

Original Paper

The U.S. Toothpaste Market: A Competitive Profile

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Abstract

This paper follows the path of seven studies (see below). However, it is different in one important respect: it also offers a benefit segmentation profile of the U.S. Toothpaste Market.

Porter associates high market share with cost leadership strategy which is based on the idea of competing on a price that is lower than that of the competition. However, customer-perceived quality—not low cost—should be the foundation of competitive strategy, because it is far more vital to long-term competitive position and profitability than any other factor. So, a superior alternative is to offer better quality vs. the competition.

In most consumer markets a business seeking market share leadership should try to serve the middle class by competing in the mid-price segment; and offering quality better than that of the competition: at a price somewhat higher, to signify an image of quality, and to ensure that the strategy is both profitable and sustainable in the long run.

Quality, however, is a complex concept that consumers generally find difficult to understand. So, they often use relative price, and a brand's reputation as a symbol of quality.

In 2008 retail sales in the U.S. were \$1.27 Billion for the Toothpaste Market. The market leader Crest had a market share of 34.7%, closely followed by Colgate with a share of 33.5%. We focused on the most popular pack-size—5.8-6.5oz—which had a 45.3% share. Employing Hierarchical Cluster Analysis, we tested two hypotheses: (1) That a market leader is likely to compete in the mid-price segment, and (2) That the unit price of the market leader is likely to be somewhat higher than that of the nearest competition.

Employing U.S. retail sales data for 2008 and 2007, we found that, for both 2008 and 2007, the market leader in the U.S. Toothpaste market—Crest—was a member of the mid-price segment. Furthermore, the unit price of Crest was somewhat higher than that of Colgate, the runner-up, which was also a member of the mid-price segment.

Thus, the results fully supported both Hypothesis I and II—for 2008 and 2007.

We also found strong support for the idea, that relative price is a strategic variable, as we have hypothesized.

We discovered five benefit segments. The most fundamental result of this analysis is that it revealed an avalanche of various brands of toothpaste that not only whitened teeth, but were also helpful in preventing tooth decay, as before.

Finally, we discovered four strategic groups in the industry.

Keywords

U.S. Toothpaste Market, cost leadership, price-quality segmentation, benefit segmentation, market-share leadership, relative price a strategic variable, strategic groups.

1. Introduction

This work follows the path of *seven* studies: the U.S. Men's Shaving Cream, the U.S. Beer, the U.S. Shampoo, the U.S. Shredded/Grated Cheese, the U.S. Refrigerated Orange Juice, the U.S. Men's Razor-Blades, and the U.S. Women's Razor-Blades markets (Datta, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b). However, this research is different in one important way: that we have also been able to offer a *benefit* segmentation profile of the U.S. Toothpaste Market.

This research is based on the idea that the path to market share leadership does not lie in lower price founded in *cost leadership* strategy, as Porter (1980) suggests. Rather, it is based on the premise—according to the PIMS (Note 1) database research—that it is *customer*-perceived quality that is crucial to long-term competitive position and profitability. So, the answer to market share leadership for a business is to *differentiate* itself by offering quality that is *better* than that of the nearest competition (Datta, 2010a, 2010b, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b).

To make this idea *operational* requires *two* steps. The first is to determine which price-quality segment to compete in? Most consumer markets can be divided in three *basic* price-quality segments: *premium*, *mid-price*, and *economy*. These can be extended to *five* by adding two more: *ultra-premium* and *ultra-economy* (Datta, 1996, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b). The answer lies in serving the *middle* class by competing in the *mid-price* segment. This is the socio-economic segment that represents about 40% of households in America (Datta, 2011). It is also the segment that Procter & Gamble (P&G), a leading global consumer products company, has successfully served in the past (Datta, 2010b, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b).

1.1 The Strategic Importance of Price Positioning

The second step is to position the brand at a price that is *somewhat* higher than that of the nearest competition in the *mid-price* segment. This is in accord with P&G's practice based on the idea that although higher quality does deserve a "price premium," it should *not* be excessive (Datta, 2010b). A higher price offers two advantages: (1) it promotes an image of quality, and (2) it ensures that the strategy is both profitable and sustainable in the long run (*ibid*).

A classic example of price positioning is provided by General Motors (GM). In 1921 GM rationalized

its product line by offering “a car for every purse and purpose”—from Chevrolet to Pontiac, to Oldsmobile, to Buick, to Cadillac. More importantly, GM positioned each car line at the *top* of its segment (Datta, 1996, 2010a, 2017, 2018a, 2018b, 2018c, 2019a, 2019b).

A more recent and familiar example is the *economy* chain, Motel 6, which has positioned itself as “offering the *lowest* price of any national chain”. Another example is the Fairfield Inn. When Marriott introduced this chain, it targeted it at the *economy* segment. And then it positioned it at the *top* of that segment (Datta, 1996, 2017, 2018a, 2018b, 2018c, 2019a, 2019b).

1.2 Close Link between Quality and Price

As mentioned above, *customer*-perceived quality is the most important variable contributing to the long-term success of a business. However, quality cannot really be separated from the price (Datta, 1996). Quality, in general, is an intricate multi-dimensional concept that is difficult to understand. So, consumers often use *relative* price—and a brand’s reputation—as a symbol of quality (Datta, 2010b, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b).

2. History of Brushing Teeth and Toothpaste

2.1 Teeth-cleaning Twig or *Datun*

Brushing with a teeth-cleaning twig from a tree can be helpful in preventing tooth decay and gum disease. Its use dates all the way back to 3500-3000 BC, when Babylonians and Egyptians made a toothbrush by *chewing* a twig until one end is *frayed*, while the other end could then be used as a *toothpick*. It was around 1600 BC that the Chinese developed chewing sticks which were made from *aromatic* tree twigs to *freshen* breath. According to Buddhist scriptures, chewing sticks—called *datun*—were in use in Northwestern India around the 5th century BC (Note 2, Note 3).

The most common plants used for twigs are those with a high *tannins* content: meaning that they possess *astringent* and *antibacterial* qualities that promote healthy gums and teeth (Note 3).

In India the most common chewing sticks are *neem* twigs. *Neem* has strong *anti-bacterial* and *anti-microbial* properties. That is why brushing with *neem datun* is still very popular in small towns and rural India (Note 3). It is effective in “fighting *germs*, maintaining the *alkaline* levels in your saliva, keeping bacteria at bay, treating *swollen gums*, preventing *plaque* and also giving you *whiter* teeth” (Sengupta, 2018; *italics* added; also Note 4).

2.2 The Natural-Bristle Toothbrush

The Chinese are believed to have invented the *first* natural-bristle toothbrush made out of bristles from pig’s necks. The first precursor to modern toothbrush was invented by William Addis in England around 1780. While the handle was carved out of cattle bone, yet the brush was still made from swine bristles (Note 2).

2.3 The Nylon Toothbrush

With the invention of nylon by Du Pont in 1938, the *first* toothbrush made with *nylon* yarn went on sale on February 24, 1938. The Broxodent, a Swedish invention, was the first *electric* toothbrush that

appeared in the U.S. in 1960 (Note 5).

Today both manual and electric toothbrushes come in several shapes and sizes, and most are made of *plastic*-molded handles and nylon bristles (Note 2).

