either the acceptability or the safety of the product. This is because many factors, for example, temperature abuse

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during storage and distribution affects shelf life beyond the control of those who select the date printed on the packages. For this reason, the idea that the open dating enforcement should be conducted by food processors and consumers rather than through federal or state agencies has been generally accepted. There is no universally accepted open dating system for food in the United States, but federal agencies provide some regulations and guidelines, particularly for perishable food items (Open Shelf-life Dating of Food 1981).

There was a comprehensive study discussing the inclusion of "sell-by" dates in the new German regulations on labeling foodstuffs to apply to all pre-packaged foods. Jagerhuber (1982) insists that "sell-by" dates should be realistic and achieved after the relevant products have been subjected to tests simulating actual storage conditions, either in-house, or by external examination. He also points out that produce which has reached the market after the "sell-by" date should be marked either with "not for consumption" or "significantly diminished in value."

It is noticed that much food is thrown away because its "sell-by" date has passed, even though the food may still be quite edible. It is suggested that different keeping times should be indicated for storage in deep-freeze, under refrigeration and at room temperature (Shelf-Life Dates replace with... 1977).

The OTA (1979) points out that there is little evidence to support or to negate the contention that there is a direct relationship between open shelf-life dating and the actual freshness of food products when they are sold. Nevertheless, consumers often try to buy "younger" and "fresher" foods from supermarkets referring to the open date on the

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packages. The OTA survey also found that 62 percent of the consumers try to get the freshest food products possible. This consumer behavior destroys the "first in-first out" basis display system in supermarkets (An Analysis of Consumer Demands..., 1981). This is one of the reasons why the consumers must be educated about the open dating system.

An FDA nationwide survey found that 43 percent of all consumers do not know that the date stamped on milk is the date by which it should be sold (pull date) and 62 percent think it should be the date by which milk should be used (use date) (Labuza 1982). This assumption has led to consumer rejection of slightly older packages with good quality, and eventually has caused a loss of merchandise and destroyed stock rotation at retail stores. Because many consumers do not seem to know that a sell-by date includes a period of home storage during which the product remains at acceptable quality, they are confused as to the safety of food products bearing sell-by or pull dates, especially if they are purchased near or on the date itself (Open Shelf-life Dating of Food 1981).

The recent survey conducted by Packaging Digest (Consumers Rate Packaging Traits 1995) found that more than four-fifths of the surveyed households indicated that they would like more open date information relative to product usage. 25 percent believed that a fresh product should be thrown out on the day of expiration, and 60 percent said it should be tossed within three days. For refrigerated foods, however, there were only 14 percent who said it should be discarded within three days. With processed foods, consumers are willing to continue using a product well beyond its expiration date.

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There have been some controversies about the usefulness and the benefits of the open dating system among governmental agencies, manufacturers and consumers. The Ministry of Agriculture in England concluded that it is difficult to accept the views expressed by manufacturers that open date marking might result in substantial price rises. Especially for the perishable products, the difficulties will be greatest for manufacturers, "but the potential advantages are also greatest" (Ministry of Agriculture, Fisheries and Food 1972).

Open shelf-life date marking of perishable food and pharmaceuticals can be a marketing service and competitive advantage (Escher 1984). He insists that invisible hazards and imperfect knowledge and information about foodborne risks make food safety an explosive issue, that can disrupt markets and cause substantial economic losses for everyone, from farm input suppliers to consumers.

But if open dating can be a strategic advantage for the marketers of perishable products, there is some disagreement about benefits for the producers of longer shelf-life products such as carbonated beverages. Some marketing investigators worry that increasing consumers' demands for open dating will reach to forming strict federal regulation, which will affect manufacturers, and will eventually increase product price (Horton 1994). This controversy began with the Pepsi-Cola Company with the idea that the open dating system can be part of a marketing strategy. Aspartame, which is used as an artificial sweetener, significantly loses its sweetness after 12 to 14 weeks although there is some question as to whether the loss of sweetness of aspartame means end of the product's shelf life (The Dating Game 1994).

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Open Dating Techniques

The purpose of open dating is to give the consumer a date which will provide information about the expected shelf life and quality of the product if it has been properly stored (Open Shelf-life Dating of Food 1981). There are various open dating techniques, depending upon the product characteristics and preference of manufacturers and consumers. The following are several types of open dating systems currently employed (FAO/WHO 1992 and US Congress 1979):

1. Date of manufacture is the date on which the product becomes the product as described.

2. A date packaged(pack date) is the day, month, and year the product was processed or packaged for retail sale.

3. A sell-by date is the last date a product should be sold in order to allow a "reasonable" length of time for consumer use.

4. Date of minimum durability (best-if-sold-by date) is the date which signifies the end of the period under any stated storage conditions during which the product will remain fully marketable and will retain any specific qualities for which tacit or express claims have been made. However, beyond the date the product may still be perfectly satisfactory.

5. A best-if-used-by date(use-by date, recommended last consumption date) is the date after which food is no longer at its most acceptable level of quality.

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6. An expiration date is the date that a drug product is expected to remain within the approved shelf life specification provided that it is stored under the conditions defined on the label in the proposed containers and closure (USP 23 1995).

7. Combination dates may be also used such as a sell-by and best-if-used-by combination.

While many documents discussed open dating recommendations for each product, recommendations vary by authors. For frozen foods, for example, Childers (1982) recommends the "Best-if-used-by" date, providing accurate determination of shelf life can be made. National Food Processors Association (NFPA) (1989) suggests that there should be two categories of refrigerated foods according to perishability and safety hazard. For the group A foods, which is highly perishable, packaged, processed foods that must be refrigerated for safety reasons, "Must-be-used-by" is recommended. For the group B foods, the products intended to be refrigerated but have no safety hazard if temperature abused, "Use-by", "Sell-by" or other proper date marking is recommended. Ministry of Agriculture, Fisheries and Food of the United Kingdom (1972) recommended "Sell-by" date because of the difficulties to measure the exact duration of storage. According to the United Kingdom Association of Frozen Food Producers (UKAFFP) (1978), appropriate storage information should also provide for 'star' (*) marked freezer, which indicate storage periods at -12 °C (**) and -6°C(*).

One of the major environmental factors for perishable foods is temperature fluctuation. As temperature increases, loss of quality increases following the Arrhenius relationship, simple kinetics mathematical model (Labuza 1982). If the products are

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temperature abused in distribution channel and retail stores, open dates on packages are useless (Taoukis 1991). For this reason, time-temperature indicators (TTIs) have been introduced as alternatives to an open date and have been used to monitor temperature condition of food products throughout distribution. Any distribution channel has great potential for temperature abuse, to reduce the quality and shelf life of foods because of various criteria such as environmental conditions, packaging, processing, etc. Jeffery (1985) notices that a typical food product is handled and moved at least 17 times from harvest and manufacture to point of consumption. Thus, there is a need to monitor the history of time-temperature exposure of product, which may be the most important element for quality control during distribution flow (Fields 1985).

Campbell (1985) defined TTI as a device which may be affixed to the outside of a product package to provide evidence of the thermal history to which the product has been exposed. There are, as yet, limited commercial applications of TTIs for a number of reasons: high cost, unreliability of some TTIs, lack of consistency and reproducibility of some TTIs, and so on (IFST 1993). In 1982, at least 60 such TTIs have been patented, but there are still none in widespread use (Farquhar, 1982).

Nevertheless, Taoukis (1991) stresses that suitable and economical TTIs will be widely used for consumer products in the near future and they can be combined with the open date to give more information to the consumer about freshness and stability of the products.

A recent consumer survey conducted by Sherlock (1992) was undertaken to determine whether the concept of the use of a consumer readable shelf-life TTI tag (CT)

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in conjunction with open shelf life dating would be a useful practice for the dairy industry to follow. Success of the application of the TTI used as CT implementation is a function of consumers' education about food spoilage and the dependability of the CT technology. Sherlock also suggests that consumer education would be a necessary part of this type of program.

Expiration Dating for Non-prescription Drugs

United States Pharmacopeia (USP 23/NF 18 1995, p. 1963) defines the shelf life of drugs ("Expiration Dating Period") as "the time interval that a drug product is expected to remain within the approved shelf life specification provided that it is stored under the conditions defined on the label in the proposed containers and closure. The expiration date limits the time during which the article may be dispensed or used."

The expiration date is determined by appropriate stability testing described in the US Code of Federal Regulations, Title 21, section 211.166, to assure that "a drug product meets applicable standards of identity, strength, quality, and purity at the time of use" (National Archives and Records Administration 1993, 92). Stability testing can provide evidence on how the quality of a drug substance or drug product varies with time under the influence of a variety of environmental factors such as temperature, humidity and light, and enables recommended storage conditions, retest periods, and shelf lives to be established. There are five criteria for acceptable levels of stability: chemical, physical, microbiological, therapeutic, and toxicological (USP 23/NF 18 1995).

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It is generally accepted that the need for information to be conveyed by the label is more crucial for drugs than for food, and the accuracy of the information on the label is more important. The shelf life dating of drugs is also more tightly regulated than is the shelf life dating of foods. For example, the Code of Federal Regulations (CFR) requires that "the expiration date" must be provided "on the immediate container and also the outer package, if any, unless it is easily legible through the outer package"(National Archives and Records Administration 1993, 16).

Because the consequences of mislabeling drugs or misreading by consumers are more likely to be harmful than that of foods, and because the presentation of product information in an easily readable and understandable form makes it more consumer friendly, especially for elderly consumers, the expiration date should be clearly indicated (Jenkins 1993). The United States Pharmacopeia (1995) explains that the expiration date shall be prominently displayed in high contrast to the background or sharply embossed, and easily understood (e.g., "EXP 6/89," "Exp.June89," "Expires 6/89"). However, the label need not show an expiration date in the case of "a drug product or nutritional supplement packaged in a container that is intended for sale without prescription and the labeling of which states no dosage limitations, and which is stable for not less than 3 years when stored under the prescribed conditions."

