DEFENSIVE MARKETING STRATEGY: EMPIRICAL APPLICATIONS

BY

Michael J. Halloran
B.S., Lehigh University, 1981

and

Marc A. Silver
B.S., Carnegie-Mellon University, 1979

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF
SCIENCE AT THE
MASSACHUSETTS INSTITUTE OF
TECHNOLOGY

June, 1983

Signature of Author .....

Signature of Author .....
Alfred P. Sloan School of Management, May 19, 1983

Certified by .....
John R. Hauser
Thesis Supervisor

Accepted by .....
Jeffrey A. Barks
Director of Master's Program

DEFENSIVE MARKETING STRATEGY: EMPRICAL APPLICATIONS

BY

Michael J. Halloran

Marc A. Silver

Submitted to the Alfred P. Sloan School of Management on May 19, 1983 in partial fulfillment of the requirements for the degree of Master of Science

ABSTRACT

A decision support system is developed for defending profitability and market share of existing competitors in a marketplace in the presence of the threat of penetration from new products. This topic of Defensive Marketing Strategy is empirically applied to the OTC analgesic market.

Both qualitative and quantitative analyses are combined to provide insight on the market and to aid management in making timely and effective decisions. Particularly, the use of the marketing model, Defender, reveals intriguing implications about the structure of the market. The synthesis of this analysis provides a framework for designing a decision support system for the formulation of Defensive Marketing Strategy.

Thesis Advisor: John R. Hauser
Title: Associate Professor of Management Science

Thesis Reader: M. Anthony Wong
Title: Assistant Professor of Management Science

ACKNOWLEDGEMENTS

We are deeply indebted to our thesis advisor, John R. Hauser, for his continuous enthusiasm and generosity with his time. Secondly, our thanks go to Tony Wong for guiding us through the statistical quagmires and perturbations of our thesis. We are grateful to the various industry sources who provided valuable insight to our analyses. We would also like to extend special thanks to Steven Gaskin who provided important assistance (for the mere price of one bottle of Russian vodka) in our "Defender" chapter. Lastly we would like to thank each other for patience and constructive criticism.

TABLE OF CONTENTS

EXHIBITS, FIGURES, AND TABLES

List Of Exhibits

All exhibits follow the text of Chapter IV

List Of Tables

List Of Figures

CHAPTER 1

INTRODUCTION

Section 1.1: Nature of the Marketplace

The nature of the marketplace has become quite competitive today. Sophisticated quantitative tools and careful qualitative assessments are combined to develop well-defined plans of competitive strategy. More firms are concerned with developing proactive strategies in light of the aggressive competitive nature of the market.

New product development is a key ingredient to this growing proactive force. Fueled by a rapid pace in technological development and sophisticated techniques for analyzing consumer markets, new product development has become a key factor to help insure the continuing existence of the firm in the market.

Much effort has been put into the offensive launch of new products. See for example reviews by Pessemier(1982), Shocker and Srinivasan(1979), and Urban and Hauser(1980).

Section 1.2: Defensive Marketing Strategy

The launch of each new product creates the need for competitive reaction from existing brands in the attacked marketplace. The use of sophisticated marketing tools has only recently been developed to aid in the decision-making process used by firms to defend their established products. This thesis will address how firms marketing the existing brands can defend their products against the launch of a competitive new brand. This topic will be referred to as defensive marketing strategy.

This topic of defensive marketing strategy stems from recent work done by several people at the Sloan School of Management, M.I.T. A defensive strategy model called Defender is discussed in papers by Hauser and Shugan(1981, 1982). This model yields a number of qualitative normative implications on how a firm marketing an established brand should defend its profit facing an attack by a competitive new brand. An empirical test of Defender is found in Hauser and Gaskin(1983) where the feasibility, practicality, and predictive ability of the defensive strategy model is examined.

Two other theses on defensive marketing strategy are of interest. A thesis by Joseph Beshel(1982) provided an examination of "Defensive Marketing Strategy in the Prescription Analgesic Market." Another thesis by Judy Young(1982) reviewed the "Responsive Marketing Strategy" of AT&T in the long distance services market.

All this previous work attempts to combine quantitative and qualitative analysis to develop strategy for defending established brands against competitive new entrants. It is the goal of this thesis to further develop the discussion of defensive marketing strategy through the evaluation of an empirical application.

CHAPTER 2

OBJECTIVES

The over-the-counter(OTC) analgesic market is approximately $1.2 billion(Business Week, 1982). Five major brands(i.e. Anacin, Bayer, Bufferin, Excedrin, and Tylenol) constitute a major portion of this market. Over the past year, several new products have made significant attempts to penetrate this market.

The leading brands face strong challenges from these new entries. Each must now defend their products to maintain market share and profitability. It is the goal of this thesis to combine the use of the quantitative model, Defender, and a qualitative analysis of the industry to synthesize a decision support system(DSS) that could be used to assess the threat of these entries.

Section 2.1: Methodology

The methodology to develop this DSS will involve the following steps:

1. An industry analysis of the OTC analgesic market focusing on current marketing strategies.

2. An analysis of historical decisions and

results for the analgesic brands. Response curve analysis for the marketing mix variables will be discussed using regression techniques and qualitative judgments.