2.4 Early History of Toothpaste

Egyptians are said to have started using a toothpaste to clean their teeth around 5,000 BC. This was a time before toothbrushes were invented. Ancient Greeks and Romans are also believed to have used toothpaste, and the Chinese and Indians, too, were using toothpaste around 500 BC (Note 2).

Ancient toothpastes were intended to treat some of the *same* concerns that we have today: keeping teeth and gums *clean*, *whitening* teeth and *freshening* breath. The ingredients of ancient toothpastes were however quite *different*. For example: (1) A powder of *ox hooves' ashes* and *burnt eggshells* that was combined with *pumice*, (2) The Greeks and Romans preferred more *abrasiveness* and their toothpaste ingredients included *crushed bones* and *oyster shells*, (3) The Romans added more *flavoring* to combat bad breath as well as powdered *charcoal* and *bark*, (4) The Chinese used a *wide* variety of ingredients in toothpastes. Over time these included ginseng, herbal mints and salt (Note 2).

The development of toothpastes in more recent times began in the 1800s. Early versions contained *soap*, and in the 1850s *chalk* was added. *Betel nut* was included in toothpaste in England in the 1800s, and in the 1860s a home encyclopedia described a home-made toothpaste that used ground *charcoal* (Note 2).

2.4.1 The Pioneering Role of Colgate

Prior to the 1850s, "toothpastes" were usually *powders*. During the 1850s, a new toothpaste in a *jar* called Crème Dentifrice was developed. In 1873 Colgate started the mass production of toothpaste in *jars* (Note 2).

In 1911 Colgate distributed *two* million tubes of toothpaste *and* toothbrushes to schools, and provided hygienists to demonstrate tooth brushing (Note 6).

In the early years of the twentieth century Colgate did *more* than any other company to promote toothpaste (Miskell, 2004).

2.4.2 Colgate Introduces Toothpaste in a Collapsible Tube

In 1896 Colgate introduced a toothpaste in a *collapsible* tube similar to contemporary toothpaste tubes (Note 6). At that time a jar of toothpaste cost a manual worker half a-day's wage. The collapsible tube not only cut down the *cost* of producing toothpaste significantly, it also eliminated the *unhygienic* practice of scooping the paste from shared jars onto a toothbrush. Later, another innovation by Colgate made it possible for toothpaste to come out in a flat "ribbon" that would *not* easily fall off the brush (Miskell, 2004).

This *packaging* innovation by Colgate turned out to be *critical* in stimulating mass production and consumption of toothpaste because consumers found toothpaste in a collapsible tube so *easy* to use (*ibid*).

2.5 History of Brushing by Americans

Surprisingly, most Americans did *not* brush their teeth until after WWII. When the Army soldiers returned home after the war, they brought with them the habit of *regular* brushing: a practice the Army had made obligatory (Warner, 2014; Bellis, 2018).

No wonder dental *cavities* had become a big health problem in America at that time.

A similar phenomenon happened to *shaving* by men before WWI. Then, a two-day *stubble* was quite common among American men. However, during WWI American military began to issue Gillette shaving kits to every U.S. serviceman. When the soldiers returned home after WWI, the *required* habit of clean shaving acquired by millions of servicemen broke down any lingering resistance to self-shaving among the civilian men (Datta, 2019a).

3. A Brief History of the Sugar Industry

It was around 400 B.C. that sugar production started in India (Note 7). In his second voyage across the Atlantic in 1493, Christopher Columbus carried sugarcane stalks from the Spanish Canary Islands (Muhammad, 2019). The Portuguese introduced sugar to Brazil in the middle of the 16th century. After 1625 the Dutch brought sugarcane from South America to the Caribbean islands where it was cultivated from Barbados to Virgin Islands (Note 8).

3.1 Slavery and the Sugar Industry

For thousands of years sugarcane was a *heavy* and unwieldy crop that was very *labor-intensive*. It was the introduction of *slavery* that changed everything. “The true Age of Sugar had begun—and it was doing more to *reshape* the world than any ruler, empire, or war had ever done”. Over the four centuries following the arrival of Columbus in the New World, innumerable lives were *destroyed* and around 11 million Africans were *enslaved*” (Muhammad, 2019; *italics added*).

The manufacture of sugar from sugarcane began in Louisiana Territory in 1795. Within decades, Louisiana planters were producing as much as a *quarter* of the world’s cane-sugar output. However, this impressive achievement was the fruit of a bitter harvest grown on the backs of *enslaved* labor. In sugar mills, children, alongside with adults, “toiled like factory workers with assembly-like precision and discipline under the constant threat of boiling hot kettles, open furnaces and grinding rollers” (*ibid*).

To attain the highest efficiency—like the round-the-clock Domino refinery *today*—sugar factories worked day and night. On cane plantations there is no distinction as to the days of the week. Fatigue might mean losing an arm to the grinding rollers, or being flayed for not being able to keep up. Resistance was often met with *sadistic* cruelty (*ibid; italics added*).

Louisiana led America in *destroying* the lives of black people: all in the name of *efficiency*. Life expectancy on a sugar plantation was *less* like that on a cotton plantation, but *more* than on a Jamaican cane field, where the “most overworked and abused could drop *dead* after just *seven* years” (*ibid; italics added*).

3.2 *The Birth of High Fructose Corn Syrup (HFCS)*

In the early 1970s the Nixon administration told American farmers that the government would pay them for all the corn they could produce. This policy of *cheap* corn led to considerable increase in the production of corn, which, in turn, drove the price of corn down. This policy led to an unintended consequence that was *monumental* in scope. Now a *new* kind of sweetener—High Fructose Corn Syrup (HFCS)—became much *cheaper* to produce than sugar. More importantly, the consumers couldn't tell the difference between the two (Pollan, 2009, p. 80; also, Datta, 2017).

In 1980 Coca Cola and Pepsi switched over from sugar to HFCS. But, instead of reducing cola prices Coke and Pepsi chose a different path: *increase* the size of the cola bottle (*ibid*).

Since then HFCS have become the *chief* source of sweeteners in our diet (Pollan, 2006, p. 103).

3.3 *The Insatiable American Craving for Sugar*

In colonial Maryland more than 300 years ago the governor's wife died. Her coffin was made out of expensive *lead*; her wrists were bound with *silk* ribbons. But one of the "most telling signs of her wealth was her *teeth*"—or lack thereof. She had lost 20, and many others had *decayed* right down to the root stubs. One reason her mouth was in such bad shape was that "she was *affluent* enough to *afford* sugar" (Gritz, 2017; *italics* added).

We have been "hardwired by natural selection" to desire *sweet* foods (Pollan, 2008, p. 112). Yet, earlier Americans could not get enough because sugar then was a luxury item. During the time of George Washington—who wore *false* teeth—Americans consumed just *six* pounds of sugar per year (Gritz, 2017). By the middle of the twentieth century, sugar became much more affordable, thanks to its mass production. Consequently, the per capita consumption of sugar jumped to 100 pounds per year (Miskell, 2004).

Today the average American consumes 130 pounds of sugar every year, much of it in the form of the cheap HFCS. Sugar has become so pervasive today that most of it is consumed by *lower-income* Americans. According to a 2013 Gallup poll, Americans with an income of *less* than \$30,000 per year are *more* than twice as likely to drink *regular* soda that those earning more than \$75,000 per year (Gritz, 2017).