Drugs are usually kept on the shelf life far longer than are food products. This puts a special demand on the package design to protect the contents against slow deterioration and on the package label to convey a realistic expiration date (Jenkins 1993).

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Regulation of Open Shelf Life Dating Techniques

There have been many limitations to achieve a universal regulation for open dating because any regulations focused on predicted shelf life, rather than a real time measure of product quality, depending on appropriate storage conditions. There have been great efforts to keep optimum distribution environments by manufacturers and retailers, but time-temperature abuse can occur. On the other hand, it is very difficult to find out whether the packaged foods have gone bad or not. Thus, government regulatory agencies would not have available the needed methods to determine whether a given product that is still in date is out of compliance with some quality standard (Fields 1985).

Since the State of Massachusetts issued regulations concerning the open dating of food packages in 1979, there have been many controversies about regulation of open dating technique in the USA. Some state governments have passed laws on open dating, trying to solve the diverse and often conflicting demands from consumers by various approaches. Dr. George Michael of Massachusetts Department of Public Health is strongly in favor of open dating, but he has gotten a bad response from the industry. He feels that open dating, along with prescribed temperatures and method of storage, would result in an optimum distribution system. However, even some government officials across the country charged with implementing the law have varying opinions on the benefits of open dating laws and regulations. The following five telephone interviews with the government officials were summarized by Labuza (1982, 18-21):

Billy Riddle, Assistant Director of Consumer Protection Division, the Georgia Department of Agriculture, has mixed filling about the problem - he feels open dating has

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benefits for the consumer, especially for perishables and knows consumers are very aware of dates on food. But he cited the problem of long shelf life for canned food (2-2 ½ years). In fact, just because food is in-date does not assure good quality (distribution and warehouse conditions are more important). He feels that open dating for some long shelf life products may just increase prices.

Oregon has passed laws on open dating in 1973. Carl Farmer, of the Food and Dairy Division said that regulations from state have been confusing to everyone: consumers, retailers and manufacturers. Some products are required to have the pack date, some (with shelf lives less than 30 days) are required to have the pull date. For fresh meat (including poultry) the pack date is the date it is packaged in the supermarket. He feels the issue is confusing and that it is hard to know what is the best way to implement the law - everyone has a different idea.

Arizona passed legislation in August, 1974. Through this legislation the state enforces the voluntary dating of perishable products with a shelf life of less than 60 days. When the products are overage they must be designated as such and sold at a lowered price. There were a lot of problems with this legislation at first but now consumers are aware of it and markets practice good stock rotation. West Horton, the Arizona Weights and Measures section of the Department of Agriculture and Horticulture, thought that a mandatory open dating law would work in Arizona.

There is no open dating law or regulations in Arkansas. Bill Teer, of the Arkansas Health Department feels if open dating were mandatory it would take a lot of personnel time policing it when there is no problem with the food.

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Florida has open dating on milk and all grade A dairy products (expiration date, after which they are not sold). Dr. George M. Rose of the Division of Inspection of the Florida Food Grades and Standards Bureau says that it is entirely unnecessary and wasteful to have required open date on processed food. The pack date does not mean anything to consumers-they just look for the freshest product. They don't have that much of a problem with foods. He says it is hard to educate the public against open dating, particularly for non-perishables.

Food legislation in many developed countries requires most prepackaged foods to carry a date of 'minimum durability'. The procedures to evaluate appropriate shelf lives have been established mainly by manufacturers. In the United Kingdom, for instance, 'best before' date is the most common type of date marking required by current legislation to appear on prepackaged foods. Meaningful storage instructions are also required alongside the best before date if the food is to be enjoyed at its best. 'Use by' date is required when the food is highly perishable and has a significant risk to human health. Selling any food in the UK after its 'use by' date is illegal (Ellis 1994).

In Germany, Federal German legislation replaces minimum shelf life marking with "use by" date marking in effective 1 July, 1993. This legislation declares that foodstuffs may not be sold after their use by date. However, the German Food Retailers Association says the new legislation does not clarify which foodstuffs are affected (Use by Date Replaces --- 1993).

Finding a "significant" loss in quality of foods and non-prescription drugs would be difficult to measure in a regulatory sense unless the regulators were trained for each

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product. What is needed is a chemical or physical index that changes in a similar manner to the sensory changes. OTA (1979) expects some type of accurate reliable shelf-life indicators that could measure reaction rate of food to both temperature and moisture. Although such indicators can be utilized for shipping frozen food cases or pallets of foods, they predict that the indicators may never become inexpensive enough to warrant their use on individual consumer packages.

OTA also suggests three basic legal options for Congress to consider in the open dating issue: Voluntary System, Mandatory System and Voluntary/Mandatory System.

First, Voluntary System is advantageous because it allows manufacturers flexibility in determining whether or not to open date, minimizing the cost and allowing time for specific research to develop more effective open dating system. However, lack of uniformity in deciding open date techniques, scientific measurements and open date labeling may cause confusion to all Government, manufacturers and consumers.

Second, Congress could take Mandatory System requiring the use of specific open dates. It has advantages because by providing standardized regulations which tightening inventory control, it can reduce food waste and set higher quality standards and criteria for calculating open dates.

Finally, Voluntary/Mandatory System is "one in which the Federal Government develops guidelines, and processors who choose to open date food product are required to follow these guidelines". The prime advantage of this system is providing uniformity of open date for products while individual processors have some flexibility of determining open dates. However, this may increase costs to government for developing open dates

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for every products and cause time consuming for both Government and industry (US Congress 1979).

Summary

Based on the review of literature, the following implications are summarized:

1. Consumer education about open dating techniques has not yet been accomplished.

2. There has been a tremendous confusion by state governments, manufacturers and consumers about the open dating techniques.

3. There are varying perceptions and measurements of shelf life, including shelf life after the sell-by date, the effect of temperature abuse, and shelf life variation by product.

4. There is more than one solution for accurate shelf life information and consumer readable open dating techniques. New technologies like TTIs will eventually replace or coexist with open dates in the future.

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CHAPTER III

RESEARCH METHODOLOGY

The purpose of this study was to provide an assessment of open date usefulness and understanding, as perceived by shoppers. This chapter states the research questions and discusses the research methodology, survey instrument, population, procedure, and treatment of the data. This chapter is also an attempt to provide structure that can also be utilized for future studies of this subject.

The Research Questions

This study was based on four research questions:

1. How important is a date when shoppers are deciding to buy food or non-prescription drugs?

2. How do shoppers interpret a date without any explanation on different kinds of foods and non-prescription drugs?

3. How do shoppers perceive a date after sell-by, use-by, or expiration date?

4. What is the most useful type of open date for shoppers?

From these four research questions, 16 individual questions were generated to provide information about shoppers' perceptions toward open date techniques.

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<u>Survey instrument</u>

The survey instrument was developed by the investigator with input from the thesis committee and feedback from a pilot test, through a number of drafts. The interview method was selected for this survey to ensure a good response rate and provide an opportunity to answer the respondents' questions. Two MAP (Minority Apprentice Program of the College of Agriculture and Natural Resources in Michigan State University) high school students were hired and trained. The length of the interview and order of the questionnaire were the most carefully determined in order to limit the interview time to 10 minutes. The interviews were conducted in July 1995.

The interview began after a brief introduction explaining the purpose of this survey. The survey questionnaire consisted of 25 questions including 9 demographic questions and was divided into five sections (Appendix A):

Section 1: Importance of Open Dates for Shoppers in their Buying Decision. Included here was in question 1. A number of individual foods and non-prescription drugs were discussed and 16 samples were chosen considering perishability of products and availability in supermarkets. A five-point scale was used, ranging from extremely important (5) to not at all important (1).

Section 2: Shoppers' Understanding of an Unexplained Open Date on a Package. Question 2 was designed for this section. In this section, respondents were given four categories of products: perishable, semi-perishable, shelf-stable, and non-prescription drugs, and asked how they interpret an unexplained open date for each product.

Section 3: Products Past the Date. Shoppers were asked their perceptions of the shelf-life of a product after the date marked.

The respondents were asked to assess two things in this section:

1) How long would shoppers expect a food to be usable after the sell-by date?

2) Will shoppers use a product (perishable, semi-perishable, shelf stable food, or non-prescription drugs) any time after the date (sell-by, use-by, or expiration date) marked on package?

For the first part, open ended questions asking expected usable time of individual food items in days were used. Second part consisted of question 3, 7, 10, 13 and 15, and shoppers were asked whether they would use a product after open date or not. Respondents could present why they would or would not use in the following open ended questions: 4, 8, 11, 14 and 16.

Section 4: Usefulness of Open Date Techniques. This section included three question groups (question 6, 9, 12.) to study about consumer preference among the four open date techniques: date packaged, sell-by, use-by, and spoilage indicators. A five-point scale was also used in this section, with responses ranging from "(5) extremely useful" to "(1) not at all useful."

Section 5: Demographic Background Information. The researcher assumed that the consumer awareness and understanding of open dating system might depend upon various personal, social, and economic factors. Thus, 9 questions were generated, including sex, age, education, income, family size, and frequency of shopping, and whether interviewees were the primary shoppers in their families.

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Population and Sampling

The population for the study consisted of shoppers at three Kroger supermarkets (Lansing, East Lansing and Okemos) in mid-Michigan. Kroger supermarkets, one of the most common grocery stores in United States, were chosen because target participants were typical shoppers who usually do grocery shopping for foods and non-prescription drugs. These three different locations were chosen to get a range of respondents representative of the regional population. One store location is in a lower-middle income area, one is in a college town, and the third is in an upper-middle-class suburb.

The data were collected on site from 10 a. m. to 5 p. m. during weekdays between July 10 to July 27, 1995. The investigator and two trained interviewers approached entering shoppers and asked for their participation. Although it was almost impossible to obtain true representative of the regional population, researcher tried to get the best samples as close as possible true range of gender and age difference. Obtaining good demographic variables such as income, numbers of households, level of education, etc. were not possible with this survey method. Chapter V explains for the limitations and discussions about sampling method based on the results.