3. Perceptual maps and other key marketing measures will be developed. This will lead to snapshot pictures of the marketplace as perceived by physicians and consumers.

4. The combination of results from parts 2 and 3 will be analyzed with the defensive marketing model, Defender.

5. A set of marketing recommendations will be made based upon the results of parts 1 and 4.

Section 2.2: Outputs

The four main outputs of this thesis will be the following:

1. Response curve analysis for the marketing mix variables.

2. "Defenderized" perceptual maps of the physician and consumer markets.

3. A set of initial marketing recommendations.

4. Defender implementation plan.

The synthesis of these four outputs will then be used to evolve a decision support system that current analgesic manufacturers could use regularly following our methodology.

It should be noted that the data presented in this thesis will be disguised but the overall integrity of the methodology and results will be maintained.

CHAPTER 3

INDUSTRY OVERVIEW

Section 3.1: The Analgesic Market

Analgesics are drugs that reduce or eliminate pain and inflamation. They are available as both prescription and proprietary (i.e. OTC) drugs. This thesis will focus on the adult OTC analgesic market.

In 1981, total analgesic sales were about $1.2 billion. This represents a 20% increase over 1980 sales of $1 billion. In the previous five years, the revenue growth rate had been 16%. On a package basis, 1981 sales of 581 MM reflected only a 3% increase over 1980 sales of 565 MM. Therefore, sales growth was due primarily to price increases.

Operating incomes for the major brands(i.e Anacin, Bayer, Bufferin, Excedrin, and Tylenol) are believed to be about $200 Million. A 20% increase in aspirin costs and a 30% increase in caffeine costs had forced the brands using those compounds to raise price to maintain profit levels. In addition to raising prices, many brands cut brand marketing expenses (BME's) to boost operating profit margins.

The adult analgesic industry is a concentrated one. Anacin, Bayer, Bufferin, Excedrin, and Tylenol constitute about 63% of total analgesic dollar sales(see Table III-1). In addition to competing against one another, these brands face challenges from both generics and a group of new non-steroidal anti-inflammatory drugs.

Table III-1

Analgesic Industry
Dollar and Tablet Share

	1980	1981	1982
ANACIN	10.5/11.5	9.5/10.6	8.7/9.7
MAXIMUM STRENGTH ANACIN	1.9/1.2	2.1/1.4	1.7/1.2
ANACIN-3	NA	1.0/1.7	1.7/1.1
ARTHRITIS PAIN FORMULA	NA	1.8/1.6	1.7/1.5
TOTAL ANACIN	12.3/12.7	14.4/14.3	13.8/13.5
BAYER	8.7/12.4	7.8/11.4	7.0/11.1
BAYER TIMED RELEASE	NA	.4/.3	.4/.2
TOTAL BAYER	8.7/12.4	8.2/11.7	7.4/11.3
BUFFERIN	7.9/8.5	6.7/7.4	5.6/6.3
EXTRA STRENGTH BUFFERIN	NA	.7/.4	1.8/1.2
ARTHRITIC STRENGTH BUFF	NA	1.2/.8	1.1/.8
EXCEDRIN	6.9/6.5	7.5/6.4	7.0/5.8
TOTAL BRISTOL MYERS	14.8/15.0	16.1/15.0	15.5/14.1
TYLENOL	25.3/16.9	28.5/18.6	34.7/21.1

SOURCE: NIELSON DATA

The OTC analgesic market is composed of two segments: aspirin and acetaminophen. The aspirin segment accounts for 60% of the analgesic market and includes four major brands with 11 major products which comprise 35% of the market. In addition, "aspirin" has become the generic term for these analgesics and thus making brand aspirin products vulnerable to penetration. By the end of 1981, generic aspirin, held a dollar share of 10.6% of the analgesic market, higher than any of the individual brands. Given their lower pricing, generics make up an impressive 24% of the analgesic tablet share.

The acetaminophen segment composes 40% of the analgesic market(dollar volume). This segment is dominated by Tylenol. Tylenol's name is highly recognized by both health professionals and the consumer. Consequentially, generic as well as other brand name acetaminophen products have had a harder time penetrating into this segment. Generic acetaminophen products only hold 2% of the market.

In general, prescription drugs are only used if the physician needs a stronger product and is willing to usually compromise on side effects and/or safety. There presently exist some new prescription drugs that are attractively safe as well as effective and are

successfully penetrating the arthritic segment of the market(Business Week, 1982).

The OTC analgesic industry has been relatively stagnant in terms of its own product innovations. With the exception of Tylenol, there have been no significant new products in the past twenty years. Datril, an acetaminophen product introduced in 1975, holds only a 0.2% market share. Similarly, Anacin-3, introduced in 1977, holds less than 2% of the market(Business Week, 1982).

The introduction of a revolutionary OTC analgesic compound is very unlikely within the near future. Therefore, the analgesic market will only achieve real growth as new uses for the products are found.