3.4 *Sugar and Dental Cavities*

It is commonly known that sugar can lead to tooth decay, but not many understand how it happens. The mouth is populated by a myriad of bacteria many of which are beneficial to oral health. However, some *harmful* bacteria feed on the sugars we eat that create *acids* that destroy the tooth enamel. This in turn leads to *cavities* that cause *holes* in the teeth (Note 9).

Acids *leech* minerals from the teeth through a process known as *demineralization*. Luckily, the natural process of *remineralization* replenishes these minerals that strengthen the teeth back again. The vital factor in this process is *saliva* that contains minerals like *calcium* and *phosphates* that help repair weakened enamel. Another mineral is *fluoride* that can aid in repairing damaged enamel (Note 10).

4. Industrialization of American Food and Dental Decay

An important reason for *processing* food is the need to *preserve* it. However, industrial processing goes *far* beyond extending food shelf life. Instead, it is particularly calculated to “sell us *more* food by pushing our *evolutionary* buttons—our *inborn* preferences for *sweetness* and fat and salt” Pollan (2008, pp. 149-150; *italics* added; also, Datta, 2017).

4.1 From Whole Foods to Refined

Humans have been refining cereal grains at least before the industrial revolution with a preference for *white* flour. So, white flour acquired an aura of *prestige*. The introduction of steel rollers in 1870 marks the beginning of the *industrialization* of our food (Pollan, 2008, p. 107).

Before the steel rollers, wheat flour was produced by grinding wheat between two large *stone* wheels. But this process produced flour that was *far* from being white. This is because that while stone grinding removed the *bran*—the part that contains *fiber*—from the wheat *kernel*, it could *not* separate the *germ*: the component that contains volatile *oils* that are *rich* in *nutrients*. This operation produced *two* important results: (1) The flour acquired a yellowish gray *tint*, and (2) It *shortened* the flour’s shelf life, because the oil once exposed to the air soon oxidized and turned *rancid* (Pollan, 2008, pp. 107-108).

With the invention of steel rollers, it became possible to remove the *germ*—the component rich with *nutrients*—and then grind the remaining part—endosperm—into a an extremely *fine* powder. Now everyone could *afford* snowy-*white* flour that could stay on a shelf for months (Pollan, 2008, p. 108).

Ironically, the problem was that this “gorgeous white powder was nutritionally *worthless* or nearly so” (*ibid*; *italics* added).

The roller milling process not only removed wheat *germ*—and its nutrients—but also the *fiber*, leaving behind nothing but *starch* and a little protein (Note 11) Starches made from *white* flour are *carbohydrates* that can *linger* in your mouth and then break down into simple *sugars*. Bacteria feed on these sugars and produce *acid*, which causes tooth *decay* (Note 12).

Research during the early years of the twentieth century revealed that where people ate *coarser* dry bread had much lower incidence of cavities, than people who ate *soft* white-flour bread. This is because the coarser bread stimulated secretion of *saliva* which contains *alkaline* properties that *neutralize* acids in the mouth (Miskell, 2004).

Pollan (2008, pp. 9-10) suggests that *four* of our leading *chronic* diseases—coronary heart disease, diabetes, stroke and cancer—can be traced directly to *industrialization* of our food, which he calls the *Western* diet. Among the key factors contributing to these diseases are the rise of highly *processed* foods, *refined* grains, and the “superabundance of *cheap* calories of *sugar* and fat produced by modern agriculture” (*italics* added).

However, studies of *native* populations *not* exposed to the Western diet, reveals a different picture. In the early decades of the twentieth century, several medical professionals working with native populations in several countries found almost complete absence of these four chronic diseases that afflicted Western societies at that time (Pollan, 2008, pp. 90-91).

But more importantly, as far as this study is concerned, they had little or *no* tooth decay as well (*ibid*).

5. The Modern History of the U.S. Toothpaste Industry

5.1 P&G Launches Crest Toothpaste with Fluoristan

In the early 1940s Procter & Gamble (P&G) started a research program to discover ingredients that when added to a toothpaste would *decrease* tooth decay. Then Americans developed about 700 million *cavities* a year. That made dental disease one of the *most* common health problems in America (Note 13).

In 1950 P&G created a joint research project, led by Dr. Joseph Muhler of the University of Indiana, to develop and test a toothpaste with *fluoride*. A clinical study found 49% *reduction* in cavities in children with ages between 6-16 years, with almost identical results among adults (Note 13; also see Miskell, 2004).

In view of such encouraging results, P&G launched Crest with Fluoristan nationally in 1956. In 1960 Crest became the *first* brand of toothpaste to earn an endorsement from the American Dental Association. As a result, Crest's sales nearly tripled, pushing it well ahead of the best-selling toothpaste in the United States. In 1976, the American Chemical Society recognized Crest with fluoride as one of the 100 greatest discoveries of the previous 100 years (Note 10).

P&G launched Gleem toothpaste in 1953, and soon it was able to garner a market share of 20 percent (Miskell, 2004). However, after the introduction of Crest in 1955, Gleem began to lose its popularity. Finally, in 2014 P&G discontinued it (Note 14).

5.2 Colgate Palmolive Co.

In 1953 Colgate-Palmolive Co. became the company's official name.

In 1963 Colgate added *MFP Fluoride* to reduce cavities. In 1997 Colgate introduced *Total* toothpaste, and quickly it became the market *leader* (Note 14). In 2018 Colgate introduced the *next* generation of Colgate *Total* toothpaste which contains a new *stannous fluoride* formula that "fights plaque-causing bacteria on 100% of mouth surface, including teeth, tongue, cheeks, and gums" (*italics added*) (Note 15).

5.3 Glaxo SmithKline and Aquafresh

Glaxo SmithKline is a British multinational pharmaceutical company that was formed as the result of a merger of Glaxo Wellcome and SmithKline Beecham in 2000 (Note 16). SmithKline Beecham introduced Aquafresh toothpaste in 1973. Aquafresh was the *first* striped toothpaste. Originally, it had two colors: blue and white. But later a third red stripe was also added (Note 17).

According to the company Aquafresh was the *first* brand to offer 'freshness' as a *major* product benefit. This is because "fresh breath" and "good-tasting" toothpastes were important to *young* people and families at that time (Note 18).

5.4 Glaxo SmithKline and Sensodyne

Sensodyne was introduced in 1961 by Block Drug, a Brooklyn, New York-based company, which was acquired by Glaxo-SmithKline in 2000 (Note 18). Sensodyne is targeted at people with *sensitive* teeth (Note 19).

5.5 Church & Dwight and Arm & Hammer Toothpaste

Church & Dwight—maker of Arm & Hammer (A&H) baking soda—entered the U.S. toothpaste market in 1989 in a joint venture with Occidental Petroleum. In a brilliant advertising campaign during the prior decade, A&H had dramatically raised consumer awareness of its baking soda as a refrigerator *deodorant* and *freshener*. Also baking soda had a long-standing reputation as an effective *dentifrice*. Furthermore, A&H had access to mass marketing *channels* through the distribution of A&H baking soda (Datta, 1996). So, exploiting these rich resources, A&H successfully launched its Dental Care brand in 1989. Following the A&H's example, now almost every brand offers a baking soda toothpaste (*ibid*).