Approximately 30 percent of the opportunistic shoppers agreed to the interview, resulting in 200 interviews. Most interviews took less than 15 minutes to complete, but varied depending on the shoppers' interest. For the distribution of participants by interview time, see Appendix D. Coupons for a free gallon of milk, donated by The Kroger Company, and an information sheet about open dating were given to participants as a sign of appreciation, following the interviews.

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Data Analysis

The Statistical Package for the Social Sciences (SPSS) was used for the data analysis. Results were obtained by computing analysis of variance (ANOVA), factor analysis, and simple statistics including means, frequencies and standard deviations. Cronbach's alpha and standardized item alpha were used to test the reliability for multiple questions on a single topic.

Factor analysis was used to confirm relationships among variables for section 1. Its purpose was to summarize a large number of variables with a smaller number of factors. The interpretation of factors was then sorted by size so that variables which load principally on each factor are grouped together, and are listed in descending order of loading.

Analysis of variance was employed because it was considered appropriate "to determine whether the differences among two or more means [were] greater than would be expected by sampling error alone" (Glass and Hopkins 1984, 324). When ANOVA tests indicated the existence of significant differences, the Scheffe post-hoc tests were used to determine pairwise differences. Two-way analysis of variance was also performed to determine the statistical significance of perceptions by demographic variable groupings (see Appendix C). Comments from shoppers were summarized and included in the Appendix B. The results of the data analysis are reported in the next chapter.

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Assumptions and Limitation of the Study

Several Assumptions were made regarding the data generated in this study which may influence the value of the resulting conclusion. This study was limited by the following factors:

1. Conclusions assume that the survey instrument was valid and reliable. Some measures of reliability are presented in the results.

2. Answers to the interview questionnaire were assumed to represent valid perceptions of the shoppers' own understanding.

3. The results are limited to those persons who shopped and interviewed at three Kroger supermarkets in Michigan during July 10 through July 27, 1995. The results may not truly represent the population of US shoppers.

4. The study is delimited to information obtained from a review of the literature and responses to the survey instrument.

Summary

This chapter consisted of a description of the methodology and implementation of the study. The research questions, research methodology and development of a survey instrument were focused. The population, sampling procedures, statistical procedures used on the data analysis were also included. The results of the data analysis are reported in the next chapter.

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CHAPTER IV

ANALYSIS AND INTERPRETATION OF THE DATA

The major purpose of this study was to determine shoppers' awareness and understanding of the open dates on packages. The study was designed to accomplish five goals:

1. To analyze consumer demands for open date information on various packaged foods and non-prescription drugs with differing shelf-life characteristics, including perishable, semi-perishable and shelf-stable products.

2. To determine consumer awareness and understanding of the open date systems.

3. To investigate whether demographic characteristics affect shoppers' perceptions about open dates and shelf life.

4. To predict the marketing effects of providing effective open date information.

5. To identify needs for consumer education regarding the shelf life of food and pharmaceutical products.

In order to achieve these goals, sixteen survey questions were developed and analyzed in the following four sections:

1. How important is a date when shoppers are deciding to buy food or non-prescription drugs?

2. How do shoppers interpret a date without any explanation on different kinds of foods and non-prescription drugs?

3. How do shoppers perceive a date after sell-by, use-by, or expiration date?

4. What is the most useful type of open date for shoppers?

Results from these sections will be explored later in this chapter. But first, the demographics of the respondents will be described.

Demographic Data

Listed in Tables 1 through 8 is the demographic information describing the study participants. The demographic data recorded for shoppers were: gender, age, family size, educational attainment, frequency of shopping, annual income, and whether interviewees were primary shoppers in their families.

Gender and Age

Table 1 shows that 34.0 percent of the total sample were males and 65.5 percent were females.

Table 1. Distribution of Participants by Gender.

Gender	Number	Percent of Population
Male	68	34.0
Female	131	65.5
Unrecorded	1	0.5
Total	200	100.0

Table 2 shows that the greatest percentage of participants (26.0%) were 35 to 44 years of age. Three quarters (74.5%) of the participants were over 35 years old. The age category of under 18 years contained only 1 participant.

Table 2. Distribution of Participants by Age.

Age Group	Number	Percent of Population
under 18	1	0.5
18-24	15	7.5
25-34	34	17.0
35-44	52	26.0
45-54	38	19.0
55-64	25	12.5
65 or over	34	17.0
Unrecorded	1	0.5
Total	200	100.0

Family size

Table 3 shows the number of adults in each participant's household. The largest percentage (61.0%) of participants had two adults in their household. The next largest percentage (22.5%) had only one adult; 16 percent had 3 or more adults in their household.

Table 3. Distribution of Participants by the Number of Adults in Households.

Number of Adults in participants' household	Number	Percent of Population
1	45	22.5
2	122	61.0
3	23	11.5
4	7	3.5
5	2	1.0
Unrecorded	1	0.5
Total	200	100.0

As shown Table 4, the largest percentage (63%) of participants had no children. 6.5% of participants had more than 2 children.

Table 4. Distribution of Participants by the Number of Children in Households.

Number of Children in participants' household	Number	Percent of Population
0	126	63.0
1	25	12.5
2	35	17.5
3	7	3.5
4	4	2.0
≥5	2	1.0
Unrecorded	1	.5
Total	200	100

Based on the data of Table 3 and 4, family characteristics were further analyzed. 36 shoppers lived themselves. 126 shoppers had at least one child in their households. See Table 5.

Table 5. Distribution of Participants by the Family Characteristics.

Marriage Status	Single	Non-single	Total
	36	163	199
Children	More than 1	No children	
	73	126	199

Education

Table 6 shows that the greatest percentage (53%) of participants held a Bachelor's

degree or higher. It is believed that higher educated people were more interested in this

study and were more willing to participate in the interview.

Table 6. Distribution of Participants by Level of Education.

Level of Education	Number	Percent of Population
Some high school or less	8	4.0
Completed high school	33	16.5
Some college	52	26.0
Bachelor's degree	51	25.5
Graduate or professional studies	55	27.5
Unrecorded	1	0.5
Total	200	100.0

Shopping Frequency

Table 7 shows that the greatest percentage of participants (46.0%) went shopping

once a week and most shoppers (80.0%) shopped once a week or more.

Table 7. Distribution of Participants by Shopping Frequency.

Shopping Frequency	Number	Percent of Population
Everyday	18	9.0
More than once a week	51	25.5
Once a week	92	46.0
More than once a month	37	18.5
Once a month	1	.5
Unrecorded	1	.5
Total	200	100.0

Income

Table 8 shows that 34.5 percent of the participants earned between $25,000 and $49,999 in total household income. Almost half (44%) earned more than $50,000, and 17.5 percent earned less than $25,000.

Table 8. Distribution of Participants by Level of Income.

Income	Number	Percent of Population
< $25,000	35	17.5
$25,000 < < $49,999	69	34.5
$50,000 < < $74,999	59	29.5
> $75,000	29	14.5
Missing	8	4.0
Total	200	100.0

Shopper Characteristics

Most (85%) participants said that they were the person in the household who usually did the grocery shopping for their households, as shown in Table 9.

Table 9. Distribution of Participants by Shoppers' Characteristics.

Principal Shopper	Number	Percent of Population
No	27	13.5
Yes	171	85.5
Missing	2	1.0
Total	200	100.0

Section 1: Importance of Open Dates

Overall Scales

Respondents were given a list of 15 common grocery items, ranging from fresh milk to canned food, and were asked to rate the importance of open dates for each product. Shoppers rated them on the 1 to 5 scale, where 5 = "extremely important." The 15 responses were aggregated to form a multi-item scale indicating overall importance of dates on products for each shopper.

Analysis of responses in Section 1 revealed that a date is important for shoppers' buying decisions. The importance varied from product to product, depending on product categories.

Using Cronbach's reliability coefficients, a coefficient alpha and standardized alpha determined the reliability of the multi-item scale. The coefficient alpha of .8834 and standardized item alpha of .8895 at the .05 alpha level indicates respondents were consistent and the results have a high degree of reliability. The results are shown in Table 10 in order based on the mean importance score.

As shown in Table 10, the respondents indicated that open dates are important in their shopping decisions (mean for all products = 3.97). For individual items, shoppers indicated that an open date is the most important for fluid milk products (mean = 4.77). Dates were considered the least important for frozen pizza (mean = 3.05), but it is important to note that this means most respondents still gave a high importance for the item.

Table 10. The Results of Section 1: Shoppers' Perception of Importance of Open Date on Food and Non-prescription Drugs.

Variable	Mean	Std Dev	No of valid cases
Fluid milk products	4.77	.75	198
Fresh meat	4.70	.85	198
Cured meats	4.59	.94	194
Eggs	4.45	1.04	198
Cheese	4.36	1.06	199
Packaged lettuce salads	4.20	1.19	172
Bakery items	4.15	1.20	196
Vitamins	4.02	1.26	185
Fresh Pasta	3.86	1.28	167
Non-prescription drugs	3.84	1.41	194
Cereals	3.46	1.33	196
Potato chips	3.44	1.26	183
Ice cream	3.41	1.36	192
Canned Foods	3.09	1.41	195
Frozen pizza	3.05	1.29	177
Overall Mean	3.97	.72	200

Reliability Coefficients   15 items
Alpha = .8834   Standardized item alpha = .8895

Subscales and Interaction Effects

A factor analysis on the 15 items was performed in order to examnine whether the

shoppers' perceptions about the importance of the open date can be grouped according to

the perishability of each product. In analyzing the factors of items in Section 1, it was

found that there are significant differences among the three groups. The three groups are

labeled as Group 1, Group 2 and Group 3. The results are shown in Table 11.

The first group represents the most perishable refrigerated foods: dairy products,

eggs and meat. A second group includes foods with a longer shelf-life: frozen food,

bakery and snack items, packaged salads and cereal. The third group includes shelf-stable

products including canned food, prescription drugs and vitamins.