Section 3.2: Analgesic Users

People are analgesic users for many reasons. Some of the major uses include pain relief, fever reduction, anti-inflammatory relief, reduction of discomfort due to headaches, and relief of arthriti Three-fourths of all adults use pain relievers with the majority of users being women. Within this audience, there is a core of heavy users (use an analgesic twice or more per week) consisting of one quarter of the adult population who account for approximately 80% of the analgesic consumption. Women also account for the larger

percentage of heavy users. Heavy users tend to be older, with more than two-fifths falling in the 55+ age group.

It should be noted that arthritis sufferers comprise approximately one quarter of the adult population and are responsible for two-fifths of analgesic consumption. The number of arthritic sufferers can be expected to increase significantly in the coming decades. This can be attributed to the substantial increase in the number of senior adults living in the U.S. The 55+ age segment grew from 38.6 million to 47.2 million people between 1970 and 1980. This represents an increase of 22% as compared with an 11% increase in the total population. As a percentage of the total population, the 55+ age group can be expected to increase from 19% in 1970 to 22% in 2000 to 30% in 2025.

Makers of aspirin products hope to capitalize on recent research that indicates that aspirin can reduce swelling, a discomforting symptom of arthritis. In addition, aspirin products have blood thinning qualities which may be useful as a preventative for blood clots. Both of these qualities place aspirin in a favorable position for capturing a healthy portion of the growing 55+ segment.

Section 3.3: Marketing Mix

The analgesic industry essentially has three different interests to which it markets: retailers (i.e. mass merchandisers, food stores, and drug stores), the medical community, and the consumer.

The retail segment promotes those products so as to maximize total profits. Total profit is a function of both quantity sold and the margin (i.e. markup). Quantity sold can be affected significantly by the promotion carried on by the retailers. Manufacturers may encourage promotion on their product by reimbursing the retailer for a portion of the promotional expense. Other factors that affect the retailer's desire to promote an individual brand include percent off invoice, days dating, and the frequency and duration of deals. Competition in this arena has been extreme recently. Traditionally levels of these variables were relatively consistent from brand to brand. However, Anacin-3, Datril, Panadol, and St. Josephs Adult product have recently sought to gain market share from Tylenol and aspirin products through generous deals to the retailers.

The medical community consists of all practioners that are capable of influencing consumers of analgesics. This includes physicians, physician assistants, dentists, nurses, and pharmacists. These individuals are believed to have a strong influence on the consumer's decision.

The success of OTC products is controlled by traditional marketing variables such as advertising, packaging, promotion, etc. However, the purchase of OTC analgesics is very much like that of a prescription drug in that the consumer is not the only decision maker. With prescription drugs, the physician diagnoses a patient and writes a form to be given to the pharmacist who sells the products. Very often, medical professionals such as physicians or pharmacists are asked to recommend an OTC analgesic. Therefore, these opinion leaders have a large influence on the success of an analgesic.

Variables that influence physician perceptions and thus generate recommendations include detailing (use of a sales force), medical journal advertisements, direct mail, and sampling. Some of the brands, such as Tylenol and Bayer have done professional(health community related) marketing. Others such as Anacin and Excedrin hardly do any(IMS).

Most experts in the pharmaceutical industry believe that the key element of the professional marketing effort is the sales representative, the "detail man." His function may be considered either education or strong persuasion, depending on how one views the industry. There is some evidence for each point of view.

The magnitude of medical journal and direct mail advertising causes it to lose much of its impact. The average physician is too busy to do more than glance at the mass of material that comes into his office, and much of it is thrown away. Rather, it is felt that the presence of these materials serves only to reinforce the efforts of the detail man.

All of the five major brands also promote their products through sampling campaigns. Samples are a package of individually wrapped tablets that are dispensed at the discretion of the physician. Samples can be delivered to the physician's office via direct mail or by a salesperson. Samples given to the patient can have a stronger effect than a recommendation alone. Trial of the product is almost assured. Trial in conjunction with a verbal recommendation can affect brand switching and brand loyalty.

Section 3.4: Other Marketing Influences

Another consideration with regards to professional marketing is whether or not a particular brand has a prescription drug associated with it. Physicians are more likely to remember an OTC brand name if it is used in a combination product. Once again, Tylenol has the advantage of having a prescription pain reliever, Tylenol with Codeine associated with it. Anacin-3 and Panadol also have codeine products.

The consumer of analgesics has traditionally been concerned with efficacy and side effect/safety related issues. Price seemed to be only of minor importance in the selection of a brand (Hauser and Urban).

The perceptions of the end user are of course critical. The entire market can be divided into aspirin and acetaminophen products. Side effects/safety is a real and often obvious attribute. For instance, aspirin causes stomach irritation in many users. Those who have had this experience or know of others who have had the experience will have an increased tendency to switch to an acetaminophen-based product that does not cause stomach irritation.

However, the more critical issue is effectiveness. Many analgesic users value efficacy slightly more importantly than side effects/safety. Within the analgesic market, efficacy should be the same given that all are using about the same amount of active ingredient. Even carefully controlled clinical studies on dosage-related efficacy are somewhat inconclusive. Often placebo effects are the main factor of this difference. The point is that efficacy and perceived efficacy are not necessarily the same.

