

2015 and 2018 National Meat Case Studies: Packaging Type, Marketing Claims,  
and Allocation in the Self-Service Meat Case

by

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## **ABSTRACT**

Stores from across the United States were audited to determine the frequency of common packaging types, tray types, tray colors, marketing, and allocation of space of meat and non-meat items in the meat case. 108 stores in 25 states were visited and surveyed in 2015 whereas in 2018 150 stores were audited in 31 states. Auditors were trained by Cryovac Inc. employees at the Gordon W. Davis meat science laboratory before auditing. States were subdivided into 5 regions based on geographical area: West Coast, Mountain/ Southwest, Midwest, Southeast, and Northeast. Store were audited based on stock keeping units (SKUs) as each SKU represents a unique item in the meat case. Data were analyzed by comparing across species of beef, ground beef, pork, turkey, chicken, veal, lamb, and in 2018, seafood. Additionally, case length was recorded to determine allocation of the retail space to various species groups. In addition, the species groups above, non-meat items, value added products, sausage, processed meat, and miscellaneous were categorized and compared for the percentage allocation of the retail case. Poly-vinyl chloride packaging was the most popular in 2015 and 2018 making up 43.4% and 42.8% of the meat case, respectively. Laminate packaging was the second most popular packaging type at 16.9% and 17% in 2015 and 2018, much more than in previous studies. Tray-less packaging has increased significantly over the years reaching 29.5% of all packaging. White trays are found in the highest percentage of the meat residing around 32% of all packaging types. Black colored trays have decreased in frequency from 2007 to present making up only 19% of the meat case. Yellow tray packaging, however, is the popular tray color for chicken at 37.2%.

Chicken was the only species group found in all stores in both 2015 and 2018 while beef decreased its presence in the meat case from 100% to 98% from 2015 to 2018. Space allocated to beef shrunk by an average of 1 meter per store between 2015 and 2018. In both years, chicken was allotted the greatest amount of space in the retail case at 16 meters per store. Beef controls the majority of SKUs offered in the meat case at approximately 30% of all SKUs in 2018. The space provided to each SKU in the meat case shrunk between 2015 and 2018 to only 0.39 meters per SKU average.



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## CHAPTER I

### REVIEW OF LITERATURE

#### *History of Packaging*

Packaging has changed significantly over the last two and a half centuries. As the meat industry has changed, packaging has evolved with the industry. Dating back to the late 18<sup>th</sup> century and early 19<sup>th</sup> century, meat was packaged in barrels and netted cloths (Price & Schweigert, 1987). These packaging options allowed local butchers and self-harvesting farmers long term storage for meat utilizing the processing techniques of the day. Salting, curing, and smoking were widely used to maintain safety of meat products. These processing techniques were by no means new. Evidence of these processing methods are noted in literature dating back to 1000 BCE (Price & Schweigert, 1987). As the meat industry has adapted to the ever demanding and changing consumer, so has the packaging that contains it. In addition to the packaging options used previously, the packaging types today serve additional functions: protection from the external environment, increased shelf life, prolonged consumer acceptance of color, and provide the consumer visual assurances of the contained product's quality, safety, and health.

#### *Consumption*

Americans love their meat. In fact, since 1909, consumption of red meat, poultry, and fish have doubled (USDA Economic Research Service, 2021). As a population, Americans now rank 2<sup>nd</sup> in per capita consumption of poultry and beef and are in the top five for pork consumption. The average American consumes roughly 118 kilograms of red meat, poultry, and seafood each year. This equates to roughly 27 kilograms of beef, 53 kilograms of poultry, and 28 kilograms of pork (USDA Economic Research Service, 2020). Seafood consumption makes up roughly 9 kilograms and lamb about one kilogram

of this total (USDA Economic Research Service, 2020). According to Yen et al. (2008), in a two-day period 71.2% of beef and 19.3% of fish is consumed at home with an average consumption of 1.11 kg of beef, .05 kg of pork, .06 kg of poultry, and .02 kg of fish in a two-day average. It becomes important to understand what each consumer is buying in the meat case and for what reasons.

Meat consumption has often been broken down by ethnicity, gender, age, location, and education. Men have been found to consume meat more than women with the majority of their meat consumption comes from red meat and poultry, 60% and 30% respectively (Daniel et al., 2010; Yen et al., 2008). Additionally, Daniel et al. (2010) reported no statistical differences in the volume of meat consumed between Whites, Black, and Hispanics, but showed differences in the types of meat consumed. Whites and Hispanics consumed less poultry than Blacks. Age has also been shown to be a determining factor in the consumption of meat. Americans in the 20-49 years old category consumed the most meat followed by 50-69, and finally 12-19 years old (Daniel et al., 2010). Finally, there have been noted differences between the location of the consumer and their purchasing habits. Midwest citizens purchase and consume the most beef and pork out of the five regions. Midwest citizens consume a combined 59.5 kg of beef and pork compared to the West region, the lowest consuming region (48.6 kg) (C. Davis & Biing, 2005; C. G. Davis et al., 2005). A higher level of education has been associated with less consumption of meat, especially red meat, due to an increased nutritional knowledge (Blisard et al., 2002; Daniel et al., 2010; Guenther et al., 2005).

Consumption can also be contrasted between usage at home and away from home. While the split between at home preparation and away from home preparation used to be

larger than it is today, at home preparation still represents 58.7% of food expenditures (Lin & Guthrie, 2012). Food prepared at home is predominantly purchased at supermarkets and clubs as well as the occasional local grocery store. According to Davis & Biing (2005), 65% of all beef is purchased in supermarkets compared to 78% of all pork products (Davis et al., 2005). With such a large percentage of the meat consumed purchased in retail stores, it has become important to see what is sold and how it is sold.

### *Packaging*

A package, as Soroka (2008) describes, “is intended to contain, protect/preserve; aid in safe, efficient transport and distribution; and finally act to inform and motivate a purchase decision on the part of a consumer” (p. 148). In today’s meat industry, packaging is used widely for packaging of primals and sub primals at the processing plant and retail packages seen in stores. The meat industry has used a variety of packaging types in many different combinations (Reicks et al., 2008b). It is not uncommon for meat packaging to contain one or more packaging types for a single item. Primary packaging types are the packing forms that have direct and immediate contact with the product. Secondary packaging is packaging material that contains a primary packaging type. While rare, tertiary packaging types contain secondary packaging (Robertson, *Food Packaging: Principles and Practice Second Edition*, 2006). An example of this break down would be a netted ham inside of a shrink bag. In this case, the net would serve as the primary packaging type while the shrink bag would be a secondary packaging type.

### *Food Safety*

Food safety is a broad category covering physical, chemical, and biological hazards. Packaging assists in the prevention of physical contamination. Meat packaging’s most important quality is the ability to protect the cut from the external environment. It is

well known that contact from outside sources can lead to contamination, especially microbial and physical contamination. By providing a barrier between the meat and the outside environment, packaging can prevent unwanted and dangerous contamination.

New innovations regarding active packaging have allowed packaging types to address the chemical and biological hazards as well. Active packaging provides additional functions for the product it contains. These functions include adding additional chemicals and preservatives to extend shelf life, scavenge for carbon dioxide, provide antimicrobials, and others based on the situation (Vermeiren et al., 1999). Instead of the passive protection that simple layers provide, these types of packaging are not only able to prevent contamination, but actively control growth of microorganisms.

#### *Transportation*

Packaging's second job is safe and effective transport from the processor to the home or store. Meat packaging must be versatile due to the applications it is used for. Some packages must be able to withstand hard drops and abuse while others must provide a physical barrier while still providing the ability for atmospheric gasses to transfer through the film. These tasks, however, must be balanced with the cost, speed, and efficiency of packaging the product. This has led to innovations of new and unique packaging types to cater to the specifications each retailer and processor desire (Robertson, *Food Packaging: Principles and Practice Second Edition*, 2006).

#### *Types of Packaging*

The most common meat packing type is Polyvinyl Chloride Overwrap, or PVC Overwrap (Reicks et al., 2008b). Polyvinyl Chloride is a homopolymer, a single repeating monomer of vinyl chloride. Vinyl chloride consists of two singularly bonded carbons with one chlorine atom (Brooks, 2000). Introduced in the early 1960s, PVC overwrap

quickly became one of the most common packaging types for meat (Reh et al., 1994). PVC overwrap is an extremely high oxygen permeability film that can allow around 12,000 cc/ m<sup>2</sup>/ 24 hours/ atm at 23 degrees centigrade (Breidenstein, 1994). This permeability allows for meat in a PVC overwrap to retain a temporary oxymyoglobin color. However, due to this oxygen exposure, the shelf life of items wrapped in PVC are lowered. Compared with other packaging types, PVC Overwrap lasts on average 3-5 days (Breidenstein, 1994). Poly Vinyl Overwrap is also able to retain moisture inside the package at a high level (Breidenstein, 1994). PVC Overwrap is commonly used in conjunction with a Styrofoam tray of varying colors. The PVC is wrapped over the tray and heat sealed to the underside of the tray to create a sealed package.

Modified Atmosphere Packaging is another heavily used and researched packaging type for meat. Modified Atmosphere Packaging, or MAP, replaces the normal atmospheric gas with a predetermined amount of Nitrogen (N<sub>2</sub>), Oxygen (O<sub>2</sub>), Carbon Dioxide (CO<sub>2</sub>), and sometimes Carbon Monoxide (CO). MAP is commonly found in two varieties: High Oxygen and Low Oxygen. High O<sub>2</sub> MAP typically has a concentration of O<sub>2</sub> higher than 60% (Greibitus et al., 2013). This O<sub>2</sub> level provides ample oxygen for the MRA reaction and allows meat to retain its characteristic, fresh meat color.

However, Carbon dioxide levels are elevated to approximately 25% to stunt microbial growth. Perceivably, this allows for the best of both worlds: bright, cherry red color and increased shelf life. There is debate on how CO<sub>2</sub> achieves this microbial inhibition including theories pertaining to changes of the microbial membranes and pH changes on the surface of the meat and inside the cell (Farber, 1991).



CO is recognized as safe by the FDA for use in MAP packaging at .4% (Mercogliano, 2008). While this gas is present at the lowest volume, its impact in binding to myoglobin has shown the ability for meat to retain its fresh meat color and thus increase the consumer's perception of quality (Bredahl et al., 1998; Cornforth & Hunt, 2008). Consumer acceptance, however, is a two-edged sword. Once consumers were notified of the presence of Carbon monoxide, their perception of the product diminished (Grebitus et al., 2013).

Vacuum packaging in its most basic form is the removal of atmospheric air from a package before hermetically sealing it (Merriam Webster, n.d.). The removal of atmospheric oxygen prevents meat from progressing into a bright, cherry-red color. This lack of oxygen places meat in a perpetual state of deoxy myoglobin, yielding a purplish color. This purplish color has been shown to hurt the decision to purchase meat compared to the color indicative of oxymyoglobin (Carpenter et al., 2001). However, vacuum packaging allows for the shelf life to be greater than that of MAP and PVC Overwrap due to the decreased availability of O<sub>2</sub> (McMillin, 2017). There are many different types of vacuum packaging that are used in the meat industry. Traditional vacuum bags and shrink bags are the most common type of vacuum bag in the United States (Reicks et al., 2008b). Rollstock packaging is another form of vacuum packaging. The film is loaded into the machine and thermoformed to a variety of different plate sizes as it moves through the machine. Another roll of film is then laid over the top of the newly formed pouch and product, and hermetically sealed before being cut into individual packages.

Stretch and shrink films are most commonly found with chicken products and is more commonly referred to as SDS or SES packaging. According to Reicks et al., 63.9%

of all chicken products in 2004 were packaged in stretch shrink film. This film is used in combination with trays with the shrink film completely covering the product and is sealed on the underside of the tray.

BDF is similar to SSD/SES packaging and PVC Overwrap. BDF is a type of overwrap film that is typically found in turkey packaging. BDF, however, is a multi-layer film that keeps atmospheric air out of the package.

### *Meat Color*

Uneducated consumers at the meat case inaccurately associate the color of meat with its perceived quality leading to an extra hurdle for supermarkets and club stores across the country (Banović et al., 2012; Kropf, 1980). Consumers expect a fresh meat color such as a bright, cherry red color for beef (Klis, 1993). This has led to continued research in new and innovative packaging types. Meat color changes when the free binding sites of the heme iron myoglobin bind with compounds in the atmosphere. Molecules found in the air can bind to myoglobin and cause a change in the protein (Møller & Skibsted, 2006). The most common color change is associated with meat that has been exposed to O<sub>2</sub>. This oxygen permeability allows for myoglobin to be in the reduced, ferrous state, of oxymyoglobin. Oxymyoglobin is a fresh meat pigment known to consumers as the color freshness (Fox, 1966). This color is different by species based on the concentration of myoglobin content in the meat. High levels of myoglobin lend to a darker pigment like the pinkish-red color found in lamb down to the lower levels of myoglobin found in chicken yielding a whiter, fresh meat color (Møller & Skibsted, 2006)

### *Shelf Life*

The shelf life of meat depends on a variety of factors and conditions. Shelf life can be affected long before an animal is harvested. Environmental factors such as long-term stress caused by inclement weather and short-term stress from extended lairage to the abattoir can cause the animal to have an over or under abundance of glycogen in the muscle (Bowker et al., 2000; Newton & Gill, 1981). In the case of long-term stress there is little glycogen left in the muscle. Conversely, in short term stress, an overabundance of glycogen is within the muscle. This will cause problems due to the needed conversion of muscle to meat. When an animal is slaughtered, the glycogen is used in anerobic metabolism. This is important due to anaerobic metabolism's ability to convert glycogen into lactic acid (Bowker et al., 2000). When there is too little or too much glycogen in the body, it effects the final potential Hydrogen (pH) of the meat. Too much glycogen can result in a low pH causing the quality defect of Pale, Soft, and Exudative (PSE) while too little glycogen results in a higher pH possibly creating the quality defect Dark, Firm, Dry (DFD). pH is one of the main contributors to sustained shelf life. The farther the pH is from that of pure water (7.0) its ability to retard and inhibit antimicrobial spoilage increases. The end point of fresh meat should end around a pH of 5.6. PSE has a final pH of less than 5.2 and DFD has an ending pH of greater than 5.8 (Faucitano et al., 2010). The higher pH of dark cutting meat allows for increased microbial growth and a shorter shelf life. While in the abattoir, meat can be treated with acids and other interventions to decrease microbial growth (Newton & Gill, 1981). The application of acid and other interventions to the outside of the meat can reduce the microbial load on the meat increasing the shelf life.

Temperature also has significant impact on a product's shelf life. At lower

temperatures, many microorganisms experience slower growth. For peak shelf-life, fresh meat should be kept below 4 degrees Centigrade (*Are You Storing Food Safely? | FDA*, n.d.). This allows the product to remain unfrozen while still preventing logarithmic growth of the bacteria and other microbes.

Another key factor to manage while increasing the shelf life of a product is the availability of Oxygen. Oxygen plays two important roles in shelf life. The first is the requirement for some microorganisms to use Oxygen for growth. Microbes can use aerobic metabolism to increase in cell number. By depriving the meat, and the microbes on it, of O<sub>2</sub> it limits the ability of them to grow and reproduce. However, not all microbes are aerobic some can reproduce anaerobically. The advantages and risks must be managed to determine which packaging type is best for its application.

#### *Role of Packaging in Sales*

Dating back to the early 1960s, packaging has been referred to as “the silent salesman.” Packaging has been noted to be indistinguishable from the product it contains” (Pilditch, 1961). It is up to the retailer to know this and cater to their clientele. There have been noted differences, as indicated previously, on the impact of demographics on meat sales. However, consumer demographics also influence the packaging that is provided in the retail case. One of the largest differences seen in the number of stock keeping units (SKU) and the quantity of each SKU is in cook-in trays. Older demographics as well as working professionals have less time and inclination to cook and this has resulted in an increased number of easy, ready-to-cook meal alternatives. Many large supermarkets have begun to market their own line of these meal kits in response.

### *Color of Packaging*

Packaging color choices are important as they can influence buying decisions (L. M. Martinez et al., 2020). In the 2004 National Meat Case Study, seven different color options were reported for all species (Reicks et al., 2008b). There has been continuous research related to the impact on the color of packaging and the impact it has on consumer preference. Humans naturally associate different colors with different meanings. As meat is packaged, stores and suppliers should understand these implications. For example, white colored trays are the most common packaging color and white is often associated in the human mind with “clean,” “sanitary,” and “pure.” (Garaus & Halkias, 2019; Reicks et al., 2008b). There are also studies over the use of color as a brand endorsement. Certain companies have repeatedly used a different color package from competitors. Most recognized in the meat industry is Tyson Fresh Meats® use of yellow Styrofoam® for their chicken retail cuts. This has resulted in increased consumer recognition. By having a unique package, a consumer can then recognize that brand more easily (Garaus & Halkias, 2019, 2020).

### *Labeling of Meat*

The labeling of meat has also changed drastically over the last two and a half centuries. As legislation and consumers have changed, so has the labeling of meat. Labeling serves an important task in accurately communicating to the consumer what it is they are buying. In today’s retail case, meat must contain several important items: product name, inspection legend, establishment number, address, weight, and safe handling instructions. While obvious, the product name confers to the consumer what it is they are purchasing. FSIS has created “standards of identities” for many cuts that provides consumers a common name for a cut. If a standard does not exist, a descriptive

name may be used (AMSA, 2015). The inspection legend and establishment number indicate that the product was inspected by a USDA Food Safety Inspector for wholesomeness as well as the individual plant that it was produced. The address of the product is the location of the company that prepares the product. The weight of the product allows the consumer to determine the amount of product in the container due to meat often being sold on a non-fixed weight basis (Reicks et al., 2008b). Additionally, safe handling instructions should be on the package to ensure the consumer knows how to manage the product after purchasing. This includes cooking instructions for fresh product and instructions for after opening a fully cooked product. Occasionally, ingredient statements may be required on meat labels. Ingredient statements are required when there is more than one ingredient in the product itself. For example, sausages, marinated products, and cured products will have ingredient statements. (AMSA, 2015)

*Natural*

Currently, the FDA does not have an agreed upon formal description of “natural.” After numerous government agencies and petitions from companies, it was decided there were too many products with too many ingredients to have such a definition. However, the Food and Drug Administration has, since the Nutrition and Labeling Education Act, adopted an informal policy describing “natural” as “nothing artificial or synthetic (including colors regardless of source) is included in, nor has been added to the product that would not normally be expected to be there” (Food and Drug Administration, n.d.). In the case of meat, a general guideline exists for companies to base their company’s standards on. Artificial ingredients and colorings, extractions and heavily processed ingredients all disqualify a food item from being labeled as “natural” (Food and Drug Administration, 2015).