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Table 11. Rotated Factor Matrix (Varimax) for Section 1.

	Factor 1	Factor 2	Factor 3
Group 1			
Fluid milk products	.87492	.09161	.10642
fresh meat	.83701	.11266	.12740
Eggs	.73851	.15082	.25610
Cured meats	.72974	.18095	.25617
Cheese	.58884	.22684	.24229
Group 2			
Ice cream	.06731	.72785	.16786
Fresh pasta	.40951	.68242	.02734
Frozen pizza	-.10036	.65114	.39996
Bakery items	.32169	.59722	.09212
Packaged lettuce salads	.53030	.56218	.06922
Cereals	.09840	.53239	.52205
Potato chips	.12088	.52899	.48237
Group 3			
Vitamins	.40256	.01816	.72587
Non-prescription drugs	.27173	.03799	.71186
Canned foods	.01113	.35525	.67876

It was interesting to note that fresh salads and bakery items are grouped with semi-perishables, although salads and bakery items are usually considered perishable. This reason may be that shoppers tend to be concerned and have questions about the freshness of meats and diary products much more than other products.

The respondents said that open dates are extremely important for the first group (mean = 4.5783). Open dates are less important for Group 2 (mean = 3.6299) and Group 3 (mean = 3.6380). Results are shown in Table 12.

Table 12. Shoppers' Perception of Importance of Open Date on Food and Non-prescription Drugs.

Variable	Mean	Std. Dev.	Valid cases
Group 1	4.57	.73	200
Group 2	3.63	.91	200
Group 3	3.64	1.07	199
Overall	3.97	.72	200

As shown in Table 13, the shoppers' perceptions in Section 1 were highly related

to their gender. The analysis of variance for the overall scale revealed that there is a

significant difference between shoppers by gender (significance = .0057) about the

importance of open dates.

Table 13. ANOVA of Shoppers by Gender in Section 1: "Shopper's Perceptions toward the Importance of Open Dates."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	1	3.9516	7.8196	.0057
Within Groups	197	.5053		

On average, females rated the importance of open dates significantly higher

(4.0718) than the males (3.7747). See Table 14.

Table 14. Results of the Descriptive Analysis of Shoppers by Gender on Question 1: "Importance of Open Date on Food and Non-prescription Drugs."

Gender	Mean	Std Dev	Cases
Male	3.7747	.8727	68
Female	4.0718	.6110	131

Total Cases = 200
Missing Cases = 1 or 0.5 Pct.

Section 2: Unexplained Dates

Respondents were asked how they interpret an unexplained open date for four categories of products: perishable, semi-perishable, shelf-stable, and non-prescription drugs. All responses are grouped by following 5 types of dates[1]:

1. Date when the product was manufactured (Date Manufactured).

2. Date when the product was packaged (Date Packaged).

3. Last day it should be sold (Sell-by date).

4. Last day that it will taste fresh (or remain effective) (Freshness Date/Expiration date).

5. Last day that it is safe to consume (Use-by).

Analysis of responses for the Section 2 revealed that responses were not consistent or predictable. There is a great deal of confusion about unexplained dates depending on product types. The less perishable the product, the more confusion. Table 15 reports the results.

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[1]There are two possible sources of distortion in the unexplained open date results. The questions were asked in an open-ended fashion, but the five possible responses were prompted when the respondent requested assistance; respondents were prompted approximately 35% of the time. The data may be slightly distorted because the respondents may have learned to discriminate more after they answered the first question.

Table 15. Results of Section 2: Shoppers' Explanations about Unexplained Dates (Valid Percent).

Explanation	Perishables	Semi-Perishables	Shelf-Stables	Drugs
Date Manufactured	4.0	2.0	6.6	7.7
Date Packaged	5.1	9.2	18.3	6.7
Sell-by Date	59.1	51.5	32.5	28.7
Freshness/Exp. Date	15.7	28.1	26.9	20.0
Use-by	16.2	9.2	15.7	36.9
Total	100	100	100	100

For perishable foods, over half (59.1%) of the respondents assume that an unexplained date is the last date it should be sold. But almost one-third believe that it is the last day that it will fresh taste (15.7%) or the last day it is safe (16.2%). This agree with their perception that dates are more important for perishables.

Half (51.5%) also believe that an unexplained date on semi-perishable foods is the last date it should be sold. But many (28.1%) believe that it is the last day that the product will taste fresh, and a few (9.2%) believe that the food is unsafe after the date.

There is even more confusion about an unexplained date on shelf-stable foods. About one-third (32.5%) believe that it is a sell-by date, one quarter (26.9%) think that it is the last day the food will taste fresh, and a significant number (15.7%) believe that it is the last day that the food is safe. Many (24.9%), however, believe that it indicates a manufacturing or packaging date, which could easily mislead consumers to believe that very old food (past the date) is relatively fresh.

Perceptions about non-prescription drugs are no more clear. The largest percentage (36.9%) of people believe that an unexplained date is the last day that the product is safe. This is a notable result because most drugs do not become unsafe, but

only become ineffective as they age. Yet only 20% of the responses were consistent with this fact. Many (28.7%) believe that it is the last date that the drug should be sold. Some (14.4%) even believe it is the manufacturing or packaging date. Figure 1 presents the data in a bar chart.
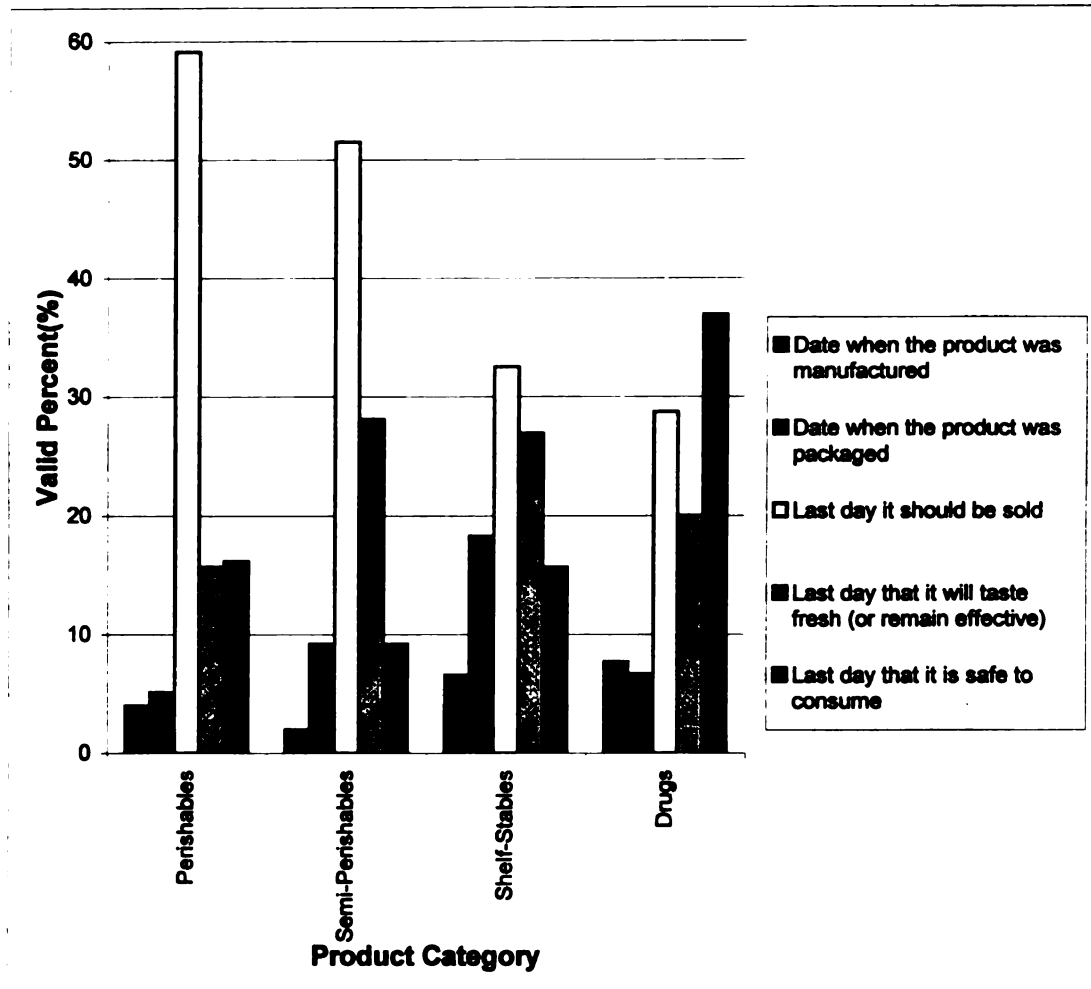
Figure 1. Results of Section 2: Shoppers' Explanations about Unexplained Dates
(Valid Percent)

Section 3: Products Past the Date

Section 3 consists of two sub-questions as follows:

1. How long would shoppers expect a food to be usable after the sell-by date?

2. Will shoppers use a product any time after the date (sell-by, use-by, or expiration date) marked on package?

First, respondents were asked, for five types of perishable foods, how long after the sell-by date they expected the food to be usable, assuming that the packages are unopened and properly refrigerated. Target products were limited to perishable foods intentionally based on the following assumptions:

1. Sell-by dates for perishable foods are much more important for shoppers to make a "use/throw out" decision than for longer shelf life foods.

2. Sell-by dates are the most common type for perishable foods in the current retail market.

Analysis of results reveal that shoppers' shelf life prediction for a food after the sell-by date is about five to seven days. However, the responses were extremely inconsistent.

The aggregate mean of the independent variables in this question is 6.54 days. Of the five products, respondents predict the longest life for cheese and eggs: 7 days after the sell-by date; milk for 3 days; orange juice for 5 days; and packaged lettuce salads for 2 days. These are median values; in all cases the mean was 1-4 days longer, with the highest mean (9.74) for cheese. However, the standard deviations were all larger than the mean, showing a large amount of variability in consumer beliefs. Furthermore, the

standard deviations varied proportionally with the means. The values are reported in

Table 16.