It is perceived efficacy that drives the consumer to purchase. Many consumer goods are marketed on a perceived efficacy or perceived value basis. It is the role of advertising to build the favorable perception. Thus the perception can be molded from two sources, the physician's recommendation or the traditional marketing techniques.

In addition to promotion, the other key factor in consumer marketing success is product line strategy. Many of the analgesic companies produce each brand in several forms, strengths, and package sizes to satisfy various preferences in the marketplace. Bristol-Myers even has two different brands in the same product category(Bufferin and Excedrin). Products introduced in a market where the same company has an existing

product are known as flankers. "These flankers expand the product line to tap specific subsegments and to defend the product line from competitive product elaboration...Flankers can also extend the life cycle by adding more enthusiasm to the advertising and marketing, or by widening the product appeal" (Urban and Hauser). These practices help lock up shelf space and allow the company to gain more clout with retailers. More importantly, econ of scale in advertising and distribution are realized.

Finally, a large percentage of consumers are brand loyal. One approximation of this loyalty could be the length of time a brand has been used by a consumer. Therefore, a key factor barrier to limit new competition has been the development and maintenance of brand loyalty.

Section 3.5: Competitor Analysis

In this section we will discuss each of the major brands with respect to historical trends and marketing strategies.

Whitehall Labs, Subsidiary of American Home Products

Whitehall Labs had four major entries in the analgesic market. Their original product, Anacin, is an aspirin based product that contains caffeine as a stimulant. (Recent studies have suggested a synergistic relationship between aspirin and caffeine. Anacin has yet to exploit this).

Table III-2

1982 ADULT ANALGESIC PRICING

	PRICE/100	INDEX
ANACIN	4.83	2.06
MAXIMUM STRENGTH ANACIN	5.43	2.33
ANACIN-3	5.28	2.26
ARTHRITIS PAIN FORMULA	NA	NA
BAYER	2.34	1.00
BUFFERIN	3.27	1.39
EXTRA STRENGTH BUFFERIN	5.65	2.42
ARTHRITIS STRENGTH BUFFERIN	5.04	2.16
ECOTRIN	3.47	1.49
EXCEDRIN	4.57	1.94
TYLENOL	5.62	2.40

SOURCE: NIELSON

Anacin is a relatively high-priced product. Using Bayer Aspirin as a standard for indexing, Anacin has a price index of 2.05. The index is calculated by dividing the price of the analgesic by the price of 1982 Bayer Aspirin. Thus Bayer would have an index of 1.0(see Table III-2).

Anacin has been steadily losing share since the commercial introduction of Tylenol. Between 1981 and 1982 its dollar share decreased from 9.5 to 8.7. Traditionally one of the most advertised brands, Anacin held a 25% "share of voice" (SOV). SOV is calculated by dividing that brand's media expenditures by the industry total(see Table III-3).

Anacin has always been positioned as fast-acting and effective. Support of this message was decreased to 18% SOV recently. Approximately 1% of Anacin's total 1981 spending was targeted direc 1982 was the first year in which Anacin used professional marketing. All professional marketing was in the form of journal advertisement.

Table III-3

SHARE OF VOICE %

	1980	1981	1982 6 Mos.
ANACIN	26	23	18
MAXIMUM STRENGTH ANACIN	6	4	4
ANACIN-3	3	5	12
ARTHRITIS PAIN FORMULA	4	4	5
TOTAL ANACIN	39	36	38
BAYER	17	15	7
BUFFERIN	11	5	3
EXTRA-STRENGTH BUFFERIN	NA	7	6
ARTHRITIS STRENGTH BUFFERIN	3	2	1
EXCEDRIN	11	11	8
TOTAL BRISTOL MYERS	25	25	18
TYLENOL	19	23	31
OTHER	0	1	6
TOTAL SPENDING ($000,000'S)	$124	$138	$67

SOURCE: LNA

Maximum Strength Anacin(MSA) was introduced nationally in 1979. It contains 25% more aspirin than the regular-strength form and is positioned to have additional efficacy. It also contains caffeine as a stimulant. MSA has leveled off at a 1.8% market share. It is unknown as to what extent this product cannibalized the existing franchise. Advertising for MSA has decreased from its 6% SOV in 1980 and leveled off at about 4% SOV. The product has a price index of

2.3 which is about average for the extra-strength category.

Whitehall's highest hopes lie with Anacin-3, an acetaminophen product with caffeine that was introduced in August, 1982. Its market share had been increasing modestly (up to 2%) prior to the Tylenol tragedy. Even with Tylenol in a vulnerable position, Anacin-3 has not yet been able to gain significant market share(Nielson Analgesic Topline, NAT).

In 1982 the advertising budget for Anacin-3 was doubled to give it a 12% SOV. Recently Whitehall Labs has accessed the sales force of Ayerst, another subsidiary of American Home Products. These strategies combined with large distributor discounts and Anacin's well-recognized name may be a significant threat to Tylenol's hold on the non-aspirin segment.

Whitehall also has two products specifically targeted at the arthritic segment. They are Arthritis Pain Formula (APF) and Aspirin Free APF introduced in 1969 and 1982 respectively. Both of these products contain antacid and are positioned to relieve minor pains of arthritis. Together they account for about 2% of the total analgesic market but about 22% of the

arthritic segment. Advertising has only been consumer oriented and has been held constant at about 4% SOV. Whitehall is positioned favorably to take advantage of the growing arthritic segment.