Thus, A&H created a new benefit *segment* that the Big Two—Crest and Colgate—had ignored up to that point (*ibid*).

5.6 Rembrandt the First Whitening Toothpaste in America

Rembrandt introduces the “first-ever whitening toothpaste” in America in 1989 (Note 20).

6. Benefit Segmentation of the U.S. Toothpaste Market: The White-Teeth Revolution

There are *two* ways to look at market segmentation: demand-side and supply-side. Traditionally, much of the marketing literature views market segmentation from the *demand* side focusing on *people* or customer characteristics, such as, demographics, sociographics, or psychographics. On the other hand, there is *supply*-side segmentation that centers on *product* characteristics, such as price-quality segmentation, physical product attributes, product quality or benefits, and so on (Datta, 1996).

However, starting with *product* characteristics is both an *easier* and more *actionable* way of segmenting markets than the traditional demand-oriented approach followed in the marketing discipline (*ibid*).

As mentioned above, one of the important attributes of the product-characteristics approach is *benefit* segmentation. We are fortunate to have access to three studies of *benefit* segmentation of the U.S. Toothpaste Market. Now let us see how they have addressed this issue.

Miskell (2004) recognizes *two* broad benefit segments: (1) Therapeutic, and (2) Cosmetic.

Haley (1968) has identified *four* benefit segments: (1) Decay prevention, (2) Brightness of teeth, (3) Flavor, product appearance, and (4) Price.

Datta (1996) discovered *five* benefit segments: (1) Dental Health, (2) Appearance, (3) Aesthetics, (4) Taste, Color, and Convenience, and (5) Low Price.

There are two main differences between Haley's and Datta's views. One is the latter's recognition of the *Aesthetics* segment which came into being when Tom's of Maine launched its toothpaste with *natural* ingredients in 1970, as we have mentioned later—and more importantly—when Arm & Hammer entered the market with a *baking soda* toothpaste in 1989. Second, Haley characterizes one of his four segments” as “Price”, meaning “brands on sale”. However, Datta calls the same segment as the “Low Price” segment which includes brands that are competing in the *economy* segment.

6.1 The White-Teeth Revolution

As we have indicated before, Rembrandt was the *first* brand to offer a *whitening* toothpaste in the U.S. in 1989. In 1993 Unilever nationally introduced Mentadent, a *peroxide-baking soda* whitening toothpaste. At that time American Dental Association and *Consumer Reports* questioned the safety of bleaching toothpaste that contained peroxide. In response to this criticism, Unilever argued that the risk of peroxide in Mentadent was no higher than in “your pickle” (Datta, 1996). Unilever discontinued Mentadent in 2016 (Note 21).

In 2001 Colgate launched *Colgate Total Plus Whitening* toothpaste. At that time, it was the *first and only whitening* toothpaste approved by the U.S. Food and Drug Administration to prevent *gingivitis* and *plaque*. Also, it was the *only* toothpaste that won the Seal of Acceptance from the American Dental Association for helping to prevent *cavities, gingivitis, plaque, tartar* build-up—and *whiten* teeth (Note 22).

In 2003 Colgate introduced *Simply White Whitening* (SWW) toothpaste. Unlike ordinary whitening toothpastes—that only remove *surface* stains—SWW “removes *deep* and embedded stains that are *below* the surface”. Colgate claims it can provide noticeably whiter teeth in as little as 14 days (*italics added*). Colgate says that SWW works because it has *hydrogen peroxide* and a unique, patented whitening *accelerator* that goes *beneath* the surface to whiten *deeper* and removing stains embedded *inside* the teeth. It also features high-cleaning *silica* to remove *surface* stains (Note 23).

In October 2019, Colgate came out with its newest offering: *Optic White Renewal Toothpaste* (Note 24). Colgate says it is “our *best* whitening toothpaste ever”. It contains “3% hydrogen peroxide, a *professionally* recommended whitening ingredient proven to *deeply* whiten *beyond* surface stains”. With “unprecedented whitening power”, it can remove “10 years of *yellow* stains while being *safe* for enamel” (*italics added*; Note 25).

Crest started adding whitening ingredients to its toothpastes in the 1990s. However, it introduced a new innovation: Crest Whitestrips in 2000 (Note 26).

In 2012 Crest launched *Crest 3D White Glamourous White whitening* toothpaste. According to P&G, this toothpaste uses a “breakthrough *shine* technology that noticeably brightens your smile after just *one* brushing”, and that it also “removes up to 90 percent of *surface* stains in just *five* days” (*italics added*; Note 27).

It seems that the two early Colgate *whitening* toothpastes—introduced in 2001 and 2003—opened the *floodgate* of *whitening* toothpaste in America, as whitening toothpaste sales catapulted to 68% of total U.S. retail toothpaste sales in 2008!

In Figure 1 we present a 2008 profile of *benefit* segments of the U.S. Toothpaste market that recognizes five segments.

6.2 Benefit Segments: 2008 vs. 1996

In Table 1 we present a benefit-segmentation profile of the U.S. Toothpaste market. Here are the highlights:

- Miskell (2004) points out that between 1955-1985 the toothpaste advertising was focused more on *cavity* protection than on “cosmetic perfection”. The data for 1996 in Table 1 shows a similar pattern with *dental health* accounting for 59% of toothpaste sales.
- In 1996 America had just *two* minor whitening brands with a 2% market share, and no toothpaste had received the seal of acceptance from the American Dental Association (ADA). However, the dam burst after Colgate was able to secure ADA’s blessing in 2001 for its *Total Plus Whitening* toothpaste, as we have just mentioned. In 2008 all brands—*except* Tom’s of Maine’s Natural Care, and Colgate’s Viadent—offered *whitening* toothpastes that accounted for a stunning 68% of total retail sales (Table 1, Note 2).
- The other significant difference between the two years is a huge drop in the “taste, color, and convenience” segment from 21% in 1996 to 3% in 2008. One important factor in this monumental decline seems to be the *overwhelming* consumer interest in *white* teeth over the years leading to 2008. In 1996 Aquafresh *striped* toothpaste had a 12.5% share. But in 2008 its share had dropped to 7.1%. Similarly, Aim *gel* toothpaste had a market share of 7% in 1996, but in 2008 it could muster just 0.7%. The lofty level of 68% for *whitening* toothpaste sales in 2008 may *erroneously* suggest a heavy tilt towards *cosmetics* by the toothpaste industry: away from its traditional concerns about dental decay. However, that is *far* from true. As mentioned above, ADA’s seal of acceptance for Colgate’s *Total Plus Whitening* toothpaste in 2001 did not only approve the brand as a whitening agent, but *also* found it helpful in preventing *cavities*, *gingivitis*, *plaque*, and *tartar* build-up.

So, today’s consumers have now become the beneficiaries of a situation in which they can *keep* the proverbial cake, but also be able to *eat* it!

6.3 Ingredients in Toothpaste

Until after 1945, toothpastes contained *soap*. After that time, soap was replaced by *sodium lauryl sulphate* (SLS). It is a common ingredient in present-day toothpastes. SLS is normally used as a *surfactant*, or *foaming* agent, and also as an *emulsifier*. An emulsifier helps oil- and water-based ingredients in a toothpaste—that do *not* mix—to *stay* mixed. It helps to properly *disperse* the ingredients during brushing, and ensures easy *rinsing* and removal of *debris*, i.e., food particles (Note 28).