Table 16. Shoppers' Shelf-life Perception of Perishable Foods after "Sell-by" Date.

Variable	Mean	Median	Std Dev
Cheese	9.74	7	10.69
Eggs	8.28	7	9.09
Milk	4.04	3	4.47
Orange juice	6.04	5	6.34
Packaged lettuce salads	3.73	2	4.45
For Entire Population	6.54	5.1	5.65

As shown in Table 17, more than 50 percent of shoppers responded they will use

perishable foods between 1 to 7 days after the sell-by date. However, a considerable

percentage of shoppers (20%) believe milk should be thrown out on the sell-by date.

More than 15 percent of shoppers said that eggs and packaged lettuce salads should be

disposed on the sell-by date. In contrast, more than one-fourth (28.8% and 27.3%) of the

shoppers indicated that cheese and eggs would be still good after 7 days of the sell-by

date. There may be some data distortion due to the fact that many respondents tended to

say "one week" rather than specifying particular day(s).

Table 17. Shoppers' Expected Shelf Life of the Foods after "Sell-by" Date (Valid
Percent of Response).

Products	0 day	1-3 days	4-6 days	7 days	More than 7 days	Total
Cheese	8.1	17.7	13.1	32.3	28.8	100
Eggs	15.2	15.2	12.6	29.8	27.3	100
Milk	20.0	38.5	13.5	21.0	7.0	100
Orange juice	9.7	30.1	16.7	29.6	14.0	100
Packaged lettuce salads	17.3	47.4	13.3	14.5	7.5	100

Shoppers were also asked whether they would use a food any time after the date (sell-by or use-by date) marked on package. Shoppers' perceptions about this decision was strongly affected by the perishability of each product category. Five questions were used to explore this concept:

Q3: Would you serve food any time after the "sell-by" date?

Q7: Would you use a perishable food after the "use-by" date?

Q10: Would you use a semi-perishable food after the "use-by" date?

Q13: Would you use a shelf stable food after the "use-by" date?

Q15: Would you take a non-prescription drug after the expiration date?

Although the responses varied (e.g. more people would serve food after the sell-by date than would take a drug after the expiration date), there was a high degree of consistency among responses. The set of five questions proved a reliable scale at the .05 alpha level, with a reliability coefficient alpha of .7334 and standardized item alpha of .7302 using Cronbach's reliability coefficients. This means that shoppers' responses were very consistent over the questions.

Almost half (43.7%) of respondents said that they would not serve food after the "sell-by" date although the foods were unopened and properly stored. This is a significant finding because the foods should still be usable after the sell-by date.

Over half (56.3%) responded that they would not use a perishable product after the "use-by" date, assuming that the package was unopened and properly stored. It was also notable that shoppers tended more to avoid using products after the "use-by" date when products are more perishable. Fewer (41.9%), responded that they would not use a

semi-perishable food after the use-by date, assuming that the package was unopened and properly stored.

Assuming that the package was unopened and properly stored, it was found that shoppers responded with the highest affirmative percentage (63.1%), when they were asked about shelf-stable foods. Shoppers are more likely to use shelf-stable foods after the "use-by" date than they are to use perishable foods.

However, most shoppers (69.2%) responded that they would not use a non-prescription drug after the expiration date, assuming that the package was unopened and properly stored. These findings would seem to indicate that shoppers did not have sufficient knowledge about open dates, but used as their own reference points. The results are shown in Table 18.

Table 18. Results of Sub-Question 2: "Will shoppers use a food any time after the date (sell-by or use-by date) marked on package?" (Valid Percent of Response).

Variable	Yes	No	Total
Sell-by(general)	57.0	43.0	100
Use-by(perishable foods)	43.7	56.3	100
Use-by(semi-perishable foods)	58.1	41.9	100
Use-by(shelf-stable foods)	63.1	36.9	100
Expiration date(drugs)	30.8	69.2	100

Reliability coefficient alpha = .7334
Standardized item alpha = 7302.

Comments from Shoppers

Open ended questions were provided to analyze the reasons why respondents would be willing to serve products after a sell-by date or not. 22 percent of shoppers

replied that they would not serve perishable foods after sell-by date because of food safety reasons while 39.5 percent said that they would serve because they believe the foods are safe. The results are shown in Table 19.

Table 19. Shopper Belief Statements with the Highest Frequency - "Will Shoppers Use a Perishable Foods any time after Sell-By marked on Package?" (Valid Percent of Response).

Statement	Percent
No	
Foods are not safe.	22.0
Foods are not fresh any more.	11.5
Date is on there for reason.	9.5
Yes	
It won't hurt, considered to be good after date	39.5
Point of reference (depend on product)	8.5
It could be checked or tested before used it.	7.5
If price was reduced	1.0
Don't believe date on package	.5
Total	100

Valid cases   200   Missing case   0

As shown in Table 20, 28 percent of the shoppers said they would not serve perishable foods after a use-by date because of food safety reasons. 18 percent of respondents assumed that the foods would still be good after use-by date.

As shown Table 21, 26.4 percent of shoppers said that they will serve semi-perishable foods after use-by date because it would not hurt their health. Only one shopper responded that he/she would serve the food if the price was reduced.

Table 20. Shopper Belief Statements with the Highest Frequency - "Will Shoppers Use a Perishable Foods any time after Use-By marked on Package?" (Valid Percent of Response).

Statement	Percent
No	
Foods are not safe	28.0
Date is on there for reason.	15.7
Foods are not fresh any more.	12.6
Yes	
It won't hurt, considered to be good after date	18.0
It could be checked or tested	15.2
Point of reference (depend on product)	10.6
Total	100

Valid cases   198   Missing cases   2

Table 21. Shopper Belief Statements with the Highest Frequency - "Will Shoppers Use a Semi-Perishable Foods any time after Use-By marked on Package?" (Valid Percent of Response).

Statement	Percent
No	
Foods are not safe	23.4
Date is on there for reason	9.6
Foods are not fresh any more.	9.1
Yes	
It won't hurt, considered to be good after date	26.4
It could be checked or tested.	18.3
Point of reference (depend on product)	12.5
Don't believe date on package.	.5
If price was reduced.	.5
Total	100

Valid cases   197   Missing cases   3

Only 16.5 percent of respondents replied they would not serve a shelf-stable food after the use-by date because they believe the food is not safe. This was a significantly small percentage compared to other product categories. Results are shown in Table 22.

Table 22. Shopper Belief Statements with the Highest Frequency - "Will shoppers use a Shelf-Stable Foods any time after use-by marked on package?" (Valid Percent of Response).

Statement	Percent
No	
Foods are not safe	16.5
Date is on there for reason.	13.2
Foods are not fresh.	7.2
Yes	
It won't hurt, considered to be good after date.	28.9
Point of reference (depend on product)	19.1
It could be checked or tested before used it	14.1
Don't believe date on package	1.0
Total	100

Valid cases   194   Missing cases   6

The highest percentage (35.4%) of shoppers replied that they would not take any non-prescription drugs after expiration date because safety reasons. This finding means that a significant numbers of shoppers misunderstand the expiration date for drug packages. They tended to be concerned about possible poisonous effects of non-prescription drugs more seriously than foods. See Table 23.

Table 23. Shopper Belief Statements with the Highest Frequency – "Will shoppers use a Non-prescription drugs any time after Expiration Date marked on package?" (Valid Percent of Response).

Statement	Percent
No	
Drugs are not safe	35.4
Drugs are not effective any more.	25.6
Date is on there for reason.	10.3
Yes	
It won't hurt, considered to be good after date	21.5
Point of reference (depend on product)	5.6
Don't believe date on package.	1.0
I paid for it, so I would use it.	.5
Total	100

Valid cases   195   Missing cases   5

Section 4: Usefulness of Open Date Techniques

The respondents found all types of open date techniques to be useful. But there was a difference in responses regarding different open date techniques. The spoilage indicators are perceived to be the most useful open dating technique although they are not common in retail stores. The "use-by" date is viewed as more useful than the "sell-by" date. The open date techniques are perceived as more useful for perishable foods. Cronbach's alpha provided the means for evaluating the Section 4 through the computation of coefficients. The coefficient alpha is .6974 and standardized item alpha is .7310, so it shows responses were consistent and reliable.

The respondents were asked what kind of open-date system that they think should be used, for three categories of grocery products, from perishable to shelf-stable. The

usefulness of four types of systems were judged on a 5-point scale where 1 equals not at all useful, and 5 equals extremely useful. The four techniques were:

1. Date packaged

2. Sell-by date (best if sold by)

3. Use-by date (best if used by, expiration date)

4. Spoilage indicators (Time Temperature Indicators, TTIs)[2]

The relative usefulness was consistent for all three food product categories (mean = 3.88). With mean of 4.34, Spoilage Indicator are perceived as the most useful open dating technique. "Date packaged" is the least useful technique among the four (mean = 3.20). See Table 24 for the results.

Table 24. The Results of Section 4: Shoppers' Perception of Usefulness of Open Date Techniques.

Variable	Mean	Std Dev	N
Date Packaged	3.20	1.31	199
Sell-by	3.81	.94	199
Use-by	4.17	.89	199
Spoilage Indicators(TTIs)	4.34	.96	199
Overall	3.88	.67	199

The most useful dating technique for perishable foods was perceived to be spoilage indicators (mean = 4.53). The "use-by" date was the next highest useful date technique for shoppers (mean = 4.25). The "sell-by" date(mean = 3.91) is perceived to be

---

[2]Spoilage indicators (Time Temperature Indicators) were described as a device that "changes its color or shape to let you know whether the product has been exposed to temperatures or conditions that would make it go bad."

more useful that the "date packaged."(mean = 3.24) But all techniques are judged to be

more useful for perishable foods (mean = 3.98), as shown in Table 25.