Whitehall's entire product line has grown from a 12.3% share in 1981 to a 14% dollar share. Aside from Tylenol they are the most successful analgesic manufacturer.

Glenbrook Laboratories, Division of Sterling Drug

The original product, Bayer Aspirin, has been losing share rapidly to Tylenol. Market share has fallen from 8.7% in 1980 to about 7% in 1982. Bayer is a very inexpensive product (index=1.0) and still maintains an impressive tablet share (12.4% in 1980 to 11.3% in 1982). Bayer, a 100% aspirin compound has always positioned itself on efficacy. To defend against other aspirin products, it has also stressed purity alluding to the presence of caffeine in Anacin and Excedrin.

They have historically been heavy advertisers (SOV=16%). However in 1982 they cut advertising back to about 10% SOV. This move might have been in anticipation of the national introduction of a new coated aspirin product (Bayer Coated Aspirin) released in late 1982. Their positioning with respect to the medical professional has been relatively unfocused. They have placed emphasis against generic aspirin, acetaminophen overdose, prescription products, and cost. Bayer's professional expenditures have been concentrated (95%) in journal advertising.

Sterling Drug is also the owner of the successful Panadol franchise. Panadol is the leading acetaminophen product in the U.K.. Sterling will most likely access its pharmaceutical sales force to introduce this new acetaminophen entry in the U.S..

Bayer Timed-Release Aspirin holds an additional 0.4% of the analgesic market. Advertising for this product has been discontinued and it will probably be taken off the market soon. It holds a 3.1% SOV down from 3.5% in 1981.

Bristol Myers

Bufferin, also a major brand in the analgesic market, is composed of aspirin and an antacid formulation. It is positioned against other aspirin products as being effective and mild (due to the buffer). Like Bayer it has also been hurt by the introduction of Tylenol. Bufferin has lost significant market share dropping from 7.9% in 1980 to 5.8% in 1982.

In 1981, Bufferin dropped its advertising from 11% to 5% SOV in 1980. This decline has continued into 1982. It now has only 2% SOV. Bufferin is building up its modest professional marketing budget as an alternative marketing strategy. Professional marketing is primarily in the form of journal advertising.

In 1981, Bristol Myers introduced Extra-Strength Bufferin. As with the introduction of Maximum Strength Anacin, it is not clear as to what extent the original franchise was cannibalized. Extra-Strength Bufferin is averagely priced (index=2.4) for the extra strength category. Advertising has increased slightly for this product in 1982 but its market share has remained constant at 1.8%.

Arthritis Strength Bufferin is essentially the same product as Extra-Strength Bufferin. However, it is priced lower (index=2.14) and targeted at the arthritic segment as its name suggests. In 1982 it continued to hold about 1% of the analgesic market. However, it still holds 14% of the arthritic segment which is guaranteed to be a growing area. Despite this valuable foothold, Bristol Myers has decreased promotion for this product from 3% SOV in 1981 to 1% in 1982 and has totally eliminated television advertising.

Excedrin another mainstay of the analgesic industry has a unique formulation. It is half aspirin and half acetaminophen and contains caffeine as well. Excedrin has positioned itself well with this mixture of ingredients and has had a stronger defense against penetration by Tylenol than most of the other major aspirin products. It is a moderately priced (index=1.93) product and has leveled off at a 7% market share despite a cutback in promotional expenditures. These expenditures have decreased from 11% to an 8% SOV in 1982. Excedrin does not have a professional marketing program.

Bristol Myers also markets the product Datril, an acetaminophen product that competes directly against Tylenol. Datril positions itself as the lower priced of the two. In the past this message has appealed to very few of Tylenol's users. Datril's market share was at 0.2% as of February 1983. Recently, Datril has pumped up advertising, playing on the increased awareness that acetaminophen is the active ingredient in both Tylenol and Datril. They are employing one of Bristol Myers' pharmaceutical sales forces to promote this message to physicians.

McNeil Consumer Products Company, Subsidiary of Johnson and Johnson

Tylenol, prior to the tampering, was by far and away the leading analgesic. Tylenol is an acetaminophen product that offers significant safety advantages over aspirin. The franchise has been growing rapidly while maintaining its premium price. Tylenol and Tylenol Extra-Strength have price indices of 2.4 and 2.5 respectively. Both versions come in tablet and the more expensive "easy to swallow" capsule form. The capsule form also gives a perception of

higher efficacy given that most prescription drugs come in capsule form.

Tylenol has been growing at about 2-3 share points per year and prior to the tampering held an estimated 37% of the dollar share as compared with 8% in 1973. Tylenol is not growing by attracting new analgesic users. It is essentially gaining share from the aspirin brands. Also, until recently there has been no major competition for Tylenol in the acetaminophen segment. Datril, Anacin-3, and generic acetaminophen held only 3% of the analgesic market collectively. Following the tragedy however, these products as well as new products introduced by Sterling and Schering-Plough, could be of significant threat to Tylenol.