*Organic*

The 20<sup>th</sup> century held many scientific advancements in the commercialization of the food industry. Implementation of growth promoting implants in animals and the use of pesticides and herbicides began to be used more and more on a widespread basis. However, in 1962, *Silent Spring* by Rachel Carlson was published and concern for the environment increased. This book instigated what is now the idea of growing and raising plants and animals in a more organic way. Organic labeling was not controlled by the USDA until 1990. Each individual company had its own set of guidelines regarding the requirements for products to qualify as organic. But with the implementation of Organic Foods Production Act followed by the start of the National Organic Program in 2002, the USDA established specific criteria regarding the use of the term “Organic.” Accordingly, meat must follow the set guidelines found in the Code of Federal Regulations to be labeled as “Organic,” “100% Organic,” or “Made with Organic Ingredients.”

The benefit in producing organic meat is driven by the demand of the consumer. Generally, consumers who purchase organic meat do so for the perceived safety, health, and overall quality of the meat itself. These factors combined with the less efficient production factors have led to premium incentives for producers. According to Ellen et al. (2010), consumers are willing to pay a premium of 103.5% on chicken breasts labelled as organic. This indicates a willingness-to-pay by consumers based on the marketing shown on the package. In 2004, however, only 0.5% of all chicken was labelled organic (Reicks et al., 2008b). With increasing pressure from outside groups, the percentage of all species labeled as organic is expected to have increased.

*Antibiotic Free*

Antibiotics have been used extensively in animal agriculture since their first use in livestock in the early 20<sup>th</sup> century to treat illness. Later on, sub therapeutic antibiotics were used to treat illness early and to increase growth of the animal (Dibner & Richards, 2005). Because of the added benefit in growth promotion, farmers, ranchers, and veterinarians began to use antibiotics to increase feed to gain ratio in livestock animals. More and more commonly, bacteria arise with the ability to be resistant to the drugs that had previously been effective. These bacteria have mutated and have become more resistant as exposure to antimicrobials increased. This resistance became known as Antimicrobial Resistance (AMR). Today, AMR is credited with approximately 2.8 million cases and around 35,000 deaths in the United States alone (U.S. Department of Health and Human Services, 2019). The use of antimicrobial drugs with the sole intention to increase growth in livestock has been criticized by the World Health Organization and the Center for Disease Control and Prevention due to this increased usage and likelihood of increasing antimicrobial resistance. To address these usages, the 2015 Veterinary Feed Directive was signed mandating veterinarian approval before antibiotic use. By requiring veterinarians to sign on all antibiotic prescriptions, the hope was to limit the use of these antibiotics. Conversely, Cervantes et al. (2015) wrote it is unlikely antimicrobial resistance was due to overuse in livestock, but due to overuse in humans.

Producers and packers have begun to market their animals as “Raised without Antibiotics” or “No Antibiotics Administered” in attempt to address these concerns in the U.S. population. According to Smith et al., (2017), 55% of consumers chose meat that were labeled as having never received antibiotics. As another study revealed, this may be



due to perceived health benefits of antibiotic free meat. 63% of consumers believe that traditionally raised meat contains antibiotics in the meat (Newman et al., 2020).

Unbeknownst to some consumers, the U.S. Food and Drug Administration mandates withdrawal times for animals given antibiotics to prevent secondary exposure to the antibiotics.

### *Grass Fed*

For thousands of years, cattle and other species have been allowed to forage for feed by eating the native grasses and plant life grazing in the open fields. Not until the 1950's did that change. The United States heavily implemented the use of feedlots to feed a larger number of animals in a smaller space and in a shorter period. Using the excess grain and corn grown from developing technologies, cattle began to be fed a high Calorie diet. Cattle were able to grow faster due to the availability of quality feed. But, due to recent changes in consumer perception of grain fed meat, processors and retailers have begun to label pasture raised and finished meat as "Grass Fed." Many consumers believe grass fed meat is healthier and better for the environment compared to traditionally raised, grain finished livestock (Conner & Oppenheim, 2008). Recent research into the subject has shown this may not be the case. According to Clark and Tilman (2017), grass fed cattle require a greater area of land, produce more greenhouse gasses, and had similar environmental impacts. Moreover, it was noted educated consumers were willing to pay less of a premium for grass fed beef when compared to similar conventionally raised proteins (Xue et al., 2010).

### *Country of Origin labeling*

Consumers care about the quality and safety of the meat they consume. With the threat of bioterrorism, BSE, and food safety, lobbyists pushed for the implementation of

mandatory country of origin labeling to mitigate these panics (Loureiro & Umberger, 2007). Passed in the 2002 Farm Bill, it required sellers of agricultural commodities to disclose the country from which they came. COOL became mandatory in 2004 and served as a consumer interest point for the purchase of nationally grown meat and vegetables. Consumer interest and trust was so high in meat raised inside the United States, premiums of meat raised in the United States were calculated at 11% and 24% for beef steaks and ground beef, respectively (Umberger et al., 2003). Country of Origin Labeling lasted until December 2015 when Congress repealed COOL due to rulings from the World Trade Organization.

#### *National vs Store Brand*

National branding, as it sounds, refers to the sale of a product under a company's corporate name. These products can be found in most supermarket and club stores across the country and is often recognized by the consumer. Due to mark ups by the retailer, these nationally labeled products can often cost up to 25% more than store brand products (Hoch, 1996). Store branded products, or private labels, are typically produced by the same processor as the nationally branded product but are found only in the stores from which they are packaged. In 1996, it was noted that private label products amounted for about 15 percent of total sales in supermarket and club stores (Hoch, 1996). More recently, the 2004 National Meat Case Study indicated private label meat products made up about 12 percent of the meat case (Reicks et al., 2008b).

#### *Quality Grade*

In 1926, the United States began grading beef based on the degree of marbling found in longissimus dorsi muscle in between the 12<sup>th</sup> and 13<sup>th</sup> rib. Besides marbling, quality grade is also based on the skeletal and lean maturity, and more recently dentition.

These maturities are necessary to categorize carcasses because the chronological age of the animal has a negative effect on the tenderness of meat (Huff & Parrish, 1993). This maturity is broken down into five categories: A, B, C, D, E. Due to collagen cross linkage, the older an animal becomes, the tougher the meat it will produce. A and B maturity carcasses qualify for USDA Prime and Choice, but only A maturity carcasses qualify for USDA Select (Huff & Parrish, 1993). Quality grading has given the consumer the ability to detect and select the product that best fits their appetite and their budget (Lyford et al., 2010). By breaking down beef cuts into these categories, it enables processors and producers to be rewarded for higher quality products and the consumers the ability to choose. No Roll carcasses, carcasses that do not qualify for A maturity and B maturity or have too low of a marbling score, will most commonly be found in trim and in lower quality applications (Meadows, 2019). Based on the research from Lucherk and others, (2016), USDA Prime and Choice was rated as higher by untrained consumers for overall liking than USDA Select. This is most likely due to the increased fat found in the marbling of the Longissimus lumborum. Interestingly, USDA Standard beef rated similar in juiciness, tenderness, flavor, and overall liking compared to USDA Select at three different cookeries (Lucherk et al., 2016).

#### *Value Added*

Value added meat is a large group of meat products that have in some way been changed or altered to increase the value of the product at the meat case. Commonly, processed meat would be the best-known value-added meat. However, in Reicks and others (2008), value added meat was separated from processed meat by limiting it to meat that was marinated, seasoned, enhanced, stuffed, or wrapped. Examples such as seasoned pork chops, bacon wrapped filet mignon, and others would all be classified as value

added. Processed meats referred to the curing, smoking, and otherwise complete change in the identity of a product. Sausages, bacon, ham slices, and hot dogs would all be classified as processed meat (Reicks et al., 2008b). Adding value to lower demanded cuts, processors can gain value in otherwise low value cuts.

### *Case Ready*

Centralized packaging, or case ready meat, is the trimming, portioning, and packaging of a meat product before it leaves the abattoir or steak cutter (Scholtz et al., 1992). There are many benefits of implementing a case ready system. For retailers, centralized packaging provides the ability for less staff behind the meat counter as fabrication and packaging have already been done. This saves retailers the cost of training new employees and the cost of maintaining a more experienced workforce. Food safety is another benefit to case ready meat. By limiting the times the product is handled and doing so in an USDA inspected facility provides an extra layer of protection for the consumer (Scholtz et al., 1992). Because these products are all done under the inspection of the Food Safety Inspection Service, they bear the inspection legend and establishment number of the packing plant. Additionally, there is also the added benefit of a more cost-efficient means of production. By packaging the product prior to it leaving the processing facility, there is the added cost savings in packaging, refrigeration, and travel (Jeyamkondan et al., 2000). The meat is already packaged in its final container preventing the waste of packaging the primal or subprimal for transit to the retail store. Additionally, because the meat is trimmed prior to shipment to the store, it saves the supermarket or club store the cost of chilling the waste product of the primals and subprimals. Travel is another added benefit of case ready meat. The weight of the

trimmings are left at the processing facility saving the store money on unneeded freight cost such as bones and fat (Jeyamkondan et al., 2000).

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## **CHAPTER II**

### **NATIONAL MEAT CASE STUDY 2015 AND 2018: PRODUCT LABELING, BRANDING, AND PACKAGING BY SPECIES**

#### **ABSTRACT**

National Meat Case Studies have been conducted every few years to determine frequency of packaging types, tray type, and tray color as well as the marketing tools used to sell product in the retail case. The 2015 meat case audit spanned 108 supermarket and club stores in 25 states and the 2018 meat case study covered 150 stores in 31 states. Frequency means were broken by species for chicken, beef, pork, ground beef, lamb, veal, and in 2018, seafood. Poly-vinyl chloride was the most used packaging type in both years making up 43.4% and 42.8% of the meat case. Laminate packaging including rollstock, blister packs and saddle packs are the second most popular packaging type at 16.9% and 17% in 2015 and 2018. Meat in tray-less packaging has increased to 29.5% of all stock keeping units (SKUs) in 2018. As expected, foam was the most popular tray type in the United States at 63%. The frequency of white trays in the meat case has fluctuated around 32% since 2007, but black trays have decreased to 19% of the meat case about 9% lower than 2007. The marketing of products as organic has increased from less than 1% since 2007 to 4.4% of SKUs in 2018. Natural labeling has been increasing as well with roughly 33% of the United States meat cases labeled as natural in 2015 and 2018 compared to 20% in 2007. Case ready meat has increased drastically by 9.7% from 2010 to 2018 to a total of 70.5%.

## **INTRODUCTION**

National Meat Case Studies have provided the industry with accurate and up-to-date information about trends in the United States retail meat case since 2002. According to Cryovac (2003), the National Meat Case Study provides the most in-depth look of the retail case compared to other completed surveys. Other surveys, such as the National Beef Tenderness Survey, National Consumer Retail Beef Study and National Beef Market Basket Survey, have provided details on tenderness, price, flavor, and leanness of beef cuts (Savell et al., 1989; Savell et al., 1991; Martinez et al., 2017). The 2002 and 2004 National Meat Case Studies were expanded upon these beef-based surveys by sampling the entire fresh meat case, including all species. By collecting information on branding, packaging type, species popularity, and quality grade, the National Meat Case Studies have provided a detailed understanding of incremental changes in consumer buying habits and retailer responses in the meat case over the last 17 years. In this study, results from the 2015 and 2018 Meat Case Study were independently compared across species for differences. Additionally, because no recent study has been published, the case studies from 2015 and 2018 were compared to those of the 2004, 2007 and 2010 studies to demonstrate changes and trends in the meat retailing sector.

## **MATERIALS AND METHODS**

### *Store Selection*

In 2015, 108 stores in 25 states and in 2018, 150 stores in 31 states were audited. All stores were selected from metropolitan areas representing the largest consumer populations in the United States. Stores were repeated in both 2015 and 2018 when possible. National management of retail stores were notified prior to audit, but individual stores were evaluated unaware to ensure current market conditions. Both studies were

conducted between January and April to avoid seasonal and holiday variations in the meat case.

#### *Auditor Training*

Before each study, auditors consisting of undergraduate and graduate students were trained by staff from Cryovac, Inc. at Texas Tech University. Auditors learned to identify different packaging and labeling characteristics as well as measure the length of the meat case. Product information was collected only from packages in the self-service case. Stock keeping units (SKU) were evaluated for product name, species, quality grade, brand name, unit count, fixed weight, value added, case ready, primary package type, secondary package type, tray type, tray color, bone-in, natural, and organic marketing. In 2018, grass-fed and antibiotic free labeling was also recorded. Species identified in the study were beef, ground beef, pork, chicken, lamb, turkey, veal, other, and in 2018, seafood. Quality grade was recorded based on the marketed quality grade of the product. A product was determined to be case ready if the United States Department of Agriculture (USDA) inspection legend was present on the package. Any claims of “natural,” “organic,” “antibiotic-free,” and “grass-fed” were recorded. Bone-in product, even if labeled “semi-boneless,” was documented. Products were to be considered value added if the product was raw and the product was changed to add value to an item. Store branded SKUs, items containing the name or brand of the audited store, were differentiated from nationally found brands and noted.

#### *Identification of Packaging*

Packaging types were recorded in the store and were categorized into 9 groups with laminates broken into 6 sub-groups during analysis. Moreover, primary packaging types and secondary packaging types were evaluated separately, if present. Primary

packaging types were identified as the packaging closest to the product with the secondary packaging covering the outside. Packaging types were poly vinyl chloride overwrap (PVC), modified atmosphere packaging (MAP), stretch and shrink overwrap film (SS), BDF, chub, vertical pouch packaging, vacuum skin packaging, and other. Poly-vinyl chloride wrap was identified by close contact with the product as well as a non-sealed bottom. This was distinguished from Stretch and Shrink film and BDF packaging as both are sealed down the center of the bottom of the packaging. BDF was recognized by a larger, beaded seal compared to stretch and shrink film as well as the known knowledge BDF is most commonly used in Turkey products (Cryovac, 2018). Modified atmosphere packaging was identified by the air gap found between the plastic film and the product. Chubs were classified as a plastic package tube with metal clips on both ends. Vertical pouch packaging was identified by the presence of machine seals on both ends compared to the metal clip found commonly on poly bag packaging (Cryovac, 2018). Rollstock and saddle pack packaging were separated by the number of thermoformed pockets. Rollstock packaging has one product pouch compared to saddle packs with two or more pouches for product. In vacuum skin packaging, the thinner, top layer is completely formed to the product and package, leaving no gaps or wrinkles in the package (Cryovac, 2018). Blister pack packaging is a hard plastic shell package. Ovenable films were recognized by packaging cues including “oven ready,” “ovenable,” and “cook in bag.” Lastly, shrink bags were recognized by a shape-adhering vacuum package where the sealed edge had been heated under hot water.

### *Statistical Analysis*

Data were analyzed using R statistical software, version 4.0.2 (R Core Team, 2021) using `prop.test` from base R. SKU was the experimental unit with variables

compared across species using a Chi-square 8- sample test for the 2018 Meat Case Study and a Chi-square 7-sample test for the 2015 Meat Case Study. Chi-square tests were performed for equality of proportions without continuity correction with a significance of  $P < 0.05$ . Data are presented by proportion of SKU with a sample size of 14,998 for 2015 and 23,034 in 2018. National average was included for numerical comparison only.

## **RESULTS AND DISCUSSION**

### *2015 National Meat Case Study*

The 2015 National Meat Case study revealed PVC overwrap was the most prevalent (43.4%) packaging type across the country (Table 2). The majority (72.3%) of beef found in the U.S. self-service meat case was packaged with PVC overwrap, the most ( $P < 0.01$ ) of any species. Turkey was packaged in PVC overwrap the least ( $P < 0.01$ ) at 4.4%. Stretch and shrink film accounted for 15.6% of the retail case with chicken being packaged in SS the most (58.7%;  $P < 0.01$ ) compared to any other species. Modified atmosphere packaging was used in turkey (38.2%) and veal (36.6%) the most ( $P < 0.01$ ) compared to the least used species of beef (4.3%) and pork (3.9%). Veal and turkey do not have as large of a consumer base leading to speculation that the use of MAP in these species could increase shelf life for these products and decrease retail waste. Turkey used BDF packaging more ( $P < 0.01$ ) than any other species at 19.2%. As is expected, chubs made up the highest percentage of ground beef (21.5%) more than any other ( $P < 0.01$ ). Vacuum skin packaging was most ( $P < 0.01$ ) popular in lamb (11.7%) and veal (5.5%) compared to all other species. Shrink and vacuum bags were used most ( $P < 0.01$ ) in lamb (25.9%) followed by pork at 18.1%. Veal and pork were the most ( $P < 0.01$ ) likely to found packaged in laminate packaging. Breaking down laminates, rollstock packaging was the most popular laminate package nationally (14.7%). Rollstock was most ( $P <$

0.01) popular in veal (31%) and pork (21.6%) and least ( $P < 0.01$ ) popular in ground beef (11.8%), turkey (10.2%), and chicken (8.3%). Turkey and chicken at 3.1% and 2.9% respectively, were the most popularly packaged products in a poly bag.