In a recent report *Consumer Reports* lists the characteristics that *should* be in a toothpaste (*Consumer Reports*, 2019):

- A toothpaste bearing the seal of acceptance from the American Dental Association (ADA) means that it *must* be safe, it must contain *fluoride*, and should *not* contain any ingredients that cause dental decay, or harm the teeth.
- *Abrasives* like calcium carbonate and modified *silica* help in removing food debris and *surface* stains.
- *Baking soda* shows “some promise for reducing *plaque*”, and may “slightly decrease *gum bleeding* with *gingivitis*” (*italics* added)

- *Desensitizers* such as sodium citrate, casein phosphopeptide, and potassium may help *reduce* uncomfortable sensitivity.
- *Fluoride* is usually of two kinds: sodium and stannous. It is effective in *reducing* cavities by 20-30 percent. Stannous fluoride may also be helpful in *sensitivity* and gum *inflammation*.
- *Sodium Lauryl Sulphate* (SLS) is called a detergent, but it does *not* have much cleaning power. Instead, it generates *foam* to help push the toothpaste into *nooks* and *crannies*.
- Basic *whiteners* include hydrogen peroxide which chemically *lightens* teeth, and sodium hexametaphosphate that is supposed to help with enamel *staining*. But experts point out that they *aren't* concentrated enough, or remain in contact with tooth surfaces long enough, to make a noticeable difference.

7. The U.S. Toothpaste Market—Price-Quality Segmentation Profile

This study is based on U.S. retail sales for 2008 and 2007 (Note 29). The data includes total dollar and unit sales, no-promotion dollar and unit sales, and promotion dollar and unit sales (Note 30).

The U.S. retail Toothpaste sales for 2008 were \$1.27 Billion with two major competitors: Crest with a market share of 34.7%, and Colgate with 33.5%.

We found toothpaste packs from 0.2 to 30.4 oz. The 5.8-6.5 oz pack was by far the most popular with a 45.3% share. So, we have focused cluster analysis on this pack.

7.1 Hierarchical Clustering as the Primary Instrument of Statistical Analysis

We have used cluster analysis as the *primary* statistical tool in this study. As suggested by Ketchen and Shook (1996), we have taken several steps to make this effort as objective as possible:

- First, this study is *not* ad-hoc, but is grounded in a theoretical framework, as laid out below.
- Second, we are fortunate that we were able to get national sales data for our study for *two* years. Thus, this data provided a robust vehicle for subjecting cluster consistency and reliability to an *additional* test.
- Third, we wanted to use two different techniques—KMeans and Hierarchical—to add another layer of cluster consistency and reliability. However, we found Hierarchical cluster analysis to be *superior* in meeting that test. So, we did *not* consider it necessary to use the KMeans technique.

7.2 Theoretical Foundation for Determining Number of Clusters—And Their Meaning

As already stated, a major purpose of this paper is to identify the market share leader and determine the price-quality segment—based on unit *price*—it is competing in.

An important question in performing cluster analysis is determining the *number* of clusters based on an *a priori* theory. Most consumer markets can be divided in three *basic* price-quality segments: *premium*, *mid-price*, and *economy*. These three basic segments can be extended to *five*: with the addition of *super-premium* and *ultra-economy* segments (Datta, 1996).

Therefore, *three* represents the *minimum* and *five* the *maximum* number of clusters (Datta, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b).

An equally crucial issue is to figure out what each cluster (e.g., *economy*, *mid-price*, and *premium*) really means.

Perhaps a good way to understand what each price-quality segment stands for in real life is to look at a socio-economic *lifestyle* profile of America. It reveals *six* classes (Note 31). Each class is associated with a price-quality segment typified by the retail stores where they generally shop: each a symbol of their lifestyle (Datta, 2011).

7.3 Guidelines for Cluster Consistency and Reliability

In addition to laying a theoretical foundation for the *number* of clusters, we set up the following guidelines to enhance cluster consistency and reliability (Datta, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b):

- In general, there should be a *clean break* between *contiguous* clusters.
- The *anchor* clusters—the top and the bottom—should be *robust*. In a cluster-analysis project limited to a range of three to five clusters, a robust cluster is one whose membership remains constant from three- to four-, or four- to five-cluster solutions.
- Finally, we followed a step-by-step procedure to determine the optimal solution. First, we start with *three* clusters. Thus, the bottom cluster obviously becomes the *economy* segment and the top cluster the *premium* segment. Next, we go to *four* clusters, and *tentatively* call them: *economy*, *mid-price*, *premium*, and *super-premium*. Then we go to *five* clusters. If the membership of the *bottom* cluster remains unchanged from what it was in the four-cluster result, it clearly implies that the *ultra-economy* segment does *not* exist. Next, if the membership of the *top* cluster also remains the same from a four- to a five-cluster solution, then the *top* cluster becomes the *super-premium* segment. This means that even in a five-cluster solution we have only *four* price-quality segments: *economy*, *mid-price*, *premium*, and *super-premium*. It means that either the *premium* or the *mid-price* segment consists of two *sub*-segments (see Table 2).

7.3.1 External Evidence to Validate Results of Cluster Analysis

Whenever possible, we have tried to seek *external* evidence to validate the results of cluster analysis. For example, many companies identify on their websites a certain brand(s) as a *premium* or luxury brand. A case in point is that of P&G which says that its plan is to compete in all “price points:” *super-premium*, *premium*, and *mid-price* *except* the *economy* segment (Datta, 2010b).

7.4 Testing Hypotheses

- I—That the market-share leader would be a member of the *mid-price* segment.
- II—That the market-share leader would carry a price tag that is *higher* than that of the nearest competition.

7.5 Results of Cluster Analysis

In Table 2 we present the results of cluster analysis for Toothpaste for 2008 for the 5.8-6.5 oz pack that include 25 brands with sales >\$10,000. Since many brands have offered multiple styles in this size (and others) we have chosen the *most* popular for each brand in this study. However, the sales data for each

brand represents *total* brand sales.

The results show *five* clusters, but only four price-quality segments, with the *premium* segment featuring two *sub*-segments.

Crest, the *market leader* has a market share of 34.7%, and is a member of the *mid-price* segment with a unit price of \$2.99: a price somewhat higher than that of the *runner-up* Colgate—also a member of the *mid-price* segment—with a unit price of \$2.86.

Other notable results are: Sensodyne as a member of the *super-premium* segment; Arm & Hammer and Tom's of Maine as part of the *premium* segment, and Aquafresh as an occupier of the *economy* segment.

The results for 2007 were similar to those for 2008.

Thus, these results fully support both Hypothesis I and II: for 2008 as well as 2007.

Interestingly, these results are generally similar to those for Men's Shaving Cream, U.S. Beer, U.S. Shampoo, U.S. Shredded/Grated Cheese, and U.S. Refrigerated Orange Juice markets.

7.6 Relative Price a Strategic Variable

Finally, we performed one more test to determine the consistency and reliability of the results of cluster analysis in this study. So, we *ranked* the unit price of each brand for 2008 and 2007.