Tylenol was the innovator in the OTC analgesic market. A key tactic was to emphasize distribution to hospitals and physician offices. By associating themselves with this environment they gained the trust and respect attributed to the medical profession. Tylenol's initial success was based on a position of safety. Direct professional marketing encouraged physician recommendations of Tylenol to patients sensitive to aspirin. However, once this segment was captured, Tylenol recognized that it could not have

continued growth unless they overcame an image of lower efficacy relative to aspirin.

Indeed for the last years, Tylenol has stressed "equipotency" and increased safety making them the "product of choice". This may have increased Tylenol's perceived efficacy in the mind of the consumer.

Tylenol has always stressed the importance of professional marketing. Historically, their professional budgets have been at least twice as high as the next highest competitor, Bayer. Until recently, Tylenol has been the only brand to have significant detailing.

The importance of this approach can be highlighted by several facts. Of all Tylenol users, more than 60% have at some time received a recommendation to use Tylenol from a health professional. The impact of a physician recommendation ranges in effect depending on whether the patient already uses Tylenol. If the individual is already a Tylenol user, the recommendation strengthens brand loyalty. For a non-Tylenol user, a physician recommendation alone converts a significant proportion to the Tylenol franchise.

CHAPTER 4

DEFENDER MODEL

This chapter presents a quantitative analysis of the OTC analgesic market using the marketing model, Defender. This model will be used to support recommendations for the marketing of current analgesic products.

The chapter is divided into three sections. The first section provides a discussion for developing response curves. The second section presents perceptual maps for both consumer and physicians at two different time periods. The final section combines the outputs of sections one and two into a "Defenderized" model of the marketplace.

Section 4.1: Response Curve Analysis

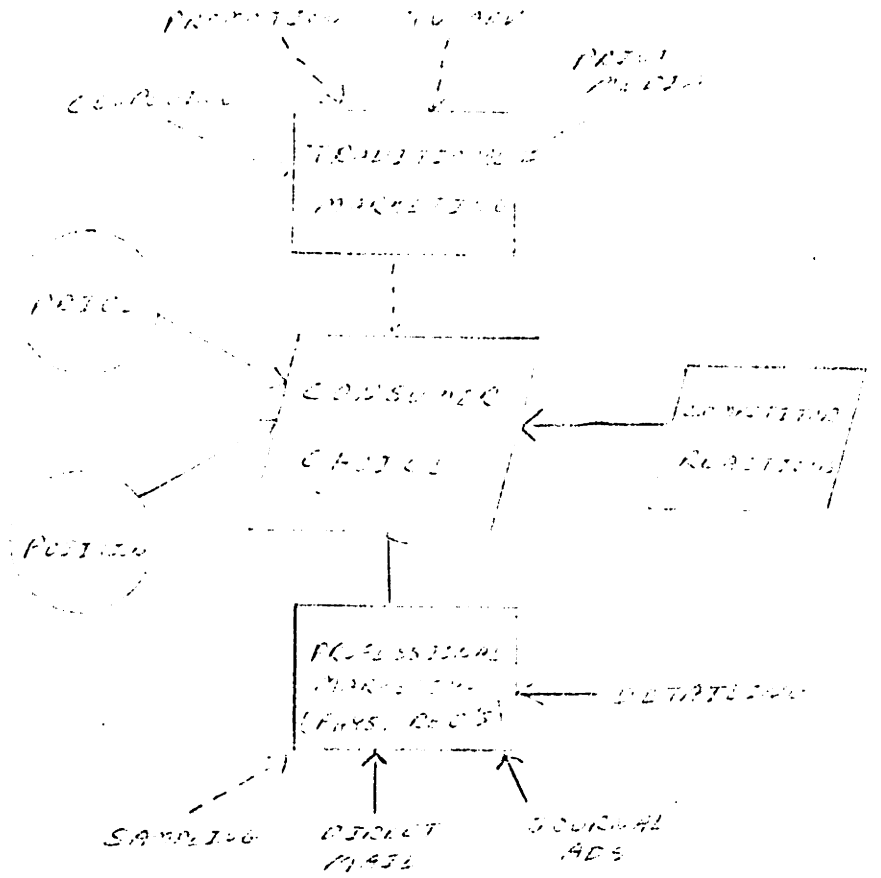
Response curves serve as inputs to the Defender Model. This thesis is attempting to examine the analgesic marketplace based upon two viewpoints, those of the physician and those of the consumer. These two decision-makers are affected by separate marketing mix variables.

The key objective of this section is build models which allow for a full range of response options to be evaluated. This goal will be achieved through the combination of statistical analysis and judgemental insight. Statistical analysis will allow exploration of the multivariate relationships based upon historical data. Judgemental insight will be used to refine this initial analysis and also allow for valid response analysis for marketing actions outside historical levels.

An ideal model would be able to interpret the relationships of all variables that affect consumer choice(see Figure 4.1). As shown in this figure, physician recommendations, consumer advertising, product positioning, retail price, and competitive activity all serve to influence consumer purchase. The solid lines indicate relationships which will be covered in this thesis. The dotted lines show relationships which are important for future work on this problem but will not be covered by this thesis. Yet, one can see that a large fraction of this model will be discussed in this thesis.