Stock keeping units found in the 2015 retail case were packaged in only primary packaging 95.7% of the time (Table 3). Beef was packaged in a primary package by itself in 99.4% of SKUs and was different ( $P < 0.01$ ) than pork (98.6%), lamb (93.5%), and turkey (75.8%). Veal did not possess SKUs with secondary packaging. Turkey was packaged more frequently ( $P < 0.01$ ) in a secondary package than any other with cardboard sleeve making up 20.9% of turkey's secondary packaging. One thought on the high presence of cardboard sleeves in turkey, which can be assumed to be covering MAP ground turkey products, is the ability to protect the product from prolonged photo-oxidation in the retail case. Lamb and turkey packaged in a net was present at 4.7% and 2.1%, respectively. Net wrapping for lamb and turkey were different ( $P < 0.01$ ) than net wrappings of beef, ground beef, chicken, and pork. Poly bags used as a secondary packaging were found most in chicken at 1.7% and was more popular ( $P < 0.01$ ) than poly bag packaging in beef, ground beef, pork, and turkey. Secondary reclose packaging shows a prevalence of 0.8% in packaged chicken product different ( $P < 0.01$ ) from beef, ground beef, pork, and turkey.

Of the 14,998 SKUs represented in the 2015 National Meat Case Study, 63% were packaged on a foam tray (Table 4). Beef and chicken trayed on foam were the most popular ( $P < 0.01$ ) compared to the other species. Lamb possessed the lowest percentage (33.2%) of SKUs packaged on a foam tray and was different ( $P < 0.01$ ) from all species except veal (42.1%). Turkey was stored on rigid plastic trays the most at 25.1% and was



different ( $P < 0.01$ ) from all species except veal at 20.7%. However, rigid plastic made up only 7.6% of the fresh meat case. Pork was packed on rigid plastic the least (3.6%) ( $P < 0.01$ ) compared to all species besides beef (4.4%). SKUs not packaged on a tray made up 28.9% of the retail case with lamb packaged the most ( $P < 0.01$ ) without a tray at 57.7%. Pork, veal, and ground beef without a tray were different ( $P < 0.01$ ) from beef and chicken.

White was the most ( $P < 0.01$ ) popular tray color with the study showing 34.4% of the United States meat case being packaged on white trays (Table 5). Turkey's SKUs are packaged on white trays the most ( $P < 0.01$ ) at 71.2% of the time. Veal (42.1%) and beef (38.5%) follow being greater than the rest of the species. White is the most predominant tray color for these three species. Black was the second most popular tray color found on 19.4% of SKUs across the country. Whole muscle beef and ground beef were packaged on black trays the most ( $P < 0.01$ ) compared to the other species at 34.0% and 31.3%. Chicken and turkey were packed on black trays the least ( $P < 0.01$ ) at 3.9% and 4.2% each. The third most used tray color was yellow at 9.8% nationally with chicken packaged on yellow trays making up 37.2% of all chicken SKUs. Yellow trayed chicken SKUs were different ( $P < 0.01$ ) from all other species. Clear trays were used in ground beef the most ( $P < 0.01$ ) at 6.9%. Chicken led in SKUs packaged on green trays with 2.3% of chicken SKUs packaged on green trays, more ( $P < 0.01$ ) than all species except veal. Except for veal (2.8%), pink trays were found to be more ( $P < 0.01$ ) common in pork (10.0%) than remaining species. Lamb packaged on a tan tray (6.3%) was found to be different ( $P < 0.01$ ) from beef, ground beef, chicken, pork, and turkey.

Marketing claims recorded for the 2015 meat case study can be found in Table 6. Naturally labeled products were nationally recorded to be at 32.5% during the 2015 study. Chicken was labeled natural the most ( $P < 0.01$ ) at 62.6% of the time. Lamb, turkey, and veal were all marketed as natural more ( $P < 0.01$ ) than ground beef, pork, and beef. Beef was labeled as natural the least ( $P < 0.01$ ) at only 10.5% of the time. Chicken led again in marketing of organic. Chicken was sold as organic 7.8% of the time over double the national average at 3.4% of all species combined. Organic chicken was different ( $P < 0.01$ ) from all other species. Interestingly, turkey was marketed as organic only 1.7% of the time, only more ( $P < 0.01$ ) than pork. Value added meat was found to be consist of 8.9% of the nation's SKUs with value added pork SKUs making up 19.0% of all pork SKUs. Value added pork was found to be the most popular ( $P < 0.01$ ) compared to all other species. Outside of veal, lamb was value added (0.9%) the least ( $P < 0.01$ ) compared to all other species. Store branding within meat products was the most popular ( $P < 0.01$ ) with 55.9% of the fresh meat case labeled privately. Beef was the least ( $P < 0.01$ ) nationally labelled product at 15.1%. Inversely, Turkey was the most ( $P < 0.01$ ) nationally labeled species at 78.9%. Turkey was the most ( $P < 0.01$ ) case ready species at 97.2%. Chicken was second at 93.0% and was different ( $P < 0.01$ ) from the remaining species. Beef, as expected, was the least ( $P < 0.01$ ) case ready species with only 36.0% of all beef SKUs portioned and packaged away from the meat counter. Breaking down beef even farther, of the 3,329 SKUs packaged in PVC wrap, 392 were also recorded as case ready. Conversely, 91% of ground beef products packaged at the retail case included a lean point percentage (Table 7). This could indicate a majority of retail packaged ground beef is being repackaged in store. Boneless SKUs made up 74.5% of the self-service meat

case. Beef (85.9%) and turkey (85.2%) were the most ( $P < 0.01$ ) boneless whole muscle cuts. Lamb was found to be bone in 63.1% of products, more ( $P < 0.01$ ) than any other. Packages with a net weight statement made up 75.6% of the meat case. Beef is labeled with a net weight statement most ( $P < 0.01$ ) at 93.9% followed by lamb at 89.3%. Fixed weight packaging was found the most ( $P < 0.01$ ) in turkey as 74.3% of turkey SKUs use a fixed weight statement. Ground beef was the second most ( $P < 0.01$ ) popularly labeled fixed weight product at 60.1%. Products labeled in ounces made up only 11.4% of the retail case nationally. Turkey was labeled in ounces (31.0%) more ( $P < 0.01$ ) than any other. At 95.1%, beef was labeled in pounds more ( $P < 0.01$ ) than any other besides veal (93.1%).

Quality grades were present on 63.5% of all whole muscle beef products. Products labeled as USDA Choice were the most ( $P < 0.01$ ) popular and were found on 60% of all beef labels (Table 8). Prime was the least ( $P < 0.01$ ) marketed quality grade found on only 1% of self-service beef products. Beef products not labeled with a quality grade could indicate a lack premiums associated with USDA Select beef. Instead of labeling beef as USDA Select, retailers are simply not labeling the product with a quality grade. Additionally, non-labelled beef may be composed of lower quality muscles and cuts from older maturity carcasses.

#### *Results- 2018 National Meat Case Study*

Like 2015, the 2018 National Meat Case Study showed PVC as the most popular packaging type nationally (42.8%; Table 9). Beef was predominately packaged (68.8%) in PVC ( $P < 0.01$ ) the most compared to other PVC overwrapped species. Ground beef, pork, and seafood each were packaged heavily in PVC overwrap at 50.8%, 52.7%, and

48.8%, respectively. Additionally, turkey products were packaged in PVC overwrap packaging the least (6.2%;  $P < 0.01$ ). Rollstock packaging was the second most common packaging type found in 2018 at 14.0%. Sub-packaging types of rollstock packaging were also recorded. 380 SKUs were identified having been packaged in easier opening (“EZ Open”) rollstock packaging. This innovation indicates retail’s acknowledgement of one of rollstock’s biggest problems: opening the pouch. Stretch and shrink film, as expected, was found heaviest in chicken products ( $P < 0.01$ ) (47.5%). Moreover, stretch and shrink film made up 10% of the packaging of turkey greater than all remaining species ( $P < 0.01$ ). Modified Atmospheric Packaging was found to be used most ( $P < 0.01$ ) in the packaging of veal and veal products at 63.2% followed by turkey at 42.2% ( $P < 0.01$ ) compared to all other noted species. Nationally, MAP made up only 9.9% of the United States fresh, self-service meat case. Turkey was the prevailing species in BDF packaging at 11.7% ( $P < 0.01$ ). Chubs appeared in the meat case most commonly as the packaging type for ground beef ( $P < 0.01$ ) at 18.4% followed by turkey at 11.0%.

Shrink bags made up 7.0% of the self-service meat case and was the main packaging type for lamb ( $P < 0.01$ ). Vacuum skin packaging was found in seafood at the highest percentage at 32.7% ( $P < 0.01$ ) followed by lamb at 18.9%. Vertical pouch packaging was only recorded in chicken and seafood with VSP making up 4.6% of seafood’s packaging types. Laminates, nationally, make up 17% of the of all packaging types in 2018. Seafood is packaged less ( $P < 0.01$ ) in laminates than any other recorded species. Separately, saddle packs were mostly found in chicken ( $P < 0.01$ ), but only made up 2.4% of the variety of saddle pack packaging found in chicken. Secondary packaging types and the frequency they occur in each species (Table 10). Stock keeping units did

not possess a secondary packaging type in 95.7% of instances. Turkey had the highest percentage of secondary packaging at 24.2% with cardboard sleeve representing 20.9% of the total.

As expected with popularity of PVC overwrap and Stretch and Shrink film, foam was found the most in the meat case at 57.9% (Table 11). Chicken and beef used foam trays the most ( $P < 0.01$ ) followed by pork and ground beef. Veal and lamb, however, had the lowest ( $P < 0.01$ ) usage of foam trays of any of the species. Rigid plastic trays, used in conjunction with modified atmosphere packaging made up 11.5% of the meat case average. Veal used rigid plastic as its preferred tray type the most ( $P < 0.01$ ) compared to any other species. Inversely, beef and pork used rigid plastic the least ( $P < 0.01$ ). Packaging types containing no trays made up 29.5% of the case. 55.2% of lamb was packaged in tray-less packaging, more ( $P < 0.01$ ) than any other. Pork was packaged without a tray 40.0% of the time more than all species besides lamb.

Out of 23,034 SKUs recorded across all eight species, the most widely used tray color was white at 29.5% (Table 12). Turkey and Veal had the highest proportion ( $P < 0.01$ ) of white trays over any other species while lamb (14.6%) was trayed the least ( $P < 0.01$ ) on the color white. Whole muscle beef and ground beef products were packaged on black trays more often ( $P < 0.01$ ) than any other species. At 4%, chicken was packaged on black trays the least ( $P < 0.01$ ). Seafood was packaged significantly more ( $P < 0.01$ ) on blue trays than any other species. Yellow trays were found with chicken (29.5%) more often ( $P < 0.01$ ) than pork (7.9%). Pork was packaged in yellow packaging the second most ( $P < 0.01$ ) compared to all other species. Moreover, pork was commonly packaged

in a pink tray more ( $P < 0.01$ ) than any other species. All other tray colors combined made up 6.5% of the variation in tray color in the US meat case.

Natural labels were found on the 33.1% of SKUs and was most predominately found in Veal (64.0%) and Lamb (59.7%) compared to all other species ( $P < 0.01$ ) according to Table 11. Beef was labelled as natural 12.1% of the time, but seafood was labelled as natural the least (3.1%;  $P < 0.01$ ). 18.8% of the fresh meat case was value-added. The most value-added cut was pork at 34.2% ( $P < 0.01$ ), but was followed by ground beef, turkey, and seafood. The most labelled organic species was chicken (11.1%;  $P < 0.01$ ) and across all regions organic made up of 4.4% of all SKUs recorded. For grass-fed labelling, lamb was labelled (17.9%) the most ( $P < 0.01$ ) compared to all other species. Grass fed Ground beef was the second most ( $P < 0.01$ ) commonly labelled grass-fed species. These popular grass-fed species could indicate possible imported product. Australia and New Zealand feed and export approximately \$3 billion of beef every year to the United States, the majority of which is grass fed product (*Australia / United States Trade Representative, 2019; New Zealand / United States Trade Representative, 2019*). These grass-fed SKUs might be contributing to the grass fed product found in the retail case.

Case ready meat made up 70.5% of the US self-service meat case and the most ( $P < 0.01$ ) common case ready species was turkey (96.7%) followed by chicken (92.4%). The least ( $P < 0.01$ ) case ready species was whole muscle beef at 45.2%. Moreover, 886 PVC wrap beef SKUs were recorded as case ready out of 4,279 PVC wrapped beef SKUs. These case ready PVC wrap beef SKUs mean 20.7% of PVC wrapped beef SKUs are packaged in a centralized packaging facility in a mother bag before being shipped to

retail stores. Additionally, store packaged ground beef was found with a labeled lean point percentage 86% of the time indicating a high number of PVC wrapped ground beef products are being repackaged in the store (Table 15). Nationally branded meat products made up 34.5% of the self-service meat case. Turkey is nationally branded more ( $P < 0.01$ ) than any other at 75.3%. Whole muscle beef products and lamb are found to be store branded at a higher percentage ( $P < 0.01$ ) than any other species. Family size products were most ( $P < 0.01$ ) commonly found in chicken (20.0%). Bone- in cuts were most ( $P < 0.01$ ) commonly found in lamb (62.9%) and bone in SKUs make up 33.1 percent of the meat case. The majority (89.6%) of meat products in the United States meat case is sold on a per pound basis. Beef and lamb are marketed the most ( $P < 0.01$ ) on a per pound basis while seafood (100%) is most ( $P < 0.01$ ) commonly marketed on a per ounce basis. Additionally, 75.6% of the fresh meat case was marketed on a net weight basis. Beef was sold on a net weight basis the most (93.9%;  $P < 0.01$ ) followed by lamb (89.3%) and then chicken (83.4%).

39.4% of beef found in the self-service meat case was not marketed with a quality grade (Table 16). USDA Choice was found on 57.2% of all beef packaging, the most ( $P < 0.01$ ) compared to all others. USDA Prime and Select labeled stock keeping units were similar ( $P < 0.01$ ) as they were found at approximately 2% each.

#### *Comparison Across Years*

Like in Reicks et al. (2008), PVC wrap was the most popular packaging type in the meat case nationally. Figure 4 illustrates the change in SKU number for some of the most common package types found across all years. Poly-vinyl chloride has seen a slight decrease in usage dropping 4% since 2010. Modified atmosphere packaging, especially

high oxygen MAP, has been associated with an increased rate of oxidative rancidity due to increased exposure to Oxygen (McMillin, 2008). According to previous meat case studies, MAP was found at the highest percentage (13.7%) in 2007 and has decreased to 9.9% in 2018. The species that has changed the most in usage of MAP is ground beef. Reicks et al. (2008) states 33.2% of ground beef was packaged in a modified atmosphere package compared to just 13.4% in 2018.

Stretch and shrink film packaging has decreased from 20% since the 2004 case study to 11.8% in 2018 (Reicks et al., 2008). Chub in the 2007 and 2010 meat case studies indicated chubs made up approximately 1.8% of the U.S. meat case SKUs compared to 2004 and 2015 case studies that indicated chub packaging made up over 3% of the fresh, self-service meat case (Reicks et al., 2008). Laminate packaging has been the largest growth area of the monitored packaging types. In 2004, laminates were estimated to be 6.8% of all SKUs. Most recent data in 2018 a growth of 8.8% to 15.6% of the U.S. meat case.

Foam has seen a large numerical drop in usage since the 2002 case study. Reicks et al. (2008) noticed a trend in the declining use of foam trays. This trend has continued to foam trays making up only 57% of packaging in 2018. This can be attributed to several different reasons including an increase in centralized packaging and an increase in laminate packaging in the most recent meat case audits (Reicks et al., 2008). The popularity of rigid plastic trays increased between 2004 and 2007 to 15.8% but has since decreased in 2015 and 2018. Modified atmosphere packaging's decrease could explain the decrease in rigid plastic trays as rigid plastic trays are commonly used for MAP.



Packaging types not including a tray spiked between 2010 and 2018 increasing 7.5% in that span as expected with the increase in popularity of laminate packaging.

Tray color is one of the first things consumers base their decisions on and as such can impact consumer purchasing habits and brand (Ahmed Javed & Javed, 2015; Garaus & Halkias, 2019, 2020). Black tray usage has been declining since 2004. The 2007 and 2010 meat case studies indicated black trays made up approximately 27% of the fresh meat case and decreased to 19.2% in 2018. Yellow colored trays have also declined 10% over the last five case audits. Packaging on blue trays has increased slowly over the same time from 0.4% in 2007 to 1.3% in 2018.

Case ready, or centralized packaging, has been a growing segment of the meat industry for the past 20 years. In the 16 years between collections, case ready packaging has increased from 60.2% up to 70.5% in 2018 (Reicks et al., 2008b). This increase in case ready product is in response to increased packaging and labor costs at the retail level. Case ready packaging increases efficiency and resultingly decreases cost (Jeyamkondan et al., 2000).

Organically labelled meat is another growing marketing tool in the meat case. Meat branded as organic has increased steadily over the past two decades in response. From 2004, meat branded as organic has increased from less than 0.5% to 4.4% in 2018. Natural had not increased its reach over the retail case until the years between 2010 and 2015 and saw a near 10% increase in marketing of meat labelled as natural. The 2010 meat case study saw meat products marketed as natural 22.8% of the time and increase to 33.1% in 2018.

## **CONCLUSION**

Poly-vinyl chloride wrap has been and is the most popular packaging type in the country, but laminate packaging types, especially rollstock, have shown major growth (15.7%; 14.0%). Retailers have not adopted the use of secondary packaging in significance in any species except turkey. Packaging without trays has been increasing as popularity of shrink bags and laminate packaging types have increased. The majority of the meat case (70.5%) is no longer made in the meat case, rather in processing plants as case ready meat. Case ready beef has increased 10% between 2015 and 2018. Retailers have increased the use of marketing claims for niche products such as natural, organic, grass-fed, and antibiotic free to cater to consumers who are more concerned on how their food was raised, handled, and harvested. Further auditing of the U.S. meat case will be important to continue understanding the consumer and their habits as it changes in the future.

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**Table 1.** Frequency of species SKUs (N=14,998) in the U.S. self-service meat case in 2015.