All *three* measures of *bivariate* correlation—Pearson, and non-parametric measures Kendall's tau_b, and Spearman's rho—were found to be significant at an amazing 0.01 level!

We believe these surprising results—that cover such a large number of brands—became possible only because management in the U.S. Toothpaste market must have been treating *relative* price as a strategic variable, as we have suggested.

While the price of a brand, compared to its nearest competition, may change over time, it is *unlikely* to change much from one year to the next. This is significant not only for the market share leader, but also for every brand no matter which price-quality segment it is competing in.

Another conclusion one can draw from such impressive results is that the U.S. Toothpaste market is highly competitive.

These results are also in accord with *seven* earlier U.S. studies involving: Men's Shaving Cream, Beer, Shampoo, Shredded/Grated Cheese, Refrigerated Orange Juice, Men's Razor-Blades, and Women's Razor-Blades (Datta, 2012, 2017, 2018a, 2018b, 2018c, 2019a, 2019b).

7.7 The Role of Promotion

For 2008 promotional sales of the Toothpaste market *averaged* 37.2% of retail sales. We performed bivariate correlation between total (net) retail sales vs. promotional (PROMO) sales. The results were significant for *all* three measures—Pearson, Kendall, and Spearman—at the 0.01 level.

Table 3 shows the promotional intensity of 14 brands with 2008 sales over \$1 million. Colgate emerges as the lone brand in the *Very Heavy* category (47.9%), followed by two brands in the *Heavy* category: Crest (38.9%) and Aquafresh (38%).

It seems both Colgate and Crest have relied on high-level promotional intensity to promote and to

defend their dominating positions in the market.

Since Aquafresh is competing in the *economy* segment on a low price, one could reasonably argue that it need not offer heavy discount as well. Nevertheless, the company must have felt that it has to do *both* to protect its market share of 7.1%—by far the highest in the *economy* segment.

8. Strategic Groups in the U.S. Toothpaste Market, 2008

We found *four* strategic groups in this market. Their market shares are as follows:

1. *Market leader*: Procter & Gamble Co.
 - Crest: 34.7%
2. *Runner-up*: Colgate Palmolive Co.
 - Colgate: 33.5%
 - Ultrabrite: 0.5%
3. Medium-size Players
 - Glaxo-SmithKline
 - Aquafresh: 7.1%
 - Sensodyne: 6.8%
 - Church & Dwight
 - Arm & Hammer: 5.2%
 - Aim: 0.7%
4. Minor Players
 - Tom's of Maine: 1.7%
 - Unilever
 - Mentadent: 1.1%
 - Close-Up: 0.6%
 - Pepsodent: 0.4%

8.1 Procter & Gamble Co. (P&G)

P&G is one of the leading consumer product companies in the world. In 2018, it had sales of \$67 Billion. Crest is part of the Health Care segment which accounted for 13% of its sales (Note 32).

8.2 Colgate Palmolive Co.

Colgate Palmolive is a large consumer products co. In 2018 its word-wide sales were \$15.5 Billion. Colgate toothpaste is part of the Oral Care Division.

In 2008 *Consumer Reports* found that Ultrabrite's All-in-one *whitening* toothpaste was "excellent at stain removal" (Note 33).

8.3 Glaxo SmithKline and Aquafresh

Glaxo SmithKline is a British multinational pharmaceutical company with \$33 Billion in sales in 2018.

8.4 Church & Dwight

Church & Dwight, the owners of Arm & Hammer toothpaste, had sales of \$4.1 Billion in 2018 (Note 34).

The company bought Aim brand in 2003 from Unilever which it introduced in 1973 (Note 35). Aim was riding high around 1996 when it had a market share of 7%: because its *gel* toothpaste had become quite popular then (Datta, 1996). However, Aim’s share dropped to a mere 0.7% in 2008 (Table 2). Interestingly, Aim did *not* offer a gel toothpaste in 2008.

8.5 Tom’s of Maine

Tom’s of Maine was founded in 1970 by Tom and Kate Chappell (Note 36). Tom’s is a leading manufacturer of toothpaste with *natural* ingredients. Its latest estimated sales are \$76 million (Note 37).

8.6 Unilever

Unilever is a huge British-Dutch international company with sales of \$73 Billion in 2017 (Note 38). We compared the 2008 market shares of Unilever’s current three toothpaste brands with their shares in 1996. We found that two of these suffered a precipitous decline in their market shares: Close-Up from 6% to 0.6%, and Pepsodent from 2% to 0.4% (Table 2; Datta, 1996).

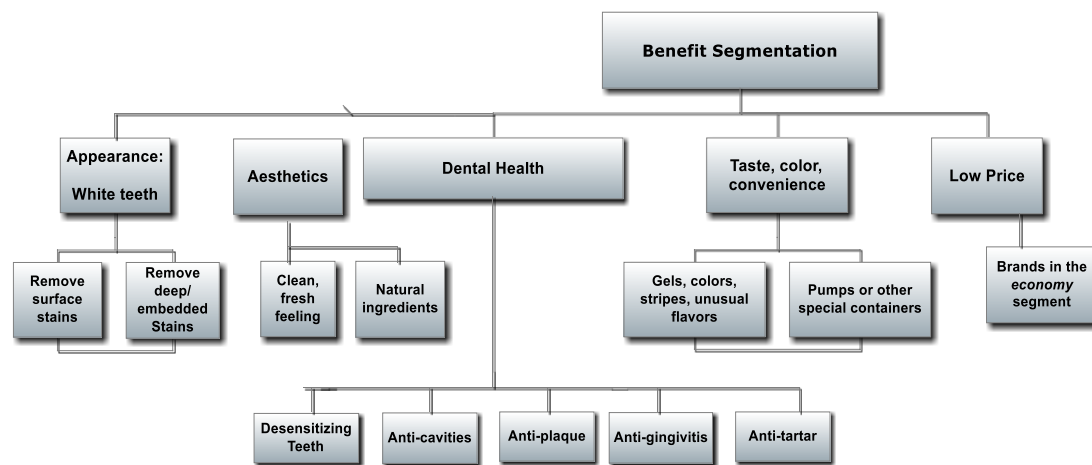


Figure 1. Benefit Segmentation Profile of the U.S. Toothpaste Market, 2008

Table 1. Benefit Segmentation Profile of the U.S. Toothpaste Market: 2008 vs. 1996

Percentage of Market Share by Segment

Benefit Segment	2008	1996
Appearance (white teeth)	60%	13%
Aesthetics (baking soda, natural ingredients)	8%	7%
Dental Health (regular, tartar, sensitivity)	29%	59%
Taste, color, convenience (gel, kids, stripes)	3%	21%
Total	100%	100%

Note 1. This analysis does *not* include the “Low Price”, or the *economy* benefit segment. This is because, in addition to offering the benefit of low price, these brands also rely on one or more of the other four benefits to target their customers.

Note 2. The 2008 data for the “Appearance” segment covers only regular general-purpose brands, but does *not* include whitening brands that are targeted at narrow segments, e.g., tartar, sensitivity, baking soda, natural ingredients, gel, kids, and stripes. So, if we look at *all* whitening brands the 60% figure in Table 1 jumps to 68%!