Table 25. Shoppers' Perception of Usefulness of Open Date Techniques for each Food
Category.

Variable	Mean	Std Dev	N
Perishable Foods			
Date Packaged	3.24	1.60	199
Sell-by	3.91	1.16	199
Use-by	4.25	1.14	199
Spoilage Indicators (TTIs)	4.53	1.11	198
Overall	3.98	.78	199
Semi-perishable Foods			
Date Packaged	3.17	1.48	198
Sell-by	3.90	1.14	197
Use-by	4.28	1.05	197
Spoilage Indicators (TTIs)	4.40	1.15	196
Overall	3.94	.75	197
Shelf stable foods			
Date packaged	3.18	1.49	197
Sell-by	3.62	1.21	197
Use-by	4.01	1.19	197
spoilage indicators (TTIs)	4.11	1.40	196
Overall	3.73	.84	197

Demographic Correlations

The researcher found some statistically significant differences, but there were few

meaningful findings from different demographics correlations. For example, female

shoppers thought the open date was more important piece of information than do male.

For most cases, the significance was believed to be a statistical accident. There was no

impressive significance with two-way ANOVA tests. Therefore, researcher concluded

that the perception on open date was not much directly related to demographic

differences. Results from ANOVA (F-ratio and F-value) for each question are

summarized in Appendix C.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary of the Results

1. Shoppers feel that an open date is a very important piece of information for their buying decision for food and non-prescription drugs.

2. Shoppers tend to rate the importance of open dates higher for perishable products.

3. The open date information is more important to females than male shoppers.

4. There is great confusion and a variety of interpretations when shoppers find an unexplained date.

5. Shoppers are more likely to interpret an unexplained date as a "sell-by" date for foods although there is more confusion about shelf-stable foods.

6. Significant numbers believe that an unexplained date would be the date manufactured or date packaged especially for shelf-stable foods.

7. Over one-third of respondents said that an unexplained date would be "the last day it will taste fresh" or "last day that it is safe to consume."

8. Considerable numbers of shoppers misunderstood the meaning of a "sell-by" date and believe that a product like milk should be discarded on that date or within 3 days.

9. Almost half responded that they would not serve foods any time after the "sell-by" date and many express worries about food safety.

10. Shoppers believe that spoilage indicators would be the most useful open dating technique.

11. Although "sell-by" type of open date techniques are dominant on the current markets, respondents said that a "use-by" date was more useful than "sell-by" date. "Date packaged" was the least useful open date technique. This finding was not much different compared to the earlier study by US Congress in 1979, which found that consumers prefer "use-by" date to "sell-by" date.

12. There were a few statistically significant demographic correlations. For example, female shoppers think that open dates are a more important piece of information than do males.

Conclusions and Implications

The purpose of this study was to learn consumer attitudes about open dating of packaged food and non-prescription drugs. Given the results of the study, the following conclusions are apparent:

1. The researcher revealed the fact through the literature review, there are several different recommended open dating techniques which are dependent on various product

types, packaging methods, intended shelf life, and so on. Those complicated and unclear expressions can not only cause consumer confusion, but also marketing disadvantages. For this reason, there may be an standardized open date needed. In this case, "use-by" is recommended because it seems to be the simplest and most preferable open date technique for consumers. Using only "sell-by" date is not recommended since shelf life judgment after the "sell-by" date is solely the consumer's responsibility and causes a lot of confusion among consumers. If manufacturers use "sell-by" date on the package, recommended storage conditions and maximum usable time after "sell-by" date (use-by date) should be always specified after the date marked. In this case, combination of "sell-by" and "use-by" is also recommended since combination can make the terms clear. Although there are still limitations to the use of technical devices such as spoilage indicators, due to their high cost, these will provide more useful shelf life information to consumers in the near future.

2. Any open date technique that gives consumers confusion should be eliminated from the market. Shoppers were confused about an unexplained date. "Sell-by" date turned out to be a very ambiguous type of open date because many shoppers have no idea how long after "sell-by" date a product would go bad.

3. There are little evidence that demographic characteristics affect shoppers' perceptions about open dates. The only notable correlation was that female shoppers think open dates are more important than do male shoppers.

4. Open dates are a valuable piece of consumer information and can give a marketing advantage, especially for more perishable products. As a marketing strategy,

marketing and customer service departments can educate consumers about open date and shelf life of their products. Although it is still difficult to provide perfectly accurate shelf life information for shoppers because of the limited technology and cost, a well-organized information campaign will eventually help to increase the fresh image of products.

5. The results of this study show that consumer education about open date and shelf life of foods and non-prescription drugs is an important step to reduce unnecessary food waste and health risks. Too much misunderstanding and confusion exist. Even though similar research was conducted more than a decade ago, there seems to be no improvement in consumer education about open dates. Shoppers should know that there is no problem with drinking milk after a "sell-by" date has passed within two days. Shoppers should also know that there are many factors that can reduce the shelf life of products so that they fail to meet the specified shelf life period. Extensive consumer education may be done by government, manufacturers, retailers, or consumers themselves.

Recommendations for Further Study

As a result of the major findings and conclusions drawn from this study, the researcher offers the following recommendations for further study.

1. Although the ultimate beneficiary of the open date is the consumer, the aspects from federal governments, retailers and manufacturers have not been reflected in this research. A survey of retailers' and manufacturers' perceptions would be valuable for

further study. There should be an investigation of the benefits and costs of regulating open dates in the U.S.

2. Spoilage indicators (time-temperature indicators) will be the most useful open date technique in the future. Studies to develop low cost consumer readable spoilage indicators are needed.

3. Use-by dates require better shelf life evaluation techniques. Research about standardization and the possible regulation of techniques is recommended.

APPENDICES

APPENDIX A

SURVEY INSTRUMENT

APPENDIX A

Interview no. _____

CONSUMER SURVEY FOR OPEN DATE SYSTEM

Interviewer name   : _____
Date & Time   : _07_ / ____ / _1995_   _____ *AM / PM* _____
Location   : _____
Length of Interview : _____ *(minutes)*

Hi, my name is _____ , and I am from Michigan State University. We are interviewing shoppers about the dates marked on packages.

Would you be willing to participate in a 10-minute interview?

Please understand that your participation is completely voluntary. We will not record your name, so your responses will be anonymous.

Do you have any questions before we start?

If you have any questions, they can be directed to Dr. Diana Twede, MSU School of Packaging (517) 353-3869.

Q 1: Many different <u>foods and non-prescription drugs</u> are marked with dates to help consumers. I am going to read a list of items that often have dates on them. For each item, please consider how important a date is when you are deciding to buy it, and give me a number from 1 to 5 rating how important a date on the item is to you, where 1 is not at all important and 5 is extremely important.(*Interviewer record scale.*)

```
|————————————|————————————|————————————|————————————|
1            2            3            4            5
not at all                                          extremely
important                                            important
```
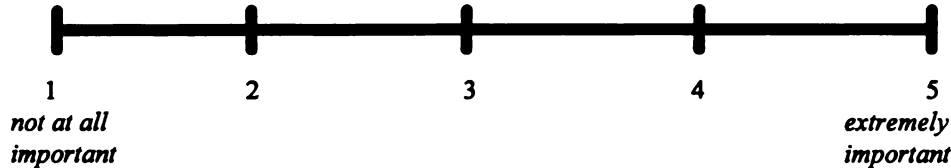
_____ 1. Bakery items
_____ 2. Canned foods
_____ 3. Cereals
_____ 4. Cheese
_____ 5. Cured meats (for example, lunch meat.)
_____ 6. Eggs
_____ 7. Fluid milk products (milk, yogurt)
_____ 8. Fresh meat
_____ 9. Frozen pizza
_____ 10. Ice cream
_____ 11. Non-prescription drugs (for example, pain relievers.)
_____ 12. Packaged lettuce salads
_____ 13. Fresh Pasta
_____ 14. Potato chips
_____ 15. Vitamins

Q 2: The dates on different foods and non-prescription drugs can have several different meanings. Sometimes the date is explained on the package, and other times it is not. <u>Considering different kinds of foods and non-prescription drugs</u>, If you found a date <u>without any explanation</u>, what do you think it would mean? (*read through each possible answer if necessary; better do not prompted; write number on the space provided.*)

_____ 1. First, for <u>perishable foods</u> including fluid milk products,
            fresh bakery items, fresh meats, fish and poultry, and fresh
            fruits and vegetables

_____ 2. What about <u>semi-perishable foods</u> including snack foods,
            cheeses, ice cream, some pickled foods, and cured meats

_____ 3. And then, for <u>shelf-stable foods</u> including dried legumes,
            nuts and grains, many dried-baked foods such as cereals and
            pasta, all canned foods, salt, and sugar

_____ 4. And finally for <u>non-prescription drugs</u> including pain relievers.

* *Read below possible answers if necessary*

1. *Date when the product was manufactured*
2. *Date when the product was packaged*
3. *Last day it should be sold*
4. *Last day that it will taste fresh(or remain effective)*
5. *Last day that it is safe to consume*

Q 3: One of the typical types of date on a food package is a "sell by" or "best if sold by" date. Would you serve that food any time after the "sell by" date? *(Interviewer circle one.)*

      1. No   2. Yes

Q 4: Why or why not?

_____

_____

Q 5: The following food items usually have a "sell-by" date on the package. How long would you expect each of the following products to be usable after the "sell-by" date? Assume that the products are unopened and properly refrigerated. *(Interviewer write the expected period at appropriate food items.)*

    1. Cheese   _____ *days*
    2. Eggs   _____ *days*
    3. Milk   _____ *days*
    4. Orange juice   _____ *days*
    5. Packaged lettuce salads _____ *days*

Q 6: Now I want you to consider what kind of date you think should be marked on different kinds of foods. Here are four different date systems for packages: *(give interviewee card and read through each definition.)*

* Definition of various open date systems

* A *date packaged* is the day, month, and year the product was processed or packaged for retail sale.