	Species							
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Veal	National
SKU Count	4,627	1,757	3,386	3,434	428	1,221	145	14,998

**Table 2.** Frequency of retail packages (N=14,998) by packaging type for each species in the U.S. self-service meat case in 2015

Packaging Type	Species							SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Veal			
PVC	72.3 <sup>a</sup>	48.2 <sup>b</sup>	10.4 <sup>d</sup>	51.3 <sup>b</sup>	27.8 <sup>c</sup>	4.4 <sup>e</sup>	26.2 <sup>c</sup>	3.65	<0.01	43.4
MAP	4.3 <sup>d</sup>	16.5 <sup>b</sup>	6.3 <sup>c</sup>	3.9 <sup>d</sup>	14.3 <sup>b</sup>	38.2 <sup>a</sup>	36.6 <sup>a</sup>	4.00	<0.01	9.5
SS	0.9 <sup>d</sup>	1.2 <sup>d</sup>	58.7 <sup>a</sup>	3.0 <sup>e</sup>	0.2 <sup>d</sup>	14.8 <sup>b</sup>	--	1.02	<0.01	15.6
BDF	--	--	0.4 <sup>b</sup>	--	--	19.2 <sup>a</sup>	--	1.13	<0.01	1.7
Chub	--	21.5 <sup>a</sup>	0.1 <sup>cd</sup>	0.2 <sup>c</sup>	--	7.9 <sup>b</sup>	--	0.98	<0.01	3.2
Vertical Pouch	--	--	0.9 <sup>a</sup>	--	--	0.1 <sup>b</sup>	--	0.16	<0.01	0.2
Vacuum Skin	0.1 <sup>c</sup>	0.1 <sup>bc</sup>	0.7 <sup>b</sup>	0.1 <sup>c</sup>	11.7 <sup>a</sup>	0.2 <sup>bc</sup>	5.5 <sup>a</sup>	1.90	<0.01	0.6
Shrink Bag	5.1 <sup>d</sup>	--	6.5 <sup>c</sup>	18.1 <sup>b</sup>	25.9 <sup>a</sup>	1.5 <sup>e</sup>	--	2.12	<0.01	8.1
Poly Bag	0.0 <sup>b</sup>	0.1 <sup>b</sup>	3.1 <sup>a</sup>	0.2 <sup>b</sup>	--	2.9 <sup>a</sup>	--	0.48	<0.01	1.0
Other	0.3 <sup>c</sup>	0.1 <sup>c</sup>	2.0 <sup>a</sup>	0.7 <sup>bc</sup>	1.9 <sup>ab</sup>	0.2 <sup>c</sup>	0.7 <sup>abc</sup>	0.69	<0.01	0.8
Laminates	16.9 <sup>c</sup>	12.4 <sup>e</sup>	10.9 <sup>de</sup>	22.6 <sup>ab</sup>	18.2 <sup>bcd</sup>	10.6 <sup>de</sup>	31.0 <sup>a</sup>	3.84	<0.01	15.9
<i>Rollstock</i>	15.8 <sup>c</sup>	11.8 <sup>d</sup>	8.3 <sup>e</sup>	21.6 <sup>ab</sup>	18.2 <sup>bc</sup>	10.2 <sup>de</sup>	31.0 <sup>a</sup>	3.84	<0.01	14.7
<i>Blister Pack</i>	0.8 <sup>a</sup>	--	--	--	--	--	--	0.13	<0.01	0.2
<i>Saddle Pack</i>	0.3 <sup>b</sup>	0.6 <sup>b</sup>	2.2 <sup>a</sup>	0.7 <sup>b</sup>	--	0.4 <sup>b</sup>	--	0.25	<0.01	0.9
<i>Ovenable Bag</i>	--	--	0.4 <sup>a</sup>	0.1 <sup>ab</sup>	--	--	--	0.11	<0.01	0.1

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

PVC- poly-vinyl chloride; MAP- modified atmosphere packaging; SS- stretch and shrink films; BDF- Cryovac BDF; Vacuum Skin- vacuum sealed tray; Vertical Pouch- flexible, multilayer laminate; Laminates- flexible films; Shrink bag- vacuum system with only bag; Chub- flexible plastic with metal clips; Poly Bag- polyvinyl bag with no vacuum; Rollstock- thermoformed vacuum system with 1 pouch; Saddle Pack- thermoformed vacuum system with multiple pouches; Blister Pack- hard plastic shell with vacuum; Ovenable Bag- cooking safe packaging

**Table 3.** Frequency of retail packages (N=14,998) by secondary packaging type for each species in the U.S. retail meat case in 2015.

Packaging Type	Species							SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Veal			
None	99.4 <sup>a</sup>	99.3 <sup>ab</sup>	93.1 <sup>c</sup>	98.6 <sup>b</sup>	93.5 <sup>c</sup>	75.8 <sup>d</sup>	100.0 <sup>ab</sup>	1.23	<0.01	95.7
Cardboard Sleeve	0.0 <sup>d</sup>	0.7 <sup>bc</sup>	1.2 <sup>b</sup>	0.2 <sup>cd</sup>	--	20.9 <sup>a</sup>	--	1.16	<0.01	2.1
PVC Wrap	0.3 <sup>ab</sup>	--	0.8 <sup>a</sup>	0.6 <sup>ab</sup>	--	0.4 <sup>ab</sup>	--	0.18	<0.01	0.4
Net	0.2 <sup>b</sup>	--	0.1 <sup>b</sup>	0.3 <sup>b</sup>	4.7 <sup>a</sup>	2.1 <sup>a</sup>	--	1.02	<0.01	0.4
Poly Bag	--	--	1.7 <sup>a</sup>	--	--	0.2 <sup>b</sup>	--	0.22	<0.01	0.4
SS	--	--	0.9 <sup>a</sup>	0.0 <sup>b</sup>	--	0.1 <sup>b</sup>	--	0.15	<0.01	0.2
Reclose	0.0 <sup>b</sup>	--	0.8 <sup>a</sup>	0.0 <sup>b</sup>	--	--	--	0.19	<0.01	0.3
Other	0.1 <sup>c</sup>	0.1 <sup>bc</sup>	1.3 <sup>a</sup>	0.3 <sup>bc</sup>	1.9 <sup>a</sup>	0.6 <sup>ab</sup>	--	0.65	<0.01	0.5

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

Cardboard Sleeve- cardboard covering of primary package; PVC wrap- poly-vinyl wrap; Net- String wrapping; Poly bag- polyvinyl bag without vacuum, SS- stretch and shrink films; Reclose- recloseable packaging

**Table 4** Frequency of retail packages (N=14,998) by tray type for each species in the U.S. retail meat case in 2015.

Packaging Type	Species							SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Veal			
Foam	73.0 <sup>a</sup>	50.7 <sup>bc</sup>	73.0 <sup>a</sup>	54.4 <sup>b</sup>	33.2 <sup>d</sup>	51.9 <sup>bc</sup>	42.1 <sup>cd</sup>	3.3	<0.01	63.0
Rigid Plastic	4.4 <sup>de</sup>	14.9 <sup>b</sup>	5.0 <sup>d</sup>	3.6 <sup>e</sup>	8.9 <sup>c</sup>	25.1 <sup>a</sup>	20.7 <sup>ab</sup>	4.3	<0.01	7.6
No Tray	22.1 <sup>d</sup>	34.1 <sup>c</sup>	21.6 <sup>d</sup>	41.0 <sup>b</sup>	57.7 <sup>a</sup>	22.9 <sup>d</sup>	37.2 <sup>bc</sup>	3.3	<0.01	28.9
Other	0.5 <sup>a</sup>	0.3 <sup>a</sup>	0.4 <sup>a</sup>	0.9 <sup>a</sup>	0.2 <sup>a</sup>	0.2 <sup>a</sup>	-	1.4	<0.01	0.5

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )



**Table 5.** Frequency of retail packages (N=14,998) by tray color for each species in the U.S. retail meat case in 2015.

Tray Color	Species							SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Veal			
No Tray	22.1 <sup>d</sup>	34.1 <sup>e</sup>	21.6 <sup>d</sup>	41.0 <sup>b</sup>	57.7 <sup>a</sup>	22.9 <sup>d</sup>	37.2 <sup>bc</sup>	4.01	<0.01	28.9
White	38.5 <sup>b</sup>	25.7 <sup>d</sup>	29.3 <sup>c</sup>	28.0 <sup>cd</sup>	12.4 <sup>e</sup>	71.2 <sup>a</sup>	42.1 <sup>b</sup>	4.10	<0.01	34.4
Black	34.0 <sup>a</sup>	31.3 <sup>a</sup>	3.9 <sup>d</sup>	14.4 <sup>c</sup>	20.3 <sup>b</sup>	4.2 <sup>d</sup>	16.6 <sup>bc</sup>	3.09	<0.01	19.4
Blue	0.5 <sup>bcd</sup>	--	1.6 <sup>a</sup>	0.6 <sup>bc</sup>	1.6 <sup>ab</sup>	--	--	0.61	<0.01	0.7
Clear	0.5 <sup>c</sup>	6.9 <sup>a</sup>	2.6 <sup>b</sup>	0.4 <sup>c</sup>	--	--	--	0.61	<0.01	1.6
Green	0.0 <sup>b</sup>	0.1 <sup>b</sup>	2.3 <sup>a</sup>	0.1 <sup>b</sup>	--	--	--	0.26	<0.01	0.6
Other	0.6 <sup>ab</sup>	0.1 <sup>b</sup>	0.1 <sup>b</sup>	0.9 <sup>a</sup>	--	0.1 <sup>ab</sup>	--	0.58	<0.01	0.5
Multicolored	0.0	--	0.0	0.0	--	--	--	0.16	0.61	0.03
Pink	1.1 <sup>b</sup>	0.8 <sup>bc</sup>	--	10.0 <sup>a</sup>	0.7 <sup>bc</sup>	0.1 <sup>cd</sup>	2.8 <sup>ab</sup>	1.36	<0.01	2.8
Tan	1.8 <sup>b</sup>	0.6 <sup>cd</sup>	1.4 <sup>bc</sup>	0.6 <sup>d</sup>	6.3 <sup>a</sup>	0.1 <sup>d</sup>	1.4 <sup>abcd</sup>	0.97	<0.01	1.6
Yellow	1.0 <sup>cd</sup>	0.4 <sup>d</sup>	37.2 <sup>a</sup>	4.0 <sup>b</sup>	0.9 <sup>cd</sup>	1.6 <sup>c</sup>	--	0.83	<0.01	9.8

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 6.** Frequency of retail packages (N=14,998) by marketing claims, value-added, case ready, bone-in, weight, and branding for each species in the U.S. retail meat case in 2015.

Category	Species							SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Veal			
Natural	10.5 <sup>e</sup>	32.4 <sup>c</sup>	62.6 <sup>a</sup>	22.8 <sup>d</sup>	51.9 <sup>b</sup>	51.7 <sup>b</sup>	44.1 <sup>b</sup>	4.12	<0.01	32.5
Value- Added	4.1 <sup>d</sup>	4.0 <sup>d</sup>	8.0 <sup>c</sup>	19.0 <sup>a</sup>	0.9 <sup>e</sup>	11.7 <sup>b</sup>	1.4 <sup>de</sup>	0.96	<0.01	8.9
Organic	2.2 <sup>c</sup>	5.4 <sup>b</sup>	7.8 <sup>a</sup>	0.4 <sup>d</sup>	3.0 <sup>bc</sup>	1.7 <sup>c</sup>	0.7 <sup>bcd</sup>	0.83	<0.01	3.4
Case Ready	36.0 <sup>e</sup>	71.7 <sup>c</sup>	93.0 <sup>b</sup>	64.5 <sup>d</sup>	72.7 <sup>c</sup>	97.2 <sup>a</sup>	76.6 <sup>c</sup>	3.51	<0.01	66.0
Bone-In	14.1 <sup>d</sup>	--	43.5 <sup>b</sup>	35.3 <sup>c</sup>	63.1 <sup>a</sup>	14.8 <sup>d</sup>	26.2 <sup>c</sup>	3.65	<0.01	25.5
Pounds	95.1 <sup>a</sup>	87.4 <sup>c</sup>	92.2 <sup>b</sup>	87.1 <sup>c</sup>	97.2 <sup>a</sup>	69.0 <sup>d</sup>	93.1 <sup>abc</sup>	2.10	<0.01	89.6
Ounces	4.9 <sup>d</sup>	12.6 <sup>b</sup>	7.8 <sup>c</sup>	12.9 <sup>b</sup>	2.8 <sup>d</sup>	31.0 <sup>a</sup>	6.9 <sup>bcd</sup>		<0.01	11.4
Fixed Weight	6.1 <sup>f</sup>	60.1 <sup>b</sup>	16.6 <sup>d</sup>	22.4 <sup>c</sup>	10.7 <sup>e</sup>	74.3 <sup>a</sup>	20.0 <sup>cd</sup>	3.32	<0.01	24.4
Net Weight	93.9 <sup>a</sup>	39.9 <sup>e</sup>	83.4 <sup>c</sup>	77.6 <sup>d</sup>	89.3 <sup>b</sup>	25.7 <sup>f</sup>	80.0 <sup>cd</sup>		<0.01	75.6
National	15.1 <sup>f</sup>	34.4 <sup>e</sup>	62.3 <sup>b</sup>	40.4 <sup>d</sup>	52.6 <sup>c</sup>	78.9 <sup>a</sup>	60.0 <sup>bc</sup>	4.07	<0.01	40.5
Store	80.3 <sup>a</sup>	56.7 <sup>b</sup>	36.6 <sup>d</sup>	56.2 <sup>b</sup>	44.2 <sup>c</sup>	20.6 <sup>e</sup>	40.0 <sup>cd</sup>	4.07	<0.01	55.9
None	4.6 <sup>b</sup>	8.9 <sup>a</sup>	1.1 <sup>c</sup>	3.4 <sup>b</sup>	3.2 <sup>b</sup>	0.5 <sup>c</sup>	--	2.40	<0.01	3.6

<sup>1</sup> Standard Error of Proportion- square root of the population proportion multiplied by 1 less than the population divided by number of samples

<sup>a-f</sup> Proportions lacking a common superscript differ ( $P < 0.05$ )

**Table 7.** Frequency data of Ground Beef SKUs labeled with lean point percentage were compared using a Chi-Square 5-sample test without continuity correction (n = 1,751).

Species	Quality Grade				SEP	P-value
	None	70-79% Lean	80-89% Lean	90-94% Lean		
Ground Beef	6.6 <sup>d</sup>	12.8 <sup>c</sup>	48.3 <sup>a</sup>	27.5 <sup>b</sup>	4.8 <sup>e</sup>	1.19 <0.01

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-e</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

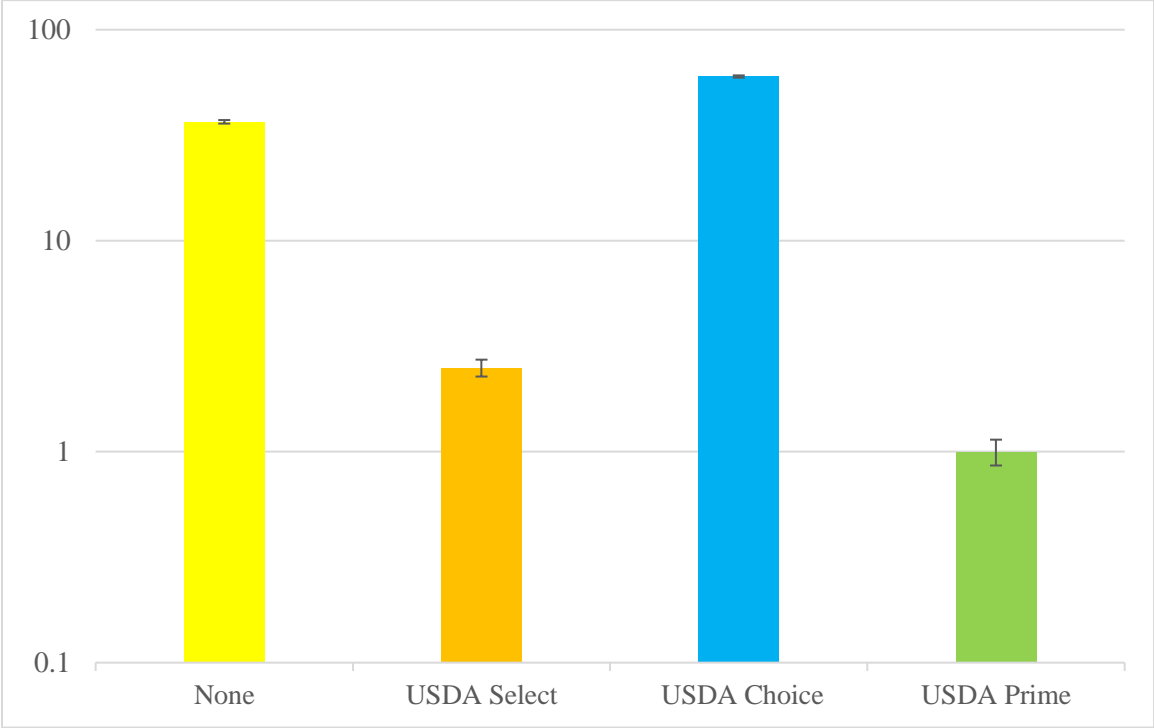
**Table 8.** Frequency of beef retail packages (n=4,627) by quality grade in 2015.

Species	Quality Grade				SEP <sup>1</sup>	P-value
	None	Select	Choice	Prime		
Beef	36.6 <sup>b</sup>	2.5 <sup>c</sup>	60.0 <sup>a</sup>	1.0 <sup>d</sup>	0.72	<0.01

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-c</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

Figure 1. Frequency of beef retail packages (n = 4,627) by quality grade in the U.S. retail case in 2015.