Table 2. Hierarchical Cluster Analysis: The U.S. Toothpaste Market, 2008

PriceQualitySgmt	Brand Name with sales >\$10,000	SizeOz	UnitPr.	ClsCtr	MkSh%	BrandSales\$M
<i>Super-Premium</i>	SENSODYNE TOOTH CLEANER WHITENER	6	\$7.50	\$7.43	6.8%	\$85.8
	SMART MOUTH TOOTH CLEANER WHITENER	6	\$7.36		0.0%	\$0.4
<i>Premium I</i>	DR. KEN'S TOOTH CLEANER WHITENER	6	\$5.78	\$5.54	0.0%	\$0.1
	VIADENT ADVANCED CARE TOOTH CLEANER	7	\$5.30			\$1.0
<i>Premium II</i>	JASON POWER SMILE TOOTH CLEANER WHITENER	6	\$4.88	\$4.58	0.1%	\$1.2
	NATURE'S GATE TOOTH CLEANER WHITENER	6	\$4.61		0.0%	\$0.4
	NOW XYLI WHITE TOOTH CLEANER WHITENER	6.4	\$4.57		0.0%	\$0.0
	T.O.M. NATURAL CARE TOOTH CLEANER	6	\$4.45		1.7%	\$21.0
<i>Mid-Price</i>	A&H ADVANCE TOOTH CLEANER WHITENER	6	\$4.38		5.2%	\$65.4
	MENTADENT TOOTH CLEANER WHITENER	5.25	\$3.43	\$3.09	1.1%	\$13.7
	CREST TOOTH CLEANER WHITENER	6.2	\$2.99		34.7%	\$440.3
	DR. TICHENOR'S TOOTH CLEANER WHITENER	6.4	\$2.99		0.0%	\$0.0
<i>Economy</i>	COLGATE /TOOTH CLEANER WHITENER	6	\$2.86		33.5%	\$424.9
	PRIVATE BRANDS TOOTH CLEANER WHITENER	6.4	\$1.80	\$1.20	0.6%	\$8.1
	CLOSE-UP TOOTH CLEANER WHITENER	6	\$1.69		0.6%	\$8.2
	AQUAFRESH T-P TOOTH CLEANER WHITENER	6.4	\$1.62		7.1%	\$90.4
	GLEEM TOOTH CLEANER WHITENER	6.4	\$1.27		0.0%	\$0.5
	ULTRA BRITE ALL IN ONE TOOTH CLEANER	6	\$1.25		0.5%	\$7.0
	PEPSODENT TOOTH CLEANER WHITENER	6	\$1.02		0.4%	\$5.6
	AIM TOOTH CLEANER WHITENER	6	\$1.00		0.7%	\$9.1
	UNITED EXCHANGE CORP-NBL TOOTH CLEANER	6.4	\$1.00		0.0%	\$0.0
	KAREWAY TOOTH CLEANER WHITENER	6.4	\$1.00		0.0%	\$0.0
	PERSONAL CARE TOOTH CLEANER WHITENER	6.4	\$1.00		0.0%	\$0.1
	CHOICE TOOTH CLEANER WHITENER	6.4	\$1.00		0.0%	\$0.1
	LAVORIS NATURALS TOOTH CLEANER WHITENER	6.5	\$0.68		0.0%	\$0.1
	Total (25 cases)			\$2.40		93.3%
Grand Total All Toothpaste Brands					100.0%	\$1,269.0

Notes.

1. All brands included here are those with the most *popular* pack size: 5.8-6.5 oz.
2. Two exceptions are: Viadent 7 oz, Mentadent 5.3 oz.
3. Sales data shows total *brand* sales for 2008.
4. Unit price data is based on the most *popular* style for each brand for the 5.8-6.5 oz pack.

Table 3. Percentage of Promotional Sales to Total Sales: U.S. Toothpaste Market, 2008

Brand Names	PromIntnsty	PQSegment	Sales\$M	MkSh%	%Prom2008
Brand Total All TOOTH PASTES			1269.0	100.0%	37.2%
COLGATE TOOTH CLEANER	Very Heavy	Mid-price	424.9	33.5%	47.9%
CREST TOOTH CLEANER	Heavy	Mid-price	440.3	34.7%	38.9%
AQUAFRESH		Economy	90.4	7.1%	38.0%
PEPSODENT TOOTH CLEANER	Moderate	Economy	5.6	0.4%	31.7%
AIM TOOTH CLEANER		Economy	9.1	0.7%	30.5%
CLOSE-UP TOOTH CLEANER		Economy	8.2	0.6%	29.6%
PRIVATE BRANDS TOOTH CLERANER	Low-Moderate	Economy	8.1	0.6%	25.5%
TOM'S OF MAINE NATURAL CARE/TOOTH CLEANER		Premium	21.0	1.7%	24.4%
SENSODYNE TOOTH CLEANER		Super-premium	85.8	6.8%	22.3%
ARM & HAMMER TOOTH CLEANER		Premium	65.4	5.2%	19.5%
ULTRA BRITE TOOTH CLEANER	Light	Economy	7.0	0.5%	16.8%
JASON TOOTH CLEANER		Premium	1.2	0.1%	15.7%
MENTADENT TOOTH CLEANER		Mid-price	13.7	1.1%	15.3%
VIADENT		Premium	1.0	0.1%	10.3%

9. Conclusion

This study is based on the idea that in most consumer markets, a business in quest of market-share leadership should try to serve the *middle* class by competing in the *mid-price* segment; and offering quality *superior* to that of competition: at a somewhat *higher* price to connote an image of quality, and to ensure that the strategy is both profitable and sustainable in the long run. The *middle* class is the socio-economic segment that represents about 40% of households in America.

Quality, however, is a complex concept that consumers generally find difficult to understand. So, they often employ *relative* price and a brand's reputation as a symbol of quality.

In 1896 Colgate introduced a toothpaste in a collapsible *tube* similar to contemporary toothpaste tubes. This *packaging* innovation by Colgate turned out to be *critical* in encouraging mass production and consumption of toothpaste because consumers found toothpaste in a collapsible tube so *easy* to use.

Remarkably, most Americans did *not* brush their teeth until after WWII. When the Army soldiers returned home after the war, they brought with them the habit of *regular* brushing: a practice the Army had made compulsory.

No wonder dental *cavities* had become a big health problem in America at that time.

Pollan suggests that *four* of our leading *chronic* diseases—coronary heart disease, diabetes, stroke and cancer—can be traced directly to *industrialization* of our food, which he calls the *Western* diet. Among the key factors contributing to these diseases are the rise of highly *processed* foods, *refined* grains, and the superabundance of *cheap* calories of *sugar* and *fat* produced by modern agriculture.

Another side effect of the *Western* diet was that dental *cavities* became a *serious* health problem in America. However, studies of *native* populations in several countries *not* exposed to the Western diet, revealed a different picture: they had little or *no* tooth decay.

P&G began a joint research project with the University of Indiana to test the role of *fluoride* in toothpaste. The clinical results were so heartening that P&G launched Crest with Fluoristan nationally in 1956. In 1960 Crest became the *first* brand of toothpaste to earn an endorsement from the American Dental Association. In 1976, the American Chemical Society recognized Crest with fluoride as one of the 100 greatest discoveries of the previous 100 years.