* A *sell-by date*(best if sold by) is the last date a product should be sold in order to allow a "reasonable" length of time for consumer use.

* A *use-by date*(best if used by date, recommended last consumption date, expiration date) is the date after which product is no longer at its most acceptable level of quality.

* A *spoilage indicator* changes its color or shape to let you know whether the product has been exposed to temperatures or conditions that would make it go bad.

I want you to consider how useful each of date systems would be for each of the categories of food we talked about earlier. First, for **perishable foods.** *(for example, fluid milk products, fresh bakery items, fresh meats, fish and poultry, and fresh fruits and vegetables.)* Please give me a number from 1 to 5 indicating how useful you think each of these date systems would be for **perishable foods,** where 1 is not at all useful and 5 is extremely useful. *(give examples of perishable foods if necessary; read each system name and wait for response.)*

```
├────────┼────────┼────────┼────────┤
1        2        3        4        5
not at all                          extremely
useful                              useful
```
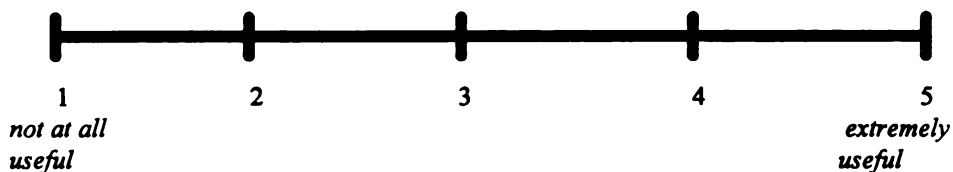
____ 1. date packaged
____ 2. sell by*(best if sold by)*
____ 3. use by*(best if used by, expiration date)*
____ 4. spoilage indicators

Q 7: Consider now the "use by" date for perishable food. Would you use a perishable food after the "use by" date? Assume the product is unopened and properly stored. *(Interviewer circle one.)*

1. No   2. Yes

Q 8: Why or why not?

_____

_____

Q 9: Next, for semi-perishable foods. *(for example, snack foods, cheeses, ice cream, some pickled foods, and cured meats.)* Again, give me a number from 1 to 5 indicating how useful you think each of these date systems would be for semi-perishable foods, where 1 is not at all useful and 5 is extremely useful. *(give examples of perishable foods if necessary; read each system name and wait for response.)*

```
├────────┼────────┼────────┼────────┤
1        2        3        4        5
not at all                          extremely
useful                              useful
```
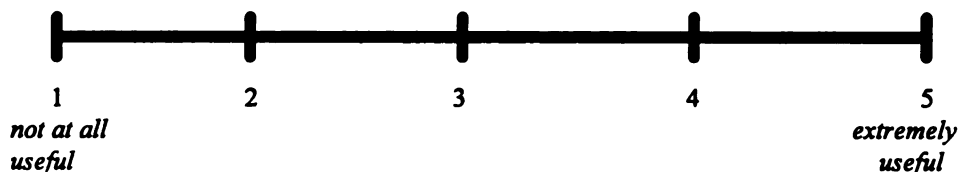
____ 1. date packaged
____ 2. sell by*(best if sold by)*
____ 3. use by*(best if used by, expiration date)*
____ 4. spoilage indicators

Q 10: Would you use a semi-perishable food after the "use by" date? Assume the product is unopened and properly stored. *(Interviewer circle one.)*

1. No   2. Yes

Q 11: Why or why not?

_____

_____

Q 12: Finally, for shelf-stable foods. *(for example, nuts and grains, many dried-baked foods such as cereals and pasta, all canned foods, salt, and sugar.)* **Once more, give me a number from 1 to 5 indicating how useful you think each of these date systems would be for shelf-stable foods, where 1 is not at all useful and 5 is extremely useful.** *(give examples of perishable foods if necessary; read each system name and wait for response.)*

1	2	3	4	5
not at all				*extremely*
useful				*useful*

___ **1. date packaged**
___ **2. sell by***(best if sold by)*
___ **3. use by***(best if used by, expiration date)*
___ **4. spoilage indicators**

Q 13: Would you use a shelf-stable food after the "use by" date? Assume the product is unopened and properly stored.*(Interviewer circle one.)*

    1. No   2. Yes

Q 14: Why or why not?

_____

_____

Q 15: The typical type of date system on a non-prescription drug package is an expiration date. Would you take the drug after the expiration date? Assume the product is unopened and properly stored. *(Interviewer circle one.)*

    1. No   2. Yes

Q 16: Why or why not?

_____

_____

* To help me analyze your answers above, PLEASE ANSWER THE FOLLOWING QUESTIONS ABOUT YOURSELF AND YOUR HOUSEHOLD. Again, please remember that the surveys are completely anonymous and that your responses cannot be identified.

Interviewer record sex.

17:   *Male*_____   *Female*_____

18: I am going to read a list of age categories. Please stop me when I reach your age category.
(Interviewer read the list & circle a number.)

    1. under 18
    2. 18-24
    3. 25-34
    4. 35-44
    5. 45-54
    6. 55-64
    7. 65 or over

19: How many children 18 years old or younger are there in your household?

_____

20: How many adults, <u>INCLUDING YOURSELF</u>, are there in your household? (note: includes adult children, grandparents or other relatives, and other permanent adult residents; does not include visitors)

_____

21: What is the highest level of education that you completed?   *(Interviewer circle number.)*

    1. Some high school or less
    2. Completed high school
    3. Some college
    4. Bachelor's degree
    5. Graduate or professional studies

22: I am going to read a list of income categories. Please stop me when I reach your <u>TOTAL HOUSEHOLD</u> income category. *(note: income before taxes)*

    1. Less than $25,000
    2. 25,000 to 49,000
    3. $ 50,000 to 74,999
    4. 75,000 or more

23: Are you the person in your household who usually does the grocery shopping?

    1. No   2. Yes

24: How often is grocery shopping usually done for your household? *(Interviewer circle number. Do not prompt.)*

    1. Everyday
    2. More than once a week less than everyday
    3. Once a week
    4. More than once a month less than once a week

25: How far away from this store is your home in minutes?

_____ minutes

Thank you for your time and participating this survey!

APPENDIX B

CONSUMER COMMENTS

APPENDIX B

Consumer Comments

Consumer comments showed various opinions from respondents' own point of view. Following are comments mentioned by interviewees.

Foods

"The date should be postmarked for ahead for endurance of use."

"If the taste is OK; use it."

"The dates there tell you of some importance, so use until that date."

"The date deals with usage of consumer."

"It might look OK, but not safe to the digestive system."

"Better safe than sorry."

"To me, if it tastes, looks, and smells fresh; it's fresh."

"Just follow the date."

"I don't eat anything that might possibly have something wrong."

"I think they give you a lot of latitude on the date."

"I'm not a risk-taker."

"Consumer would check to see if it was OK."

"The date is on there for a reason. But if I still had it, I would use it."

"Generally they can be used a few days after the date."

"It depends on the product."

"I don't know how harmful it would be after the date."

"I like the maximum freshness."

"It would be used after the date but not bought."

"The date should be placed for enough ahead."

"It usually has spoiled after sell-by date."

"I'm not certain it's safe to use after date."

I only want or use products that are acceptable or "safe"."

"If they (store) sell it, I think it's still edible. I have a lot of faith in big grocery store chains."

"I might get sick; ingredients may have changed (after use-by date)."

I like things to be at the highest quality. I don't want to take any chances."

I don't trust the date."

Non-Prescription Drugs

"Drugs are less stable-either they aren't as effective or they may be toxic."

"For fear that it (drug) would be harmful."

"Less effective and it may be harmful to your health."

"Drugs change properties (after the date)."

"Health is too important to tamper with."

APPENDIX C

INTERACTION EFFECTS

APPENDIX C

Interaction Effects

In order to see whether demographic variables affect on consumer perceptions, the analyses of the data included an examination of interaction effects. The relationships between and within variable groups were the focus of the examination. One-way ANOVA test was performed to determine the differences that existed. The Post Hoc Multiple comparison procedures (Scheffe test) with significance level .05 were performed to view which means are significantly different from each other. Further analysis (Crosstabulation statistics and Two way ANOVA) were also performed if there were significant interaction happened.

As shown in Table 26, q0301 had a significant difference by consumer's shopping frequency; the significance of the F value was .0272.

Table 26. ANOVA of Consumer's Shopping Frequency on Q0301: "Shopper's Perception after Sell-by Date."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	3	.7431	3.1186	.0272
Within Groups	195	.2383		
Total	198			

The results of multiple range test (Scheffe) show that there are significant difference between "everyday shoppers" and "once a week shoppers." "Everyday shoppers" disagreed to serve a food after the sell by date more often (mean = 1.2778) than the "once a week shoppers (1.6522)." This indicates that "everyday shoppers" are concerned more about freshness of foods than others, and that is why they shop everyday. See Table 27.

Table 27. Results of Descriptive Analysis by Consumer's Shopping Frequency on Q0301: "Consumer Perception after Sell-by Date."

Frequency	Mean	Std Dev	No. of Cases
Everyday	1.2778	.4609	18
More than once a week	1.5686	.5002	51
Once a week	1.6522	.4789	92
Less than once a week	1.5263	.5060	38
Entire Population	1.5729	.4959	199

Total Cases = 200
Missing Cases = 1 or   .5 Pct

There was a significant difference of shoppers by level of distance (significance = .0396) as shoppers' perception differed as to the date packaged for perishable foods. See Table 28.

Table 28. ANOVA of Shoppers by Level of Distance on Q0601: "Shopper's Preference on Date Packaged for Perishable Foods."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	2	8.2063	3.2832	.0396
Within Groups	194	2.4995		
Total	196			

As the distance from the store was further, the shoppers preferred the date packaged dating system. The shortest distance group (shorter than 5 minutes) had a mean of 2.9540, whereas the longest distance group(Longer than 10 minutes) had a mean of 3.6829. See Table 29.