**Table 9.** Frequency of species SKUs (N=23,034) in the U.S. self-service meat case in 2018.

	Species								
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Seafood	Veal	National
SKU Count	6,214	2,734	5,255	5,541	603	1,800	762	125	23,034

**Table 10.** Frequency of retail packages (N=23,034) by packaging type for each species in the U.S. self-service meat case in 2018

Packaging Type	Species								SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Seafood	Veal			
PVC	68.8 <sup>a</sup>	50.8 <sup>b</sup>	12.1 <sup>d</sup>	52.7 <sup>b</sup>	23.0 <sup>e</sup>	6.2 <sup>e</sup>	48.8 <sup>b</sup>	14.4 <sup>cd</sup>	3.1	<0.01	42.8
MAP	5.3 <sup>e</sup>	13.4 <sup>c</sup>	6.8 <sup>d</sup>	5.3 <sup>e</sup>	15.6 <sup>e</sup>	42.2 <sup>b</sup>	0.8 <sup>f</sup>	63.2 <sup>a</sup>	4.3	<0.01	9.9
SS	--	--	47.5 <sup>a</sup>	0.2 <sup>de</sup>	--	10.0 <sup>b</sup>	2.4 <sup>c</sup>	1.6 <sup>cd</sup>	1.1	<0.01	11.8
Chub	--	18.4 <sup>a</sup>	0.1 <sup>d</sup>	3.0 <sup>f</sup>	--	11.0 <sup>b</sup>	--	--	0.7	<0.01	3.8
Vacuum Skin	1.2 <sup>f</sup>	0.2 <sup>g</sup>	10.1 <sup>c</sup>	1.9 <sup>e</sup>	18.9 <sup>b</sup>	4.1 <sup>d</sup>	32.7 <sup>a</sup>	6.4 <sup>cd</sup>	2.2	<0.01	5.0
Vertical Pouch	--	--	0.6 <sup>b</sup>	--	--	--	4.6 <sup>a</sup>	--	0.8	<0.01	0.3
BDF	0.0 <sup>e</sup>	0.1 <sup>de</sup>	1.3 <sup>b</sup>	0.4 <sup>cd</sup>	--	11.7 <sup>a</sup>	0.9 <sup>bc</sup>	--	0.8	<0.01	1.4
Shrink Bag	5.0 <sup>d</sup>	0.0	7.0 <sup>c</sup>	13.1 <sup>b</sup>	25.9 <sup>a</sup>	2.2 <sup>e</sup>	0.8 <sup>e</sup>	0.0	1.8	<0.01	7.0
Poly Bag	0.2 <sup>d</sup>	0.0	3.5 <sup>a</sup>	1.4 <sup>bc</sup>	1.8 <sup>ab</sup>	0.7 <sup>bc</sup>	0.1 <sup>cd</sup>	0.0	0.5	<0.01	1.3
Other	0.2 <sup>d</sup>	0.3 <sup>d</sup>	2.4 <sup>b</sup>	0.9 <sup>b</sup>	0.8 <sup>bcd</sup>	0.1 <sup>d</sup>	5.4 <sup>a</sup>	--	0.8	<0.01	1.1
Laminates	19.2 <sup>b</sup>	16.8 <sup>c</sup>	8.7 <sup>d</sup>	21.1 <sup>a</sup>	13.9 <sup>bcd</sup>	11.9 <sup>d</sup>	3.6 <sup>e</sup>	14.4 <sup>abcd</sup>	3.14	<0.01	15.7
<i>Rollstock</i>	17.5 <sup>b</sup>	15.6 <sup>bc</sup>	6.0 <sup>e</sup>	19.9 <sup>a</sup>	12.8 <sup>cd</sup>	11.1 <sup>d</sup>	1.0 <sup>f</sup>	14.4 <sup>abcd</sup>	3.1	<0.01	14.0
<i>Blister Pack</i>	0.7 <sup>a</sup>	--	0.0	0.1 <sup>b</sup>	0.3 <sup>ab</sup>	--	0.1 <sup>ab</sup>	--	0.2	<0.01	0.2
<i>Saddle Pack</i>	1.0 <sup>b</sup>	1.2 <sup>b</sup>	2.4 <sup>a</sup>	1.0 <sup>b</sup>	0.8 <sup>ab</sup>	0.8 <sup>b</sup>	--	--	0.4	<0.01	1.3
<i>Ovenable Bag</i>	0.0 <sup>c</sup>	--	0.3 <sup>b</sup>	0.1 <sup>bc</sup>	--	--	2.4 <sup>a</sup>	--	0.6	<0.01	0.2

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

PVC- poly-vinyl chloride; MAP- modified atmosphere packaging; SS- stretch and shrink films; BDF- Cryovac BDF; Vacuum Skin- vacuum sealed tray; Vertical Pouch- flexible, multilayer laminate; Laminates- flexible films; Shrink bag- vacuum system with only bag; Chub- flexible plastic with metal clips; Poly Bag- polyvinyl bag with no vacuum; Rollstock- thermoformed vacuum system with 1 pouch; Saddle Pack- thermoformed vacuum system with multiple pouches; Blister Pack- hard plastic shell with vacuum; Ovenable Bag- cooking safe packaging

**Table 11.** Frequency of retail packages (N=23,034) by secondary packaging type for each species in the U.S. retail meat case in 2018.

Packaging Type	Species								SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Seafood	Veal			
None	99.2 <sup>a</sup>	98.3 <sup>bc</sup>	94.9 <sup>d</sup>	98.6 <sup>b</sup>	96.8 <sup>cd</sup>	82.4 <sup>e</sup>	94.8 <sup>d</sup>	96.0 <sup>bcd</sup>	1.23	<0.01	95.7
Cardboard Sleeve	0.4 <sup>d</sup>	1.4 <sup>b</sup>	0.4 <sup>d</sup>	0.5 <sup>cd</sup>	0.2 <sup>bcd</sup>	15.4 <sup>a</sup>	1.4 <sup>bc</sup>	0.8 <sup>bcd</sup>	1.16	<0.01	2.1
PVC Wrap	0.2 <sup>b</sup>	0.1 <sup>ab</sup>	0.7 <sup>a</sup>	0.2 <sup>b</sup>	0.2 <sup>ab</sup>	0.2 <sup>ab</sup>	0.7 <sup>ab</sup>	1.6 <sup>ab</sup>	0.18	<0.01	0.4
Net	0.1 <sup>bc</sup>	--	0.0 <sup>c</sup>	0.4 <sup>b</sup>	1.5 <sup>a</sup>	1.3 <sup>a</sup>	0.1 <sup>abc</sup>	--	1.02	<0.01	0.4
Poly Bag	--	--	1.7 <sup>a</sup>	0.0 <sup>b</sup>	0.5 <sup>ab</sup>	0.2 <sup>b</sup>	--	--	0.22	<0.01	0.4
SS	0.0 <sup>c</sup>	0.0 <sup>b</sup>	1.3 <sup>a</sup>	0.0 <sup>b</sup>	0.0 <sup>ab</sup>	0.1 <sup>b</sup>	0.1 <sup>ab</sup>	0.0 <sup>ab</sup>	0.15	<0.01	0.2
Reclose	--	--	0.8 <sup>a</sup>	0.0 <sup>b</sup>	0.3 <sup>ab</sup>	--	0.0 <sup>ab</sup>	--	0.19	<0.01	0.3
Other	0.1 <sup>c</sup>	0.1 <sup>c</sup>	1.3 <sup>b</sup>	0.2 <sup>c</sup>	0.5 <sup>bc</sup>	0.3 <sup>c</sup>	2.9 <sup>a</sup>	1.6 <sup>abc</sup>	0.65	<0.01	0.5

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

Cardboard Sleeve- cardboard covering of primary package; PVC wrap- poly-vinyl wrap; Net- String wrapping; Poly bag- polyvinyl bag without vacuum, SS- stretch and shrink films; Reclose- recloseable packaging



**Table 12.** Frequency of retail packages (N=23,034) by tray type for each species in the U.S. retail meat case in 2018.

Tray Type	Species								SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Seafood	Veal			
Foam	68.8 <sup>a</sup>	51.3 <sup>b</sup>	66.8 <sup>a</sup>	54.0 <sup>b</sup>	23.2 <sup>d</sup>	34.4 <sup>c</sup>	49.6 <sup>b</sup>	16.8 <sup>d</sup>	3.3	<0.01	57.9
Rigid Plastic	5.8 <sup>f</sup>	12.8 <sup>de</sup>	12.1 <sup>e</sup>	5.1 <sup>f</sup>	20.7 <sup>c</sup>	38.7 <sup>b</sup>	16.1 <sup>cd</sup>	64.8 <sup>a</sup>	4.3	<0.01	11.5
No Tray	25.1 <sup>d</sup>	35.4 <sup>c</sup>	19.5 <sup>e</sup>	40.0 <sup>b</sup>	55.2 <sup>a</sup>	25.7 <sup>d</sup>	27.0 <sup>d</sup>	16.0 <sup>de</sup>	3.3	<0.01	29.5
Other	0.4 <sup>d</sup>	0.5 <sup>cd</sup>	1.7 <sup>b</sup>	0.9 <sup>c</sup>	0.8 <sup>bcd</sup>	0.1 <sup>bc</sup>	7.2 <sup>a</sup>	2.4 <sup>abcd</sup>	1.4	<0.01	1.1

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 13.** Frequency of retail packages (N=23,034) by tray color for each species in the U.S. retail meat case in 2018.

Tray Color	Species								SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Seafood	Veal			
No Tray	25.1 <sup>d</sup>	35.4 <sup>c</sup>	19.5 <sup>e</sup>	40.0 <sup>b</sup>	55.2 <sup>a</sup>	25.7 <sup>d</sup>	27.0 <sup>d</sup>	16.0 <sup>de</sup>	3.28	<0.01	29.5
White	34.5 <sup>b</sup>	22.4 <sup>c</sup>	33.9 <sup>b</sup>	23.6 <sup>c</sup>	14.6 <sup>d</sup>	63.2 <sup>a</sup>	26.2 <sup>e</sup>	60.0 <sup>a</sup>	4.38	<0.01	31.1
Black	33.2 <sup>ab</sup>	35.4 <sup>a</sup>	4.0 <sup>f</sup>	13.1 <sup>d</sup>	19.9 <sup>c</sup>	5.5 <sup>e</sup>	29.4 <sup>b</sup>	16.8 <sup>cd</sup>	3.34	<0.01	19.2
Blue	0.7 <sup>b</sup>	--	0.9 <sup>b</sup>	0.1 <sup>d</sup>	0.8 <sup>bc</sup>	0.1 <sup>cd</sup>	27.4 <sup>a</sup>	0.8 <sup>bcd</sup>	1.61	<0.01	1.3
Clear	1.3 <sup>e</sup>	3.9 <sup>c</sup>	6.9 <sup>ab</sup>	1.5 <sup>de</sup>	3.8 <sup>bc</sup>	0.4 <sup>f</sup>	8.5 <sup>a</sup>	4.8 <sup>abcd</sup>	1.91	<0.01	3.2
Green	0.2 <sup>c</sup>	0.0 <sup>c</sup>	2.8 <sup>a</sup>	0.6 <sup>b</sup>	--	1.8 <sup>a</sup>	--	--	0.31	<0.01	1.0
Other	0.2 <sup>c</sup>	0.3 <sup>bc</sup>	0.6 <sup>b</sup>	0.6 <sup>b</sup>	0.2 <sup>bc</sup>	0.2 <sup>bc</sup>	2.6 <sup>a</sup>	--	0.58	<0.01	0.5
Multicolored	0.4 <sup>a</sup>	0.3 <sup>a</sup>	--	0.2 <sup>a</sup>	--	--	--	--	0.11	<0.01	0.2
Pink	0.2 <sup>b</sup>	0.4 <sup>b</sup>	0.2 <sup>b</sup>	11.6 <sup>a</sup>	--	0.4 <sup>b</sup>	--	1.6 <sup>b</sup>	1.12	<0.01	3.0
Tan	2.4 <sup>b</sup>	0.7 <sup>c</sup>	1.7 <sup>b</sup>	0.8 <sup>c</sup>	5.3 <sup>a</sup>	0.7 <sup>c</sup>	2.4 <sup>ab</sup>	--	0.91	<0.01	1.6
Yellow	2.0 <sup>c</sup>	1.3 <sup>cd</sup>	29.5 <sup>a</sup>	7.9 <sup>b</sup>	0.2 <sup>de</sup>	1.9 <sup>c</sup>	--	--	0.63	<0.01	9.5

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 14.** Frequency of retail packages (N=23,034) by marketing claims, value-added, case ready, bone-in, weight, and branding for each species in the U.S. retail meat case in 2018.

Category	Species								SEP <sup>1</sup>	P-value	National
	Beef	Ground Beef	Chicken	Pork	Lamb	Turkey	Seafood	Veal			
Natural	12.1 <sup>e</sup>	35.2 <sup>c</sup>	56.3 <sup>a</sup>	28.6 <sup>d</sup>	59.7 <sup>a</sup>	49.8 <sup>b</sup>	3.1 <sup>f</sup>	64.0 <sup>a</sup>	4.29	<0.01	33.1
Value- Added	7.9 <sup>d</sup>	23.9 <sup>b</sup>	11.7 <sup>c</sup>	34.2 <sup>a</sup>	2.5 <sup>e</sup>	25.1 <sup>b</sup>	28.1 <sup>b</sup>	1.6 <sup>de</sup>	1.63	<0.01	18.8
Organic	2.2 <sup>d</sup>	6.8 <sup>b</sup>	11.1 <sup>a</sup>	0.4 <sup>e</sup>	5.0 <sup>bc</sup>	- -	2.9 <sup>e</sup>	0.0 <sup>de</sup>	0.89	<0.01	4.4
Antibiotic Free	21.8	22.4	21.4	22.1	24.7	22.6	19.6	15.2	3.21	0.17	21.9
Case Ready	45.2 <sup>f</sup>	75.9 <sup>c</sup>	92.4 <sup>b</sup>	68.5 <sup>d</sup>	77.4 <sup>c</sup>	96.7 <sup>a</sup>	51.2 <sup>e</sup>	88.0 <sup>b</sup>	2.91	<0.01	70.5
Grass Fed	5.9 <sup>c</sup>	13.1 <sup>b</sup>	- -	- -	17.9 <sup>a</sup>	- -	- -	1.6 <sup>c</sup>	1.56	<0.01	3.6
Family Size	11.2 <sup>cd</sup>	12.4 <sup>bc</sup>	20.0 <sup>a</sup>	13.0 <sup>b</sup>	6.8 <sup>e</sup>	9.1 <sup>de</sup>	8.4 <sup>de</sup>	1.6 <sup>e</sup>	1.12	<0.01	13.3
Bone-In	13.3 <sup>d</sup>	- -	40.8 <sup>b</sup>	28.7 <sup>c</sup>	62.9 <sup>a</sup>	13.6 <sup>d</sup>	6.3 <sup>e</sup>	24.8 <sup>c</sup>	4.29	<0.01	33.1
Pounds	95.9 <sup>a</sup>	84.0 <sup>c</sup>	93.0 <sup>b</sup>	82.8 <sup>c</sup>	97.2 <sup>a</sup>	72.3 <sup>d</sup>	76.5 <sup>d</sup>	94.4 <sup>ab</sup>	2.06	<0.01	88.2
Ounces	4.1 <sup>d</sup>	16.0 <sup>b</sup>	7.0 <sup>c</sup>	7.2 <sup>b</sup>	2.8 <sup>d</sup>	27.7 <sup>a</sup>	23.5 <sup>a</sup>	5.6 <sup>cd</sup>		<0.01	11.8
Fixed Weight	5.6 <sup>f</sup>	64.7 <sup>b</sup>	14.9 <sup>d</sup>	28.9 <sup>c</sup>	10.0 <sup>e</sup>	76.8 <sup>a</sup>	30.1 <sup>c</sup>	16.0 <sup>de</sup>	3.28	<0.01	26.9
Net Weight	94.4 <sup>a</sup>	35.3 <sup>e</sup>	85.1 <sup>c</sup>	71.1 <sup>d</sup>	90.0 <sup>b</sup>	23.2 <sup>f</sup>	69.9 <sup>d</sup>	84.0 <sup>bc</sup>		<0.01	73.1
National	12.2 <sup>h</sup>	14.2 <sup>g</sup>	47.9 <sup>c</sup>	45.0 <sup>d</sup>	32.7 <sup>e</sup>	75.3 <sup>a</sup>	20.6 <sup>f</sup>	65.6 <sup>b</sup>	4.25	<0.01	34.5
Store	56.8 <sup>a</sup>	49.6 <sup>b</sup>	44.6 <sup>c</sup>	41.4 <sup>d</sup>	58.2 <sup>a</sup>	21.2 <sup>e</sup>	42.4 <sup>cd</sup>	26.4 <sup>e</sup>	3.94	<0.01	46.1
None	31.0 <sup>b</sup>	36.2 <sup>a</sup>	7.5 <sup>f</sup>	13.6 <sup>c</sup>	9.1 <sup>d</sup>	3.5 <sup>e</sup>	37.0 <sup>a</sup>	8.0 <sup>cde</sup>	2.43	<0.01	19.4

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 15.** Frequency data of Ground Beef SKUs labeled with lean point percentage were compared using a Chi-Square 5-sample test without continuity correction in 2018. (n = 2,709).

Species	Quality Grade					SEP <sup>1</sup>	P-value
	None	70-79% Lean	80-89% Lean	90-94% Lean	95% and Greater		
Ground Beef	8.9 <sup>d</sup>	12.7 <sup>c</sup>	46.6 <sup>a</sup>	26.8 <sup>b</sup>	4.9 <sup>e</sup>	0.96	<0.01

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 16.** Frequency of beef retail packages (n = 6,214) by quality grade in 2018.

Species	Quality Grade				SEP <sup>1</sup>	P-value
	None	Select	Choice	Prime		
Beef	39.4 <sup>b</sup>	1.7 <sup>c</sup>	57.2 <sup>a</sup>	1.6 <sup>c</sup>	0.63	<0.01

<sup>1</sup> Standard Error of Proportion- square root of the population proportion by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

Figure 2. Frequency of beef retail packages (n = 6,214) by quality grade in the U.S. retail case in 2018.