Figure 4.1

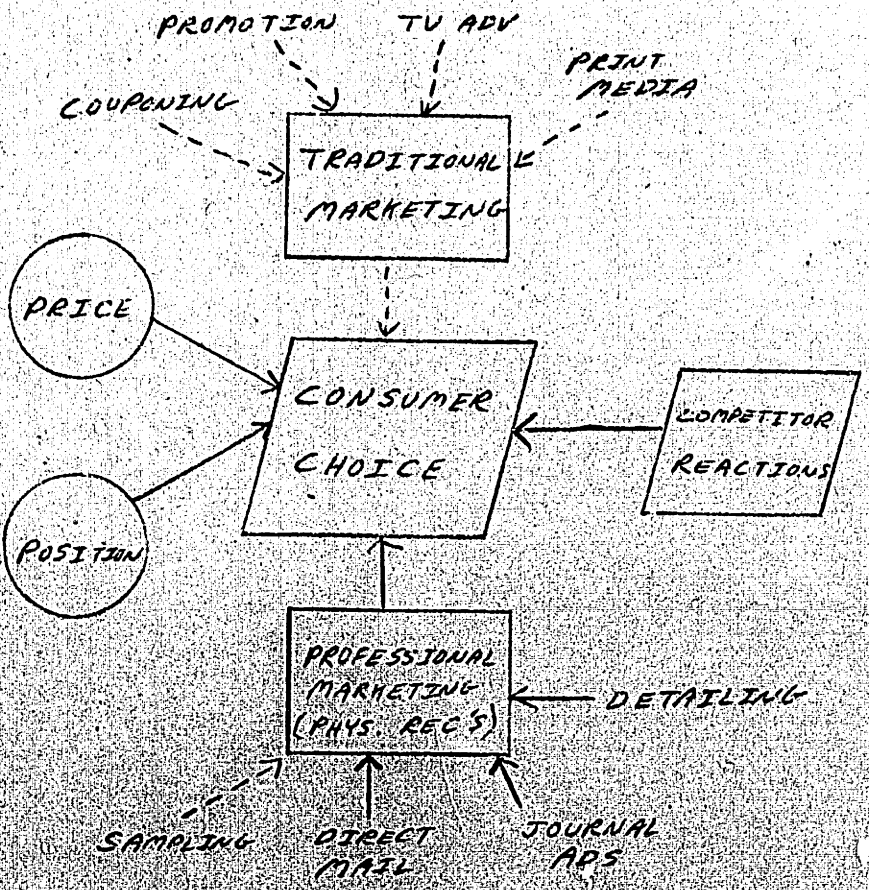
Analgesic Market Model



A key strategy of the success of some OTC analgesics has been the use of professional marketing. It has been shown that health professionals have had a strong influence on the purchase decisions of consumers(see Chapter 3). Tylenol has been the largest spender in the professional marketing of analgesics.

Figure 4.1

Analgesic Market Model



A key strategy of the success of some OTC analgesics has been the use of professional marketing. It has been shown that health professionals have had a strong influence on the purchase decisions of consumers(see Chapter 3). Tylenol has been the largest spender in the professional marketing of analgesics.

Four variables are used to influence the decisions of physicians: detailing, medical journal ads, direct mail, and sampling. Spending levels of these variables affect the total level of physician recommendations for a product. Companies employing professional(health community related) marketing attempt to maximize physician recommendations. In essence, it is assumed that additional physician recommendations will increase consumer purchases.

The monitoring of marketing expenditures in the pharmaceutical industry is fairly comprehensive considering the nature of the marketplace. IMS is the largest supplier of this information and most pharmaceutical companies subscribe to this service. This service monitors detailing, medical journal ads, direct mail, and physician mentions for both prescription and some OTC products. Fortunately, OTC analgesics is a monitored category.

Thus, data is available for three of the four independent marketing mix variables as well as the dependent measure, physician recommendations. Unfortunately, the level of sampling is quite difficult to estimate due to its nature and reliable estimates of its levels are unavailable.

The first attempt at response curve interpretation will begin with historical analysis for these variables for the periods January, 1978, through September, 1982. Monthly estimates of the professional marketing variables are available for the major brands that use detailing, journal ads, and/or direct mail. The brands under consideration are: Anacin, Ascriptin, Bayer, Bufferin, Ecotrin, Gemnisyn, Percogesic, Tylenol, and Tylenol Extra-Strength. Physician recommendations are available for these brands and also for generic aspirin and acetaminophen although generic manufacturers do very little professional marketing.

Detailing involves the use of sales representatives to influence the prescribing or recommending habits of health professionals. The use of such a sales force is quite expensive with the 1982 average "cost per call" estimated to be $34. Considering that the actual contact time with the physician is only about 5 minutes per call then the message of the sales representative should be very influential, if the use of detailing is to be cost-effective.

IMS provides a National Detailing Audit in which a panel of about 1100 physicians in private practice report on all calls made to them during a specified time period. The group is quota-sampled across specialty and geographic region. The collection methods for this data provide reasonable estimates of relative detail spending levels across products. Tylenol is by far the largest spender on detailing in the OTC analgesic category. Exhibit IV-1 shows annual detailing expenditures for the major products in the analgesic market.