In 1997 Colgate introduced *Total* toothpaste, and quickly it became the market *leader*. In 2018 Colgate launched the *next* generation of *Colgate Total* toothpaste which contains a new *stannous fluoride* formula that fights *plaque*-causing bacteria in the mouth.

In 1996 America had just *two* minor whitening brands. However, in 2008 the floodgates had opened, and all brands except two, offered *whitening* toothpastes that accounted for a stunning 68% of total retail sales.

This study is based on U.S. retail sales for 2008 and 2007. The U.S. retail Toothpaste Market sales for 2008 were \$1.27 Billion with *two* major competitors: Crest with a market share of 34.7%, and Colgate with 33.5%.

Employing Hierarchical Cluster Analysis, we have focused on the 5.8-6.5 oz pack which was by far the *most* popular with a 45.3% share.

We tested two hypotheses: (1) That the market-share leader would be a member of the *mid-price* segment, and (2)

That the market leader would carry a price tag that is *higher* than that of the nearest competition.

The results fully supported Hypothesis I and II: *both* for 2008 and 2007.

We *ranked* the unit price of each brand for 2008 and 2007. All *three* measures of bivariate correlation—Pearson, and non-parametric measures Kendall's tau_b, and Spearman's rho—were found to be significant at an amazing 0.01 level!

Thus, this result indicated that *relative* was a strategic variable in the U.S. Toothpaste market, as we have hypothesized. This result is also in accord with *seven* earlier studies.

In an analysis of *benefit* segments of the U.S. Toothpaste market in 2008 we found the following *five*:

1. Appearance (White teeth)
 - i. Remove surface stains
 - ii. Remove deep/embedded stains
2. Aesthetics
 - a. Clean, fresh feeling
 - b. Natural ingredients
3. Dental Health
 - a. De-sensitizing teeth
 - b. Anti-cavities
 - c. Anti-plaque
 - d. Anti-gingivitis
 - e. Anti-tartar
4. Taste, color, convenience
 - a. Gels, colors, stripes, unusual flavors
 - b. Pumps and special containers
5. Low price (brands in the *economy* segment)

In a comparison of benefit segmentation between 2008 and 1996, the most *striking* result was that *whitening* toothpastes accounted for 68% of total retail sales in 2008 vs. a mere 2% in 1996. Yet, in addition to white teeth, these toothpastes *also* continued to be helpful in preventing dental decay, as before.

Finally, we discovered *four* strategic groups:

1. Crest: Market leader
2. Colgate: Runner-up
3. Medium-size players
 - i. Glaxo-SmithKline
 - ii. Church & Dwight
4. Minor players
 - i. Tom's of Maine
 - ii. Unilever

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Notes

Note 1. Profit Impact of Market Strategies.

Note 2. <https://www.colgate.com/en-us/oral-health/basics/brushing-and-flossing/history-of-toothbrushes-and-toothpastes>

Note 3. https://www.en.wikipedia.org/wiki/Teeth_cleaning_twig

Note 4. *Miswak* is also popular as a chewing stick, especially among Muslims (see Note 3).

Note 5. <https://www.en.wikipedia.org/wiki/Toothbrush>

Note 6. <https://www.colgatepalmolive.com/en-us/about/history>

Note 7. A history of sugar marketing through 1974. (p. 2). <https://www.ers.usda.gov/webdocs/publications/40532/aer-382.pdf?v=0>

Note 8. https://www.en.wikipedia.org/wiki/History_of_sugar

Note 9. <https://www.colgate.com/en-us/oral-health/conditions/cavities/what-are-the-effects-of-sugar-on-teeth-1214>

Note 10. <https://www.crest.com/en-us/oral-health/why-crest/faq/history-toothpaste>

Note 11. <https://www.pioneerthinking.com/history-of-white-flour>

Note 12. https://www.deltadentalins.com/oral_health/healthyfoods.html

Note 13. <https://www.crest.com/en-us/oral-health/why-crest/faq/history-toothpaste>

Note 14. <https://www.en.wikipedia.org/wiki/Gleem>

Note 15. <https://www.dentistryiq.com/products/hygiene/article/16367707/colgate-introduces-next-generation-of-colgate-total-toothpaste>

Note 16. <https://www.en.wikipedia.org/wiki/GlaxoSmithKline>

Note 17. <https://www.aquafresh.com/about-aquafresh.html>

Note 18. <https://www.en.wikipedia.org/wiki/Sensodyne>

Note 19. https://www.gskhealthpartner.com/en-us/oral-health/brands/sensodyne/overview/?utm_source=google&utm_medium=cpc&utm_term=sensodyne&utm_campaign=GS%20-%20Branded_Sensodyne%20PH_DP&gclid=CjwKCAiAj-_xBRBjEiwAmRbqYkGmPD6ZyIKaCBiz1abC2A0QwtMspAXA6j

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Note 20. <https://www.rembrandt.com/about-us>

Note 21. <https://www.top5reviewed.com/mentadent-toothpaste/>

Note 22. <https://www.investor.colgatepalmolive.com/news-releases/news-release-details/colgater-makes-its-best-toothpaste-even-better-new-whitening>

Note 23. <https://www.investor.colgatepalmolive.com/news-releases/news-release-details/introducing-new-colgate-simply-whiter-whitening-toothpaste>

Note 24. <https://www.prnewswire.com/news-releases/colgate-launches-optic-white-advanced-led-whitening-300946668.html>

Note 25. <https://www.colgate.com/en-us/products/toothpaste/ow-renewal>

Note 26. <https://www.news.pg.com/blog/birth-icon-crest>

Note 27. <https://www.news.pg.com/press-release/pg-corporate-announcements/introducing-new-crest-3d-white-glamorous-white-toothpaste-a>

Note 28. <https://www.tomsofmaine.com/our-promise/ingredients/sodium-lauryl-sulfate>

Note 29. This data is from food stores with sales of over \$2 million, and drug stores over \$ 1 million; it also includes discount stores, such as Target and K-Mart, but *excludes* Wal-Mart as well as warehouse clubs, e.g., Sam’s Club, Costco, and BJ’s. It also does not include the “dollar” stores, such as Dollar General, and others.

Note 30. For those stores for which, during a week, there were feature ads, coupon ads, display, or temporary price decrease of at least 5%.

Note 31. The six classes are: “The Poor”, “The Near Poor”, “Traditional Middle Class”, “The Upper-Middle Class”, “The Very Rich/The Rich”, and “The Mega Rich—Masters of the Universe”.

Note 32. <https://www.pg.com/annualreport2018/index.html#/Financial-Highlights>

Note 33. <http://www.chathamjournal.com/weekly/living/health/cr-tests-whitening-toothpastes-60706.shtml>

Note 34. <http://www.investor.churchdwight.com/news-releases/news-release-details/church-dwight-reports-q4-and-fy2018-results>

Note 35. [https://www.wiki2.org/en/Aim_\(toothpaste\)](https://www.wiki2.org/en/Aim_(toothpaste))

Note 36. <https://www.referenceforbusiness.com/history2/93/Tom-s-of-Maine-Inc.html>

Note 37. <https://www.owler.com/company/tomsofmaine>

Note 38. <https://www.unilever.com/investor-relations/unilever-shares/about-shares/unilever-shares-the-basics/>