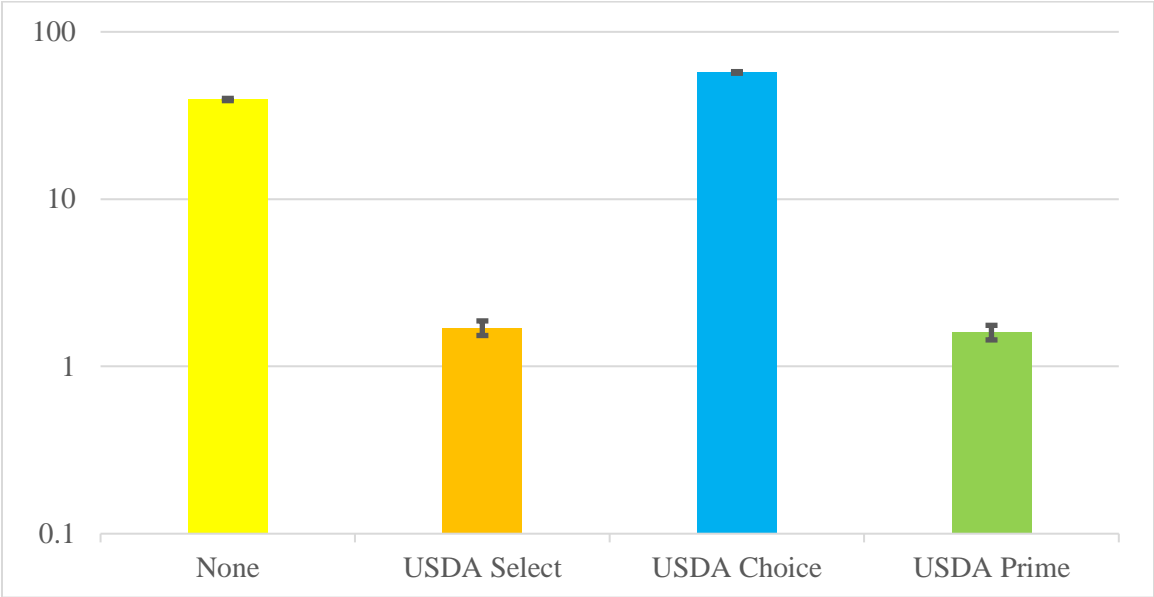


Figure 3. Marketing of natural and organic across all species in the U.S. retail meat case (N = 77,116) between 2007 and 2018.

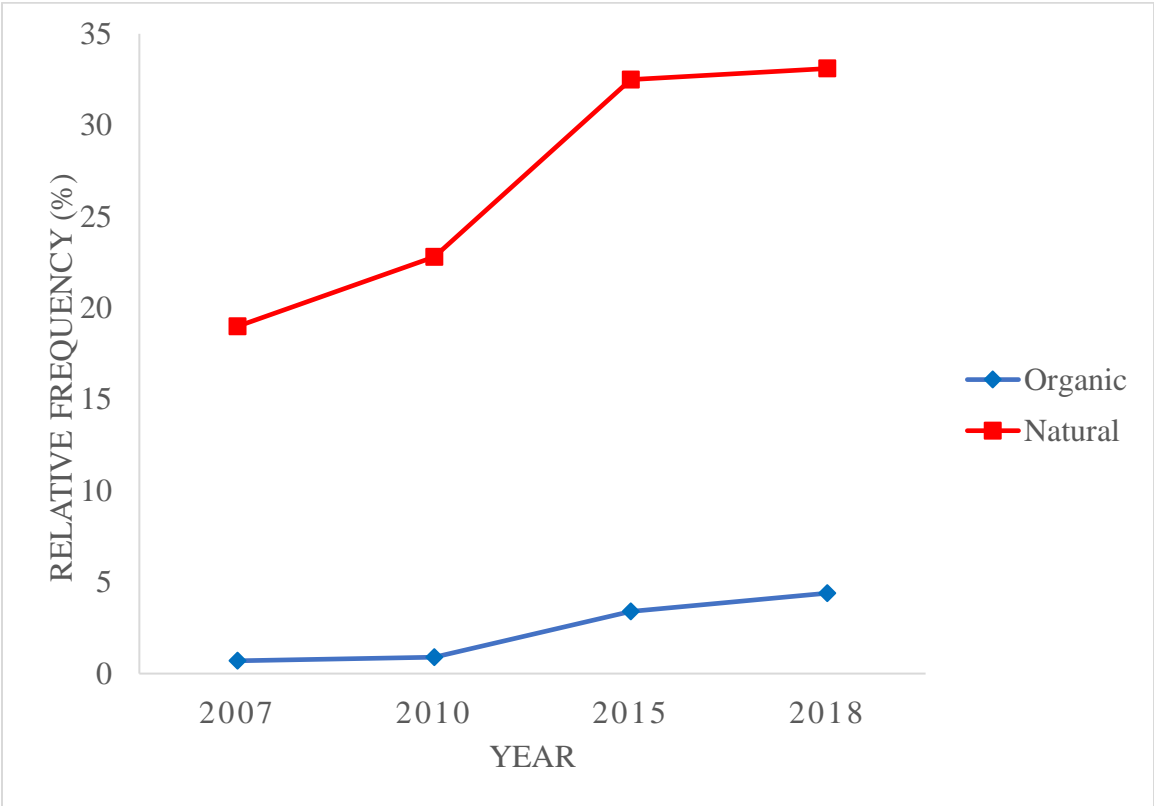


Figure 4. Packaging type across all species in the U.S. retail meat case (N = 77,116) between 2007 and 2018.

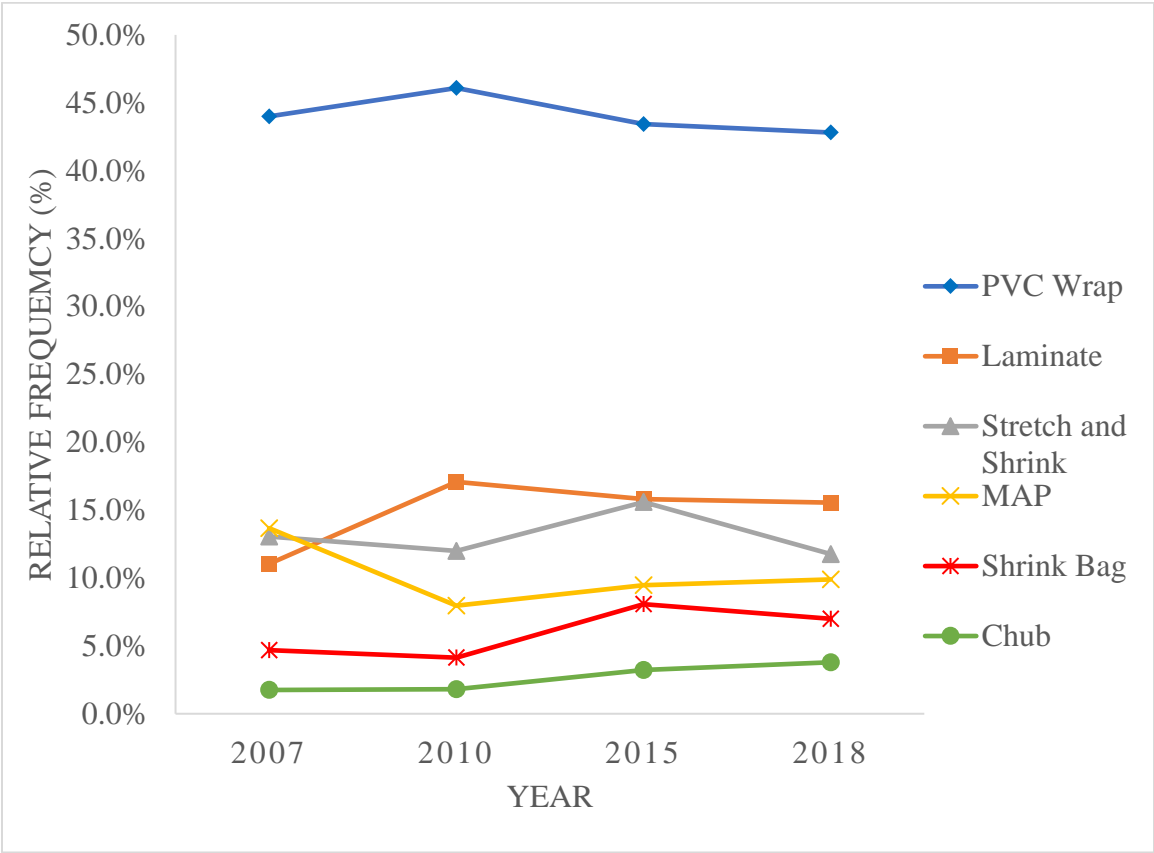




Figure 5 Tray type across all species in the U.S. retail meat case (N = 77,116) between 2007 and 2018.

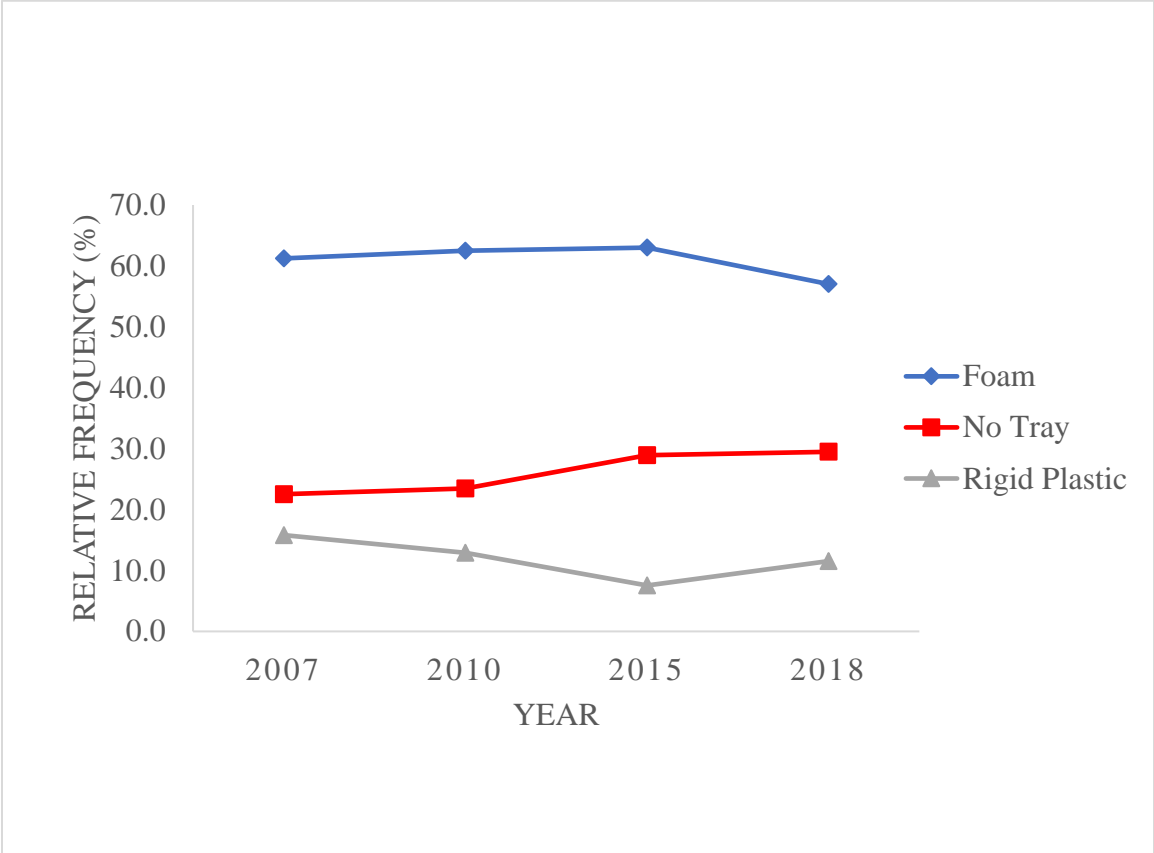


Figure 6 Major tray colors across all species in the U.S. retail meat case (N = 77,116) between 2007 and 2018.

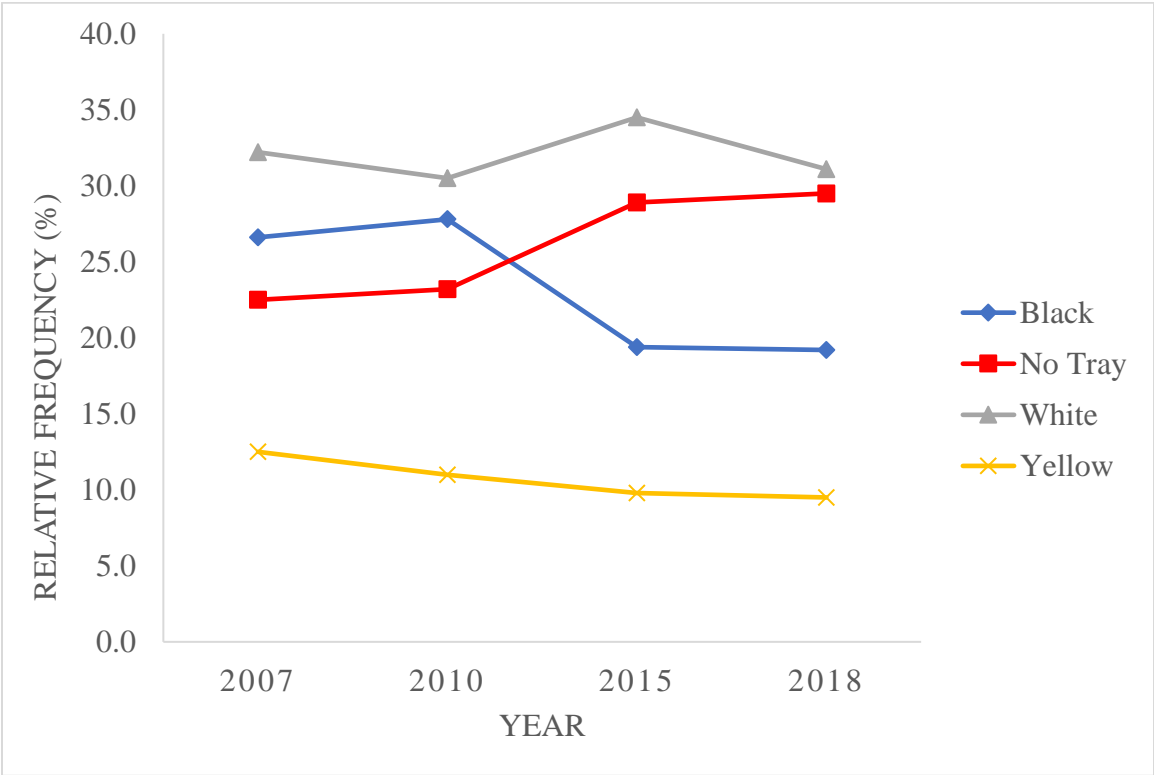


Figure 7. Minor tray colors across all species in the U.S. retail meat case (N = 77,116) between 2007 and 2018.

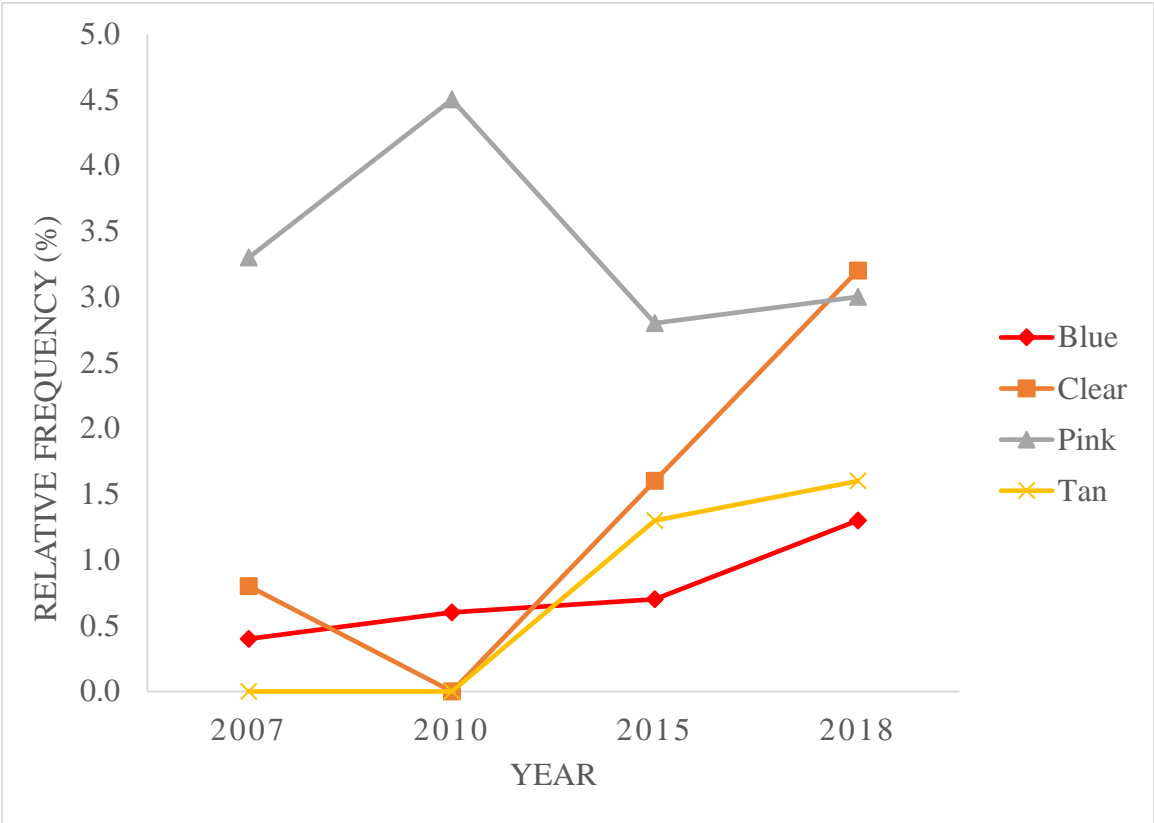
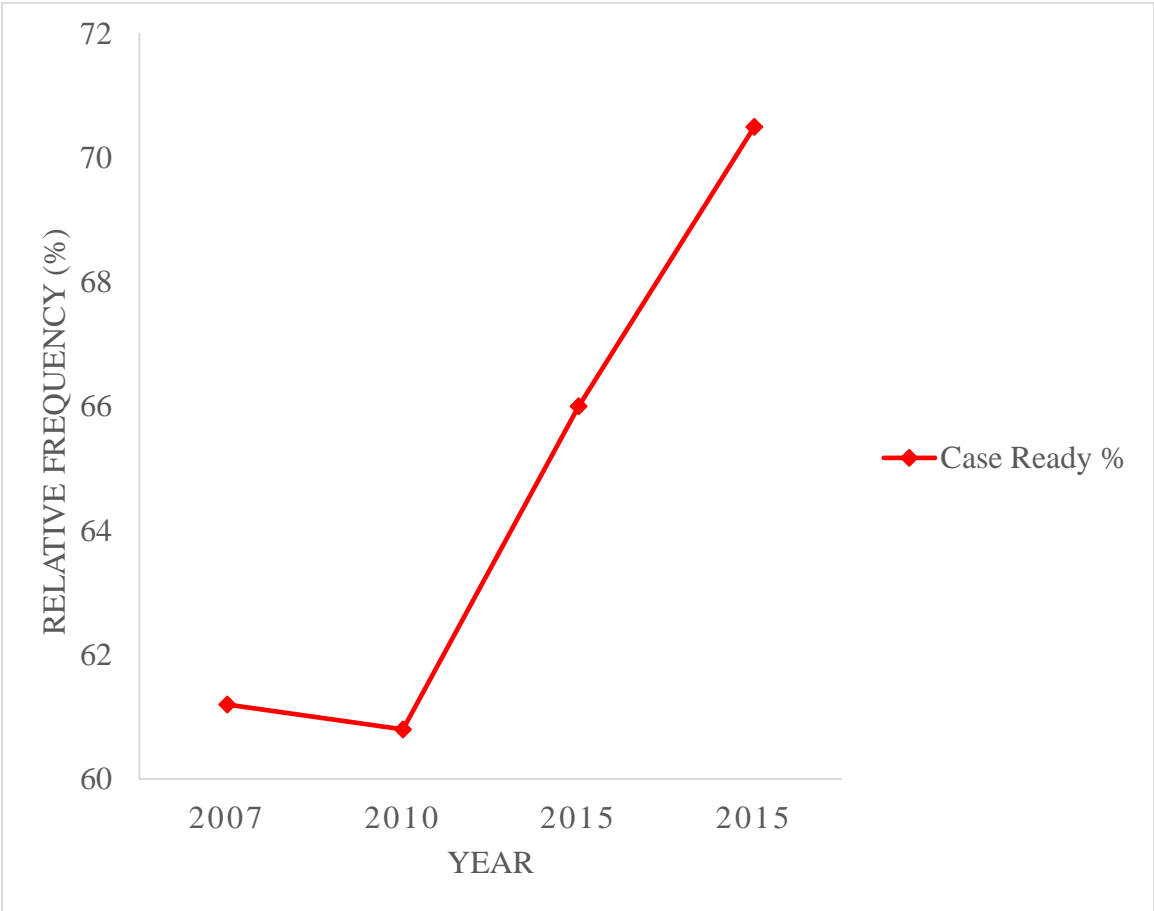