Table 29. Results of the Descriptive Analysis of Shoppers by Level of Distance on Q0601: "Shopper's Preference on Date Packaged for Perishable Foods."

Distance	Mean	Std Dev	Cases	
Shorter than 5 minutes	2.9540	1.6629	87	
6 to 10 minutes	3.3768	1.5821	69	
Longer than 10 minutes	3.6829	1.3863	41	
Total	3.2538	1.5810	197	

There was a significant difference (.0109) of shoppers by gender on q0604 in response to the preference of the spoilage indicators for perishable foods. See Table 30.

Table 30. ANOVA of Shoppers by Gender on Q0604: "Shopper's Preference on Spoilage Indicators for Perishable Foods."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	1	7.7602	6.6021	.0109
Within Groups	195	1.1754		
Total	196			

The spoilage indicators were more important to female shoppers(mean =4.6822) than the male shoppers.(mean =4.2647) The results are shown in Table 31.

Table 31. Results of the Descriptive Analysis of Shoppers by Gender on Q0604: "Shopper's Preference on Spoilage Indicators for Perishable Foods."

Gender	Mean	Std Dev	Cases
Male	4.2647	1.3672	68
Female	4.6822	.9013	129
Total	4.5381	1.0995	197

Total Cases = 200
Missing Cases = 3 or 1.5 Pct

There was a significant difference by the type of shoppers on q0604, with significance of .0115. See Table 32.

Table 32. ANOVA of Shoppers by Type of Shoppers on Q0604: "Shopper's Preference on Spoilage Indicators for Perishable Foods."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	1	7.2764	6.5020	.0115
Within Groups	194	1.1191		
Total	195			

The spoilage indicators were more important to shoppers (mean =4.6331) than the non-shoppers.(mean =4.0741) The results are shown in Table 33.

Table 33. Results of the Descriptive Analysis of Shoppers by Type of Shoppers on Q0604: "Shopper's Preference on Spoilage Indicators for Perishable Foods."

Shopper	Mean	Std Dev	Cases	
Non-shopper	4.0741	1.4122	27	
Shopper		4.6331	.9918	169
Total		4.5561	1.0727	196

Total Cases = 200
Missing Cases = 4 or 2.0 Pct

As shown in Table 34, there was a significant difference of shoppers by age, with a F-value of .0031.

Table 34. ANOVA of Shoppers by Age on Q0604: "Shopper's Preference on Spoilage Indicators for Perishable Foods."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	2	6.8573	5.9589	.0031
Within Groups	194	1.1508		
Total	196			

Younger groups (54 or younger years) tended to prefer spoilage indicators for perishable foods. The Scheffe test showed that the age of 55-or-older-years group(mean = 4.1356) was significantly different from the other age groups. Results are shown in Table 35.

Table 35. Results of the Descriptive Analysis of Shoppers by Age on Q0604: "Shopper's Preference on Spoilage Indicators for Perishable Foods."

Age	Mean	Std Dev	Cases
Under 34	4.6800	.7677	50
35 - 54	4.7273	.8405	88
55 or older	4.1356	1.5138	59
Entire Population	4.5381	1.0995	197

Total Cases = 200
Missing Cases = 3 or 1.5 Pct

As shown in Table 36, there was a significant difference of shoppers by distance on q0902; the significance was .0231.

Table 36. ANOVA of Shoppers by Distance on Q0902: "Shopper's Preference on Sell-by Dates for Semi-perishable Foods."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	2	4.7765	3.8415	.0231
Within Groups	193	1.2434		
Total	195			

Scheffe test showed that there was a significant difference between shorter-than-5-minutes distance group(mean = 4.1628) and 6-to-10-minutes group(mean = 3.7101). Results are shown in Table 37.

Table 37. Results of the Descriptive Analysis of Shoppers by Distance on Q0902: "Shopper's Preference on Sell-by Dates for Semi-perishable Foods."

Distance	Mean	Std Dev	Cases	
Shorter than 5 minutes		4.1628	1.0500	86
6 to 10 minutes		3.7101	1.0995	69
Longer than 10 minutes		3.7317	1.2654	41
Entire Population	3.9133	1.1312	196	

Total Cases = 200
Missing Cases = 4 or 2.0 Pct

As shown in Table 38, q0903 had a significant difference by level of education; the probability of the F-value was .0139.

Table 38. ANOVA of Shoppers by Education on Q0903: "Shopper's Preference on Use-by Date for Semi-perishable Foods."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	4	3.3870	3.2178	.0139
Within Groups	192	1.0526		
Total				

As increased the level of education, there was a tendency to increase preference on use-by dates for semi-perishable foods. The shoppers holding graduate or professional studies degree had a mean of 4.4727, whereas some-high-school-or-less group had a mean of 3.1250. In addition, the Scheffe test showed that the significant difference between some-high-school-or-less group and some college group or graduate or professional studies group. See Table 39.

Table 39. Results of the Descriptive Analysis of Shoppers by Education on Q0903: "Shopper's Preference on Use-by Dates for Semi-perishable Foods."

Education		Mean	Std Dev	Cases
Some high school or less		3.1250	1.6421	8
Completed high school		4.1875	1.2032	32
Some college		4.3654	.9907	52
Bachelor's degree		4.2200	.9957	50
Graduate or professional studies	4.4727	.8575	55	
Entire Population	4.2792	1.0489	197	

Total Cases = 200
Missing Cases = 3 or 1.5 Pct

There was a significant difference (the significance of .0423) by number of adults on q1001; "shopper's perception on semi-perishable foods after use-by date was passed." The results are shown in Table 40.

Table 40. ANOVA of Number of Adults on Q1001: "Shopper's Preference on Semi-perishable Foods after Use-by Date."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	2	.7692	3.2138	.0423
Within Groups	195	.2393		
Total				

There was a significant difference of shoppers by the number of adults in household on q1001. With only one adult in the household, the mean was 1.5333, whereas with more than two adults, the mean was 1.7813. See Table 41.

Table 41. Results of Descriptive Analysis by Number of Adults on Q1001: "Shopper's Perception on Semi-perishable Foods after Use-by Date."

No. of Adults	Mean	Std Dev	Cases
One	1.5333	.5045	45
Two	1.5455	.5000	121
More than two	1.7813	.4200	32
Entire population	1.5808	.4892	198

Total Cases = 200
Missing Cases = 2 or 1.0 Pct.

As shown in Table 42, there was a significant difference by the number of adults on q1301; "shoppers perception on shelf-stable foods after use-by date. The significance was .0207.

Table 42. ANOVA of Shoppers by Number of Adults on Q1301: "Shopper's Perception on Shelf-stable Foods after Use-by Date."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	2	.8987	3.9568	.0207
Within Groups	195	.2271		
Total	197			

As increased in the numbers of adults in their household, they agreed to use shelf-stable foods after use-by date. With only one adult in household, the mean was 1.5556, whereas with more than two adults, the mean was 1.8438. See Table 43.

Table 43. Results of the Descriptive Analysis by Number of Adults on Q1301: "Shopper's Perception on Shelf-stable Foods after Use-by Date."

No. of Adults	Mean	Std Dev	Cases
One	1.5556	.5025	45
Two	1.6033	.4912	121
More than two	1.8438	.3689	32
Total	1.6313	.4766	198

Total Cases = 200
Missing Cases = 2 or 1.0 Pct.

As shown in Table 44, there was a significant difference of shoppers by level of children on q1301; "shopper's perception on shelf-stable foods after use-by date." The F-value was .0069.

Table 44. ANOVA of Shoppers by Level of Children on Q1301: "Shopper's Perception on Shelf-stable Foods after Use-by Date."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	1	1.6947	7.4525	.0069
Within Groups	194	.2274		
Total	195			

Table 45 shows that more shoppers, with no children (mean = 1.6992), tended to agree to use shelf stable foods after use-by date than shoppers with children (1.5068).

Table 45. Results of Descriptive Analysis by Number of Adults on Q1301: "Shopper's Perception on Shelf-stable Foods after Use-by Date."

Children	Mean	Std Dev	Cases
No children	1.6992	.4605	123
1 or more children	1.5068	.5034	73
Entire population	1.6276	.4769	196

Total Cases = 200
Missing Cases = 4 or 2.0 Pct.

As shown in Table 46, q1301 had a significant difference by shopper's shopping frequency; the F-value was .0164.

Table 46. ANOVA of Shoppers by Shopping Frequency on Q1301: "Shopper's Perception on Self-stable Foods after Use-by Date."

Source	d.f.	Mean Square	F-Ratio	Sig.
Between groups	2	.7903	3.5073	.0164
Within Groups	194	.2253		
Total				

Everyday shoppers (mean = 1.3333) had less tendency to use shelf stable foods after use-by date than other groups. In addition, the Scheffe test showed that there was a significant difference between everyday shoppers and more-than-once-a-week shoppers or less-than-once-a-week shoppers. See Table 47.

Table 47. Results of Descriptive Analysis by Shopping Frequency on Q1301: "Shopper's Perception on Self-stable Foods after Use-by Date."

Shopping frequency	Mean	Std Dev	Cases
Everyday	1.3333	.4851	18
More than once a week	1.7059	.4602	51
Once a week	1.6044	.4917	91
Less than once a week	1.7368	.4463	38
Entire population	1.6313	.4747	198

Total Cases = 200
Missing Cases = 2 or 1.0 Pct

APPENDIX D

LENGTH OF INTERVIEW TIME

APPENDIX D

Length of Interview Time

The interview was designed to be 10 minutes long. 44 percent of interviews were taken within 10 minutes or less. In many cases, the participants were eager to ask questions and discuss the subject in more depth, and so many interviews were required more time. See Table 48.

Table 48. Distribution of Participants by Length of Interview Time.

Time (minute)	Number	Percent of Population
less than 10 minutes	30	15.0
10 minutes	58	29.0
10 < < 15 min.	52	26.0
15 < < 20 min.	51	25.5
20 minutes or over	4	2.0
Missing	5	2.5
Total	200	100.0

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