Figure 8 Case ready SKUs across all species in the U.S. retail meat case (N = 77,116) between 2007 and 2018.



### **CHAPTER III**

## **2015 AND 2018 NATIONAL MEAT CASE AUDIT: ALLOCATION OF SPACE IN THE U.S. MEAT CASE**

### **ABSTRACT**

In 2015 and 2018, 108 stores in 25 states and 150 stores in 31 states in the United States were analyzed to determine the allocation of different species categories in the meat case. Stores were grouped by geographical region (West, Mountain/ Southwest, Midwest, Southeast, and Northeast) and evaluated for: presence of a species, average length in meters provided to a SKU, percentage of the length allocated to each category, and total SKU frequency for the 2015 and 2018 case studies. Categories were broken into beef, chicken, pork, ground beef, processed meat, turkey, value-added, non-meat, sausage, lamb, veal, seafood, and in 2018, heat and serve items. Chicken was the only species found in 100% of stores across 2015 and 2018 whereas beef was present in 100% of stores in 2015 and 98% of stores in 2018. Between 2015 and 2018, space allocated to beef shortened 1 meter. Chicken leads in total allocated space at 16 meters per store. Midwest region stores possessed the longest meat cases in both 2015 and 2018 (135.2 and 110.1 meters) while the Southeast was the smallest (88.6 and 79.6 meters). In both 2015 and 2018, processed meat was the third largest percentage of the meat case at 15.4% and 12.7% respectively. Whole muscle beef still has the highest percentages of SKUs across all species and regions averaging almost 30% of a store's SKUs. The Midwest lowered the length allocated to each SKU from 0.5 meters per SKU to 0.39 meters per SKU between 2015 and 2018.

## **INTRODUCTION**

National Meat Case Studies have been conducted every few years to evaluate changes in trends, packaging, and space allocation in the retail case. Previous studies focused on single species offerings or consumer acceptability of retail traits, such as trimness and price, but had never shown the breadth and width of the self-service meat case until the first National Meat Case Study in 2002 (Cryovac, 2003; Mason et al., 2006; Reicks et al., 2008b; Savell et al., 1989). The meat case audit collects information regarding species, packaging type, packaging color, marketing, and allocation of categories in the retail space. Before the first meat case audit, no known study had audited the entire self-service meat case in the United States. It became clear by studying the meat case, knowledge gained could be used by packers and retailers to better understand what is happening on the consumer level. Similar to Reicks et al., (2008) and Cryovac (2003), this audit encompasses the regional space allocation of the largest meat markets in the United States. Regionality of these major markets were analyzed to determine if differences existed in the offering, length, or composition of the United State retail case.

## **MATERIALS AND METHODS**

### *Selection of Stores*

The largest markets in the United States were represented in the 2015 and 2018 meat case studies. Markets remained the same during 2015 and 2018 and stores were repeated as possible. During the 2015 National Meat Case Study, 108 stores were approached in 25 states compared to 151 stores in 31 states in the 2018 National Meat Case Study. Stores were approached without notice; however, permission was obtained

from management at the corporate level. Data were collected from January to April to avoid major holiday and seasonal changes in the meat case.

Stores in 2015 (N= 108) and 2018 (N= 150) were evaluated in five regions: West Coast- Arizona, California, Nevada, Oregon, and Washington; Mountain/ Southwest- Texas, New Mexico, Oklahoma, Colorado, and Utah; Midwest- Kansas, Missouri, Kentucky, Ohio, Illinois, Indiana, Minnesota, Wisconsin, and Michigan; Southeast- Alabama, Georgia, Florida, Tennessee, South Carolina, and North Carolina; Northeast- Maryland, Washington, D.C., Pennsylvania, New York, Connecticut, Massachusetts, and New Jersey.

#### *Auditor Training*

Auditors were trained by Cryovac, Inc. staff members in the Gordon W. Davis Meat Science Laboratory at Texas Tech University as well as local supermarket and club stores in Lubbock, Texas. Data were recorded by linear feet for all categories in the retail case. Measurements were estimated based on the standard length (8 feet) of a retail case. Each level of a retail case was counted towards the length of the retail case. In 2015, species groups were broken down into whole muscle beef, ground beef, pork, chicken, turkey, veal, seafood, value added, processed meats, sausage, heat and serve, non-meat, and other. Additionally, in 2018 a meal kits group was added to the measurement of the retail case. A major distinction between the 2015 and 2018 case studies is the distinction of the qualification of the meat case. In 2015, the study included the addition of secondary retail cases outside that the traditional meat case. Cases, typically containing processed meat or specially marked items, not located adjacent to rest of the meat case were counted as part of the 2015 retail case but were not included in the 2018 case study.

### *Statistical Analysis*

Data were analyzed using R statistical software, version 4.0.2 (R Core Team, 2021) using `prop.test` in base R to compare across regions (Hothorn et al., 2008). The likelihood a species group was present was analyzed across five regions in a five-sample test for equality of proportions without continuity correction with a confidence level set at 0.95. Comparisons across regions were made to determine average length of each species group in a region. A linear model was made using the “`lm`” function in the `Multcomp` package with significance set at  $P < 0.05$  (Hothorn et al., 2008). Tukey adjusted pairwise comparisons were used to separate means using the `Multcomp` package (Hothorn et al., 2008). Lastly, the percentage makeup of the length of each species group was calculated from retail cases that contained that species group using the “`lm`” function in `Multcomp` with a significance level of 0.05 using the Tukey method comparing a family of five estimates. Stores without a category present were removed from length and percentage of the meat case analyses. National averages were included for numerical comparison only.

## **RESULTS AND DISCUSSION**

### *2015 National Meat Case Study*

Whole muscle beef products and chicken were found in all 108 stores regardless of region (Table 17). Pork was found in 99.1% of retail cases with only one store in the Mountain region containing no pork. Turkey was present in 106 (98.1% present) stores surveyed. Ground beef was found in 97.2% stores with ground beef present in 89.5% of stores in the Mountain region and 95.7% of stores in the Northeast region. Sausage was found in all surveyed stores in the Northeast region and nationally was found in 96.3% of



observed retail cases. Lamb was in 87% of all meat cases, and interestingly, was least likely to be found in the Mountain region (68.4%) where lamb is produced and slaughtered the most (National Agriculture Statistics Service, 2020). Additionally, lamb was most likely to be found in stores in the Northeast region (95.7%). Value-added products, fresh meat products that have been altered through the addition of ingredients or processes, were found in 82.4% of retail cases. 100% of stores in the Northeast region contained at least one SKU of value-added product. The Midwest region had the lowest likelihood (68%) to have value added products present in the retail case. Processed meat, conversely, was most likely to be found in the Midwest region (84%). West region stores containing processed meat were least likely to be found (42.9%). Seafood was found in 67.6% of all stores with the Midwest region containing seafood the most often (92%). Northeast stores' had the lowest chance of containing seafood (43.5%). Veal was found the most commonly in stores in the Northeast region at 82.6% and was found the least in Midwest stores (26.3%). Heat and serve items were found in 52.8% of stores monitored with the Southeast region being the least likely to contain heat and serve items (40%). Non-meat items located in the meat case were found in 45.4% of retail cases. The Northeast region was the most likely to contain non-meat items in the meat case as 65.2% of stores displayed them.

Stores in the Midwest region had the largest average meat case at 135.2 meters (m) including all shelves in the meat case. The Southeast had the smallest meat case at 88.6 m long followed by the West region at 91.4 m (Table 18). Nationally, the average length of processed meat in the retail case was 16.1 m. Midwest region stores had the longest average length of processed meat at 28.1 m and was different ( $P < 0.01$ ) than the

Southeast and West regions. Cases in the Southeast region had the shortest average length for processed meat at 7.5 m. Nationally, the average length for chicken in the retail case was 16 linear m and the Northeast region had the largest dedicated length to chicken at 18.6. Dedicated length to chicken was lowest in the West coast (13.5 m). Whole muscle beef cuts made up the shortest average length (11.8 m) in the Southeast. The average length of beef nationally was 14.8 m with the Mountain region being the longest at 16.7 m. Pork had an average national length of 11.9 m with the Midwest region possessing the longest average length of 14.9 m. The Northeast region averaged the most retail space allocated towards veal at 1.3 m compared to the average of 0.9 m.

Chicken made up the highest percentage of the meat case nationally at 17.4%, leading the Midwest, Northeast, and Southeast regions in percentage of the meat case (Table 19). Chicken comprises 23.6% of the Southeast region's meat case by length and is different ( $P < 0.01$ ) from the percentage of chicken in the Midwest region. At 16.1%, beef is second nationally and leads the Mountain and West regions for the highest percentage of their respective cases. Beef in the Mountain and West regions made up 20.4% and 19.8% of their respective meat cases and were different ( $P < 0.01$ ) from the Midwest region's composition at 14.2%. Processed meat made up 18.9% of the Midwest's self-service meat case, the most of any region, while the Southeast region dedicated the least space to processed meat at 8.7%. Pork had the largest percentage of the retail case in the West region at 15.8% while the Northeast region had the smallest percentage dedicated to pork at 11.7%. 9.4% of the nation's retail case was sausage with the Northeast region allocating the most retail space to sausage at 10% while the Southeast provided only 6.2% on average. Seafood made up 7.3% of the retail case when

present with the Midwest region providing the least room at 6.9 m. Turkey, interestingly, only made up 5.2% of the length of the retail case less than seafood, value added, and sausage, but as was previously mentioned, was present in 98.1% of stores more than all species groups aside from beef, chicken, and pork. When stocked in the meat case, veal was allocated 1 m nationally with the Mountain region averaging 2.6 m per store.

Stores in the Mountain region contained the most variety (34.4%) of beef as a percentage of the meat case compared to all other regions while the Midwest displayed the least at only 28.3% (Table 20). Conversely, ground beef in the Midwest accounted for 13.3% of the variation in the meat case, the most of any region. The average numbers of SKUs presented in a store was found to be highest in the Northeast and Southeast averaging 117 and 116 SKUs per store, respectively. Mountain region stores contained the fewest SKUs per store averaging only 79. Stores in the West averaged 84 SKUs while also providing the least area. The West allocated 0.41 meters per SKU. Mountain region stores offer fewer SKUs, but spread out the meat case more averaging 0.48 meters per SKU.

#### *2018 National Meat Case Study*

In the 2018 National Meat Case Study, only chicken was present in 100% of retail stores surveyed. Turkey was found in 98.7% of the supermarkets and club stores monitored with the Southeast region being the only region with stores lacking turkey (Table 21). Whole muscle beef cuts and pork were both found in 98% of retail cases. Beef was found in 100% of stores in all regions except for the Northeast (89.3%). Pork was found in 96.9% of West region stores and 96.4% of Northeast region stores but was

found in 100% of stores in the remaining regions. 100% of stores in the Mountain, Midwest, and West regions contained ground beef and was present in 97.3% stores nationwide. Ground beef was only present in 89.3% of stores in the Northeast region and 93.8% of stores in the Southeast region. Sausage was found in 93.3% of supermarket and club stores.

Sausage was most likely to be found in the Midwest region and Southeast region (97.0% and 96.9%) and was least likely to be found in the Mountain region (84%). Of stores surveyed, 90.9% contained value-added products. The Mountain region was the least likely to contain value added products having value added products (68%). The Mountain region was the least likely to contain processed meat at 64% compared to the national average of 82%. Nationally, lamb was found in 78% of stores being most likely to be found in stores in the Northeast (85.7%). Northeast supermarkets and club stores were the least likely to stock seafood, stocking seafood in only 46.4% of stores. Mountain region stores contained seafood the most of any region (84%). Heat and serve items were most commonly found in the West region (71.9%) and nationally were found in 60.7% of stores. Non-meat items were found in only 48% of Mountain region retail cases, 13.3% less than the national average. Veal was found in retail cases the least (29.3%) compared to all other species groups. Northeast stores were more likely ( $P < 0.01$ ; 60.7%) to contain veal than stores located in the Mountain, Midwest, or West regions.

Southeast region retail cases possessed the shortest average meat case in the nation at 79.6 m (Table 22). Meat cases with the largest average size were in the Midwest region averaging 110.1 m long. Chicken had the least retail space in the West region at an average of 13.4 m per store. The Northeast dedicated the most retail space to chicken at

18.6 m per store compared to the national average of 16 m. Nationally, beef SKUs occupied an average length of 13.8 m of retail space with the Mountain and Midwest regions allocating the most space to beef at 15.8 m. Average length of Mountain and Midwest allotments of beef were different ( $P < 0.01$ ) from the Southeast region at 10.7 m. Processed meat made up 11.3 m of fresh, self-service meat case nationally. The West region devoted the least meters to processed meat of any region at 8.9 linear m per store whereas the Midwest region dedicated the most to processed meat at 15.2 m. For pork, the Midwest had the had the longest average displayed length at 13.7 m and was different ( $P < 0.01$ ) than the Southeast and West regions (8.4 and 8.2 meters). Ground beef had the greatest dedicated space in the Midwest region at 9.4 m followed by the Northeast region at 9.1 m. The West region had the lowest average of dedicated retail space to ground beef at 5.9 m per store. Nationally, sausage makes up 6.7 m of the retail case with the Midwest region providing the most space to sausage at 9 m per store. The Midwest region's case length of sausage is more than ( $P < 0.01$ ) the Southeast's at 3.7 m long. Seafood SKUs, when present, had a national average of 3.6 linear m of devoted retail case space.

Nationally, chicken made up the largest percentage of the meat case at 19.2% (Table 23). Mountain region stores averaged the greatest percentage of chicken at 22.7% while the Midwest averaged the least at 17.6%. Southeast region stores averaged the lowest percentage (15%) of beef compared to other regions. Nationally, processed meat and pork take up the same percentage of the meat case (12.7%). The Midwest region led both pork and processed meat in the percentage of the meat case (15.1% and 13.2% respectively). Pork in the Midwest region was different ( $P < 0.05$ ) than the space assigned in the West region (10.8%). The Northeast region displayed the fewest linear

meters of processed meats compared to other regions (10%). Ground beef was displayed in 10.1% of the meat case in the Northeast, 0.9% of more than the national average (9.2%). West region stores had the smallest length of displayed ground beef at 7.5%. Lamb and veal, when present, were both assigned the most room in the Northeast (3.8% and 1.2%).

Whole muscle beef accounted for 29.6% of the variety of SKUs in the Mountain region the most of any region (Table 24). Midwest's variety in SKUs was largely accounted for in pork (27.5%). Stores in the Mountain region had the highest percentage of ground beef SKUs at 14.9%. The West region had the largest variation in seafood compared to all other regions at 4.9%. The West and Southeast regions averaged the fewest SKUs per store at 134 and 127 SKUs respectively while the other three regions averaged 153 SKUs per store. Southeast region stores had the lowest meter to SKU ratio at 0.28 meters per SKU. All other regions allocated approximately 0.39 meters per SKU.

#### *Comparison Across Years*

Comparison across years of the meat case study was challenging due to changes in the collection of length measurements at the retail case. However, some interpretations can be made between 2015 and 2018. Non-meat items, value added meat, lamb, and turkey all experienced increases in availability in the meat case. Non-meat items in the meat case increased 16% between 2015 and 2018 but was still less likely to be a part of the meat case than in 2004 (Reicks et al., 2008a). Value added SKUs increased approximately 8% from 2015 and was close to matching 2004 levels at 92.3%. The increase in value added meat as well as the high incidence of heat and serve items and non-meat items could be in result of consumer demand for quick and easy meals. All

other species either remained the same or decreased in presence. Lamb saw a large presence increase in the 2015 (87%) before dipping in 2018 to 78%. Chicken was the only species present in all stores in the 2004, 2015, and 2018 collections. Beef was 100% present in all regions in the 2004 and 2015 studies but was missing from two stores in the Northeast region in 2018. Nationally, this lowered the presence of beef across major markets to 98% in 2018. The presence of Pork has slightly decreased since the 2004 case study. In 2004, all stores surveyed contained pork items, but in 2015 and 2018, 99.1% and 98% of stores contained pork. Veal saw the single largest decrease, falling from 53.7% in 2015 to 28.7% in 2018.

Meat cases have gotten larger since 2004. Between 2004 and 2018, meat cases have increased approximately 13 meters. Only one species did not benefit from this extra retail space: seafood. Seafood decreased in the length of the retail case to 3.6 meters from 5.5 meters. All other species groups increased or remained relatively the same when comparing 2004 and 2018 (Reicks et al., 2008a).

Chicken has grown to be the largest percentage of the retail case since 2004. In 2018, 19.2% of the retail case is dedicated to chicken surpassing beef at 16.4%. This could be in result of a lower price per pound, which is the leading factor in consumer decision (Schnettler et al., 2009). Beef is still second in representation in the meat case making up 16.4% of the meat case in 2018. Turkey has seen a slight rise in its make up of the meat case growing from 3.8 to 5.8% of the meat case (Reicks et al., 2008a). Marketing of turkey as healthier due to a lower fat content could have influenced this increase (National Turkey Federation, n.d.).

## **CONCLUSION**

The meat case can change based on the outside force of innovation, marketing, and consumer demands. As consumption has increased, chicken has also taken over as the leading percentage of the meat case nationally. Beef often had the highest percentages of different SKUs because of the varied cut types and marketing seen in the retail case. Veal saw the largest year to year drop in the meat case dropping out of 20% of meat cases nationwide. Nationwide, stores have increased their offerings of value-added products, meal kits, and heat and serve items as consumer demand for speed and convenience has increased. Understanding the composition of the meat case serves as an avenue to better serve an ever-changing consumer. Continued auditing of the United States meat case could prove to give the meat industry a fuller picture of the meat case and its consumer.



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**Table 17.** Presence of species categories in all self-service meat cases (N = 108) by US region in 2015.

Species Category	Region					SEM <sup>1</sup>	P-value	National
	Mountain/ Southwest	Midwest	Northeast	Southeast	West Coast			
Beef	100.0	100.0	100.0	100.0	100.0	1.58		100.0
Ground Beef	89.5	100.0	95.7	100.0	100.0	1.58	0.18	97.2
Pork	94.7	100.0	100.0	100.0	100.0	1.58	0.32	99.1
Veal	60.0 <sup>b</sup>	26.3 <sup>ab</sup>	82.6 <sup>a</sup>	40.0 <sup>ab</sup>	52.4 <sup>ab</sup>	1.58	<0.01	53.7
Lamb	68.4	80.0	95.7	95.0	85.7	1.58	0.08	87.0
Chicken	100.0	100.0	100.0	100.0	100.0	1.58		100.0
Turkey	94.7	100.0	95.7	100.0	100.0	1.58	0.52	98.1
Fresh Sausage	89.5	96.0	100.0	95.0	95.2	1.58	0.62	96.3
Value-added	89.5 <sup>a</sup>	68.0 <sup>a</sup>	100.0 <sup>a</sup>	85.0 <sup>a</sup>	71.4 <sup>a</sup>	1.58	<.05	82.4
Heat and Serve	52.6	60.0	56.5	40.0	52.4	1.58	0.49	52.8
Non-Meat	47.4	40.0	65.2	30.0	38.1	1.58	0.18	45.4
Other	47.4	56.0	70.0	30.0	28.6	1.58	<0.05	47.2
Processed Meat	78.9 <sup>a</sup>	84.0 <sup>a</sup>	69.6 <sup>a</sup>	70.0 <sup>a</sup>	42.9	1.58	<0.05	69.4
Seafood	84.2 <sup>ab</sup>	92.0 <sup>a</sup>	43.5 <sup>b</sup>	65.0 <sup>ab</sup>	52.4 <sup>ab</sup>	1.58	<0.01	67.6

<sup>1</sup> Standard Error of Proportion- square root of the population proportion multiplied by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 18.** Length in meters of species categories in all self-service meat cases (N = 108) by US region in 2015.

Species Category	Region					SEM	P-value	National
	Mountain/ Southwest	Midwest	Northeast	Southeast	West Coast			
Beef	16.7	15.1	15.9	11.8	14.6	2.0	0.42	14.8
Ground Beef	6.0 <sup>b</sup>	11.7 <sup>a</sup>	7.4 <sup>ab</sup>	6.4 <sup>b</sup>	6.8 <sup>b</sup>	1.40	<0.01	7.9
Pork	10.0	14.9	11.1	10.9	11.6	1.70	0.20	11.9
Veal	0.9	0.8	1.3	0.8	0.6	0.39	0.23	0.9
Lamb	1.3	1.6	2.2	1.5	1.9	0.24	0.12	1.7
Chicken	14.1	16.0	18.6	17.5	13.5	2.40	0.40	16.0
Turkey	3.2	5.5	5.3	4.2	5.2	0.81	0.19	4.8
Fresh Sausage	8.8	14.4	10.6	4.8	6.8	1.30	0.05	9.4
Value-added	5.7	4.7	5.3	6.8	5.1	1.20	0.69	5.5
Heat and Serve	5.2	6.8	5.2	5.6	6.5	1.90	0.91	5.9
Non-Meat	8.6	3.6	1.8	2.8	1.7	3.98	0.53	3.6
Other	2.1	1.8	2.5	0.8	1.8	0.77	0.47	1.9
Processed Meat	13.7 <sup>ab</sup>	28.1 <sup>a</sup>	14.5 <sup>ab</sup>	7.5 <sup>b</sup>	8.2 <sup>b</sup>	5.80	<0.01	16.1
Seafood	6.3	7.8	6.9	7.2	7.1	1.52	0.92	7.1
Regional Average	102.6	135.2	108.6	88.6	91.4			107.5

<sup>1</sup> Standard Error of Proportion- square root of the population proportion multiplied by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 19.** Length of retail case represented as percentage by species categories in the self-service meat case by US region (N = 108) in 2015.

Species Category	Region					SEM	P-value	National
	Mountain/ Southwest	Midwest	Northeast	Southeast	West Coast			
Beef	19.4	17.1	17.7	15.0	16.7	2.05	0.08	16.4
Ground Beef	9.3	9.5	10.1	9.2	7.5	2.03	0.25	9.2
Pork	13.5 <sup>ab</sup>	15.1 <sup>a</sup>	13.1 <sup>ab</sup>	12.7 <sup>ab</sup>	10.8 <sup>b</sup>	2.03	<0.05	12.7
Veal	0.6	0.8	1.2	1.0	0.9	1.56	0.51	1.0
Lamb	1.8	1.6	3.8	1.9	2.5	1.98	0.41	1.8
Chicken	22.7	17.6	21.8	20.1	19.1	2.05	0.06	19.2
Turkey	5.7	5.8	6.5	6.0	6.1	2.03	0.95	5.5
Fresh Sausage	6.5 <sup>a</sup>	8.0 <sup>a</sup>	8.8 <sup>a</sup>	5.7 <sup>a</sup>	9.1 <sup>a</sup>	1.99	<0.05	7.9
Value-added	6.1	4.9	6.6	7.9	7.0	1.95	0.28	6.3
Heat and Serve	6.6	5.8	4.1	5.9	6.4	1.53	0.30	5.8
Non-Meat	4.4	3.2	3.4	3.4	2.8	1.45	0.66	3.5
Meal Kits	2.9 <sup>b</sup>	2.3 <sup>ab</sup>	3.2 <sup>ab</sup>	3.1 <sup>ab</sup>	6.5 <sup>a</sup>	1.12	<0.05	3.3
Other	1.5	1.3	0.9	2.2	1.6	1.45	0.62	1.4
Processed Meat	11.2	13.2	10.0	12.7	11.9	1.84	0.85	12.7
Seafood	5.1	3.6	5.4	6.3	4.4	1.90	0.41	4.3

<sup>1</sup> Standard Error of Proportion- square root of the population proportion multiplied by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 20.** Number of SKUs for each species per region (N = 15,137) in 2015.

Item	Region									
	MT		MW		NE		SE		West	
	n	%	n	%	n	%	n	%	n	%
Species										
Beef	678	34.4	965	28.3	995	30.5	1090	29.4	900	32.4
Ground Beef	240	12.2	455	13.3	307	9.4	462	12.5	294	10.6
Pork	396	20.1	771	22.6	707	21.7	915	24.7	646	23.2
Chicken	430	21.8	759	22.2	814	24.9	822	22.2	562	20.2
Turkey	154	7.8	299	8.8	249	7.6	268	7.2	252	9.1
Lamb	43	2.2	78	2.3	115	3.5	97	2.6	99	3.6
Veal	7	0.4	41	1.2	45	1.4	38	1.0	15	0.5
Other	23	1.2	44	1.3	31	1.0	18	0.5	23	0.8
Total	1971	100.0	3412	100.0	3263	100.0	3710	100.0	2781	100.0
Average per Store	79		103		117		116		84	
Meters per SKU	0.48		0.50		0.45		0.48		0.41	

**Table 21.** Presence of species categories in all self-service meat cases (N = 150) by US region in 2018.

Species Category	Region					SEP	P-value	National
	Mountain/Southwest	Midwest	Northeast	Southeast	West Coast			
Beef	100.0 <sup>a</sup>	100.0 <sup>a</sup>	96.4	100.0 <sup>a</sup>	100.0 <sup>a</sup>	1.29	<0.01	98.0
Ground Beef	100.0	100.0	96.4	100.0	100.0	1.29	0.07	97.3
Pork	100.0	100.0	96.4	100.0	96.9	1.29	0.55	98.0
Veal	16.0 <sup>b</sup>	15.2 <sup>b</sup>	60.7 <sup>a</sup>	31.3 <sup>ab</sup>	21.9 <sup>b</sup>	1.29	<0.01	29.3
Lamb	68.0	72.7	85.7	78.1	81.3	1.29	0.55	78.0
Chicken	100.0	100.0	100.0	100.0	100.0	1.29		100.0
Turkey	100.0	100.0	100.0	100.0	100.0	1.29		98.7
Fresh Sausage	84.0	97.0	92.9	96.9	93.8	1.29	0.30	93.3
Value-added	68.0 <sup>a</sup>	90.9 <sup>a</sup>	92.9 <sup>a</sup>	90.6 <sup>a</sup>	93.8 <sup>a</sup>	1.29	<0.05	90.0
Heat and Serve	52.0	51.5	57.1	65.6	71.9	1.29	0.40	60.7
Meal Kits	40.0	36.4	46.4	50.0	28.1	1.29	0.38	41.3
Non-Meat	48.0	72.7	71.4	43.8	62.5	1.29	0.06	61.3
Other	28.0	36.4	21.4	25.0	53.1	1.29	0.06	36.0
Processed Meat	64.0 <sup>a</sup>	90.9 <sup>a</sup>	71.4 <sup>a</sup>	87.5 <sup>a</sup>	87.5 <sup>a</sup>	1.29	<0.05	82.0
Seafood	84.0 <sup>a</sup>	78.8 <sup>a</sup>	46.4 <sup>a</sup>	81.3 <sup>a</sup>	78.1 <sup>a</sup>	1.29	<0.01	76.7

<sup>1</sup> Standard Error of Proportion- square root of the population proportion multiplied by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 22.** Length in meters of species categories in the self-service meat case by US region (n = 150) in 2018.

Species Category	Region					SEM	P-value	National
	Mountain/ Southwest	Midwest	Northeast	Southeast	West Coast			
Beef	15.8 <sup>a</sup>	15.8 <sup>a</sup>	15.0 <sup>ab</sup>	10.7 <sup>b</sup>	12.4 <sup>ab</sup>	1.60	<0.01	13.8
Ground Beef	7.5	9.4	9.1	6.8	5.9	1.20	0.09	7.7
Pork	11.3 <sup>ab</sup>	13.7 <sup>a</sup>	11.6 <sup>ab</sup>	8.4 <sup>b</sup>	8.2 <sup>b</sup>	1.20	<0.01	10.6
Veal	0.3 <sup>a</sup>	1.0 <sup>a</sup>	1.3 <sup>a</sup>	0.7 <sup>a</sup>	0.7 <sup>a</sup>	0.40	<0.01	0.9
Lamb	1.3	1.6	1.8	1.2	1.7	0.24	0.22	1.5
Chicken	18.4 <sup>a</sup>	16.1 <sup>a</sup>	18.6 <sup>a</sup>	14.2 <sup>a</sup>	13.4 <sup>a</sup>	1.60	<0.05	16.0
Turkey	4.2	5.5	4.6	4.2	4.5	0.53	0.27	4.6
Fresh Sausage	5.9 <sup>ab</sup>	9.0 <sup>a</sup>	7.6 <sup>ab</sup>	3.7 <sup>b</sup>	6.9 <sup>ab</sup>	1.30	<0.01	6.7
Value-added	5.6	5.3	5.8	5.0	5.0	1.22	.96	5.3
Heat and Serve	6.0	6.3	3.7	4.5	5.2	1.10	0.31	5.1
Non-Meat	5.5	3.5	3.1	2.8	2.3	0.99	0.13	3.3
Meal Kits	2.4 <sup>ab</sup>	2.7 <sup>ab</sup>	2.5 <sup>ab</sup>	2.0 <sup>b</sup>	6.2 <sup>a</sup>	1.10	<0.05	2.9
Other	1.1	1.5	0.7	1.5	1.1	0.76	0.76	1.2
Processed Meat	10.9	15.2	11.4	9.8	8.9	3.20	0.39	11.3
Seafood	3.9	3.5	3.0	4.1	3.3	0.95	0.89	3.6
Average	100.1	110.1	99.8	79.6	85.7			90.9

<sup>1</sup> Standard Error of Proportion- square root of the population proportion multiplied by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )



**Table 23.** Length of retail case represented as percentage by species categories in the self-service meat case by US region (N = 150).

Species Category	Region					SEM	P-value	National
	Mountain/ Southwest	Midwest	Northeast	Southeast	West Coast			
Beef	19.4	17.1	17.7	15.0	16.7	2.05	0.08	16.4
Ground Beef	9.3	9.5	10.1	9.2	7.5	2.03	0.25	9.2
Pork	13.5 <sup>ab</sup>	15.1 <sup>a</sup>	13.1 <sup>ab</sup>	12.7 <sup>ab</sup>	10.8 <sup>b</sup>	2.03	<0.05	12.7
Veal	0.6	0.8	1.2	1.0	0.9	1.56	0.51	1.0
Lamb	1.8	1.6	3.8	1.9	2.5	1.98	0.41	1.8
Chicken	22.7	17.6	21.8	20.1	19.1	2.05	0.06	19.2
Turkey	5.7	5.8	6.5	6.0	6.1	2.03	0.95	5.5
Fresh Sausage	6.5 <sup>a</sup>	8.0 <sup>a</sup>	8.8 <sup>a b</sup>	5.7 <sup>a</sup>	9.1 <sup>a</sup>	1.99	<0.05	7.9
Value-added	6.1	4.9	6.6	7.9	7.0	1.95	0.28	6.3
Heat and Serve	6.6	5.8	4.1	5.9	6.4	1.53	0.30	5.8
Non-Meat	4.4	3.2	3.4	3.4	2.8	1.45	0.66	3.5
Meal Kits	2.9 <sup>b</sup>	2.3 <sup>ab</sup>	3.2 <sup>ab</sup>	3.1 <sup>ab</sup>	6.5 <sup>a</sup>	1.12	<0.05	3.3
Other	1.5	1.3	0.9	2.2	1.6	1.45	0.62	1.4
Processed Meat	11.2	13.2	10.0	12.7	11.9	1.84	0.85	12.7
Seafood	5.1	3.6	5.4	6.3	4.4	1.90	0.41	4.3

<sup>1</sup> Standard Error of Proportion- square root of the population proportion multiplied by 1 less than the population divided by number of samples

<sup>a-f</sup> Letters lacking a common superscript differ ( $P < 0.05$ )

**Table 24.** Number of SKUs for each species per region (n = 23,195).

Item	Region									
	MT		MW		NE		SE		West	
	n	%	n	%	n	%	n	%	n	%
Species										
Beef	1132	29.6	1361	24.7	1088	25.3	1473	26.7	1160	28.6
Ground Beef	570	14.9	624	11.3	464	10.8	642	11.6	434	10.7
Pork	786	20.5	1513	27.5	1085	25.3	1323	24	834	20.5
Chicken	824	21.5	1212	22	1015	23.6	1254	22.7	950	23.4
Turkey	286	7.5	487	8.9	319	7.4	394	7.1	314	7.7
Lamb	89	2.3	111	2.0	142	3.3	133	2.4	128	3.2
Veal	3	0.1	20	0.4	45	1.0	33	0.6	11	0.3
Seafood	126	3.3	123	2.2	90	2.1	225	4.1	198	4.9
Other	12	0.3	49	0.9	45	1.0	37	0.7	31	0.8
Total	3828	100.0	5500	100.0	4293	100.0	5514	100.0	4060	100.0
Average per Store	153		153		153		134		127	
Meters per SKU	0.40		0.39		0.39		0.28		0.38	