Medical journal ads are used by OTC analgesic manufacturers to maintain or promote product awareness. Often their message is not fully digested by the physician but merely serves to create product awareness. Journal expenditures vary by the length of the ad, the type of publication, and the circulation of the journal.

The IMS National Journal Audit measures all pharmaceutical advertising expenditures for products of ethical, ethical OTC, and proprietary manufacturers normally prescribed or recommended by physicians in a group of medical journals(the "top 31") selected to include all significant advertising. This data is very reliable as literally every page of all significant

journals is monitored monthly. Exhibit IV-2 provides all significant journal expenditure levels by the major brands.

Direct mail is product literature sent directly to the physician. The overall abundance of such material probably serves to dilute the effectiveness of any one piece. It is likely the least effective of the independent variables and therefore is very often used in a pulsing manner(once per year) over the life cycle of a product.

The IMS National Mail Audit measures all significant physician and pharmacy mailings by recognized pharmaceutical manufacturers for both prescription and non-prescription products. Cost estimates of these mailings are at best crude approximations and total circulation is often a rough projection. This data is soft and subject to careful interpretation. Exhibit IV-3 provides the direct mail spending levels for the major brands.

There are about 230,000 office-based physicians. Most analgesic mentions to consumers come from office-based physicians. A mention is defined as involving the patient via a formal prescription, hospital order, dispensing, sampling, recommendation,

or administration. For our purposes, it will be assumed that a mention approximates a recommendation.

IMS provides a measure of recommendations through its National Disease and Therapeutic Index(NDTI) Audit. A panel of 2130 office-based physicians is monitored quarterly. It is a stratified random sample across specialty and geographic region. This data is considered reliable. For example, an NDTI estimate of 2 million drug mentions per year would have a relative sampling error of 15%. Exhibit IV-4 provides analgesic mentions for the major brands as well as for generic aspirin and acetaminophen.

We have chosen to evaluate the historical data of Tylenol. This is because Tylenol is the largest spender in professional marketing and will provide an abundance of data to be analyzed. Similar techniques could be used to evaluate other brands within this category.

Visual examination of these data reveals some initial relationships(smoothed recommendation levels are shown in Exhibit IV-5). First, there is a seasonal pattern in the data. Especially in recommendation levels, the annual high points are usually reached in January or February, and the annual low points are seen in July or August. This is quite natural considering

that analgesics are used often for the relief of colds and fevers which are more common during the winter flu season. As might be expected, somewhat seasonal patterns are evident in the professional marketing variables as companies increase efforts during those seasonal periods when recommendations are highest.

Secondly, there is clearly an upward trend over time for acetaminophen products and downward trend for aspirin products. This can largely be attributed to the constant growth of the Tylenol brand in a relatively mature analgesic market. The main reason for this growth has been the greater acceptance of acetaminophen as an equipotent analgesic with fewer side effects.

Response curves will show the relationships between the dependent variable, physicians recommendations and the professional marketing variables--detailing, medical journal ads, and direct mail.

The statistical analysis of this historical data involved several discrete steps. The initial step was to use simple linear regression on the raw data.

Linear regressions were run on the raw data for Tylenol, Tylenol Extra-Strength, and the total analgesic market(see Exhibit IV-6). Adjusted R-squared values of 7.0, -3.4, and -0.8 percent were obtained respectively.

The next step was to examine the correlation plots for each of the brand's levels of physician recommendations versus each of the independent variables(see Exhibit IV-7). Various non-linear transformations of the data yielded no significant relationships.

The next step was to test the possibility of lag effects of the independent variables on physician recommendations. A equi-weighted six period lagged effect model was examined(see Exhibit IV-8). A substantial improvement in the model was noted yet it was not a significant model in which one could place much confidence. R-squared values and t-statistics were still unsatisfactorily low.

Effects of seasonality and trends were then removed using a twelve month moving average model. This generated the plots as shown in Exhibit IV-9.

The next step was to run regressions of the moving average models. Regressions of Tylenol recommendations (see Exhibit IV-10) on each of the independent variables--detailing, journal ads, and direct mail, and on the entire combination of these variables yielded adjusted R-squared values of 55.5, 91.8, 48.7, and 92.2 percent respectively. Although these results were exciting, they were meaningless unless the residuals of these variables were also correlated in some way.

The next step involved examination of the residuals of the moving average model(see Exhibit IV-11). Very low correlations of these residuals erased all possibility of hypothesizing any causal relationships based upon this model. The moving average model served only to show that physician recommendations and the professional marketing variables for Tylenol had been increasing together over time. No causal relationships could be justified.

At this point, it was concluded that no easily identifiable model was evident. The many man-hours spent on this analysis were not wasted, however. The conclusion of a null result is just as meaningful as the finding of valid model.

This is obviously a very complicated system and not easily amenable to modeling. Increasing trends, seasonality, lagged effects, joint causality, and measurement error are all likely sources of interpretation problems. In many real world situations it is often impossible to build strong statistical models.

Since this decision information system must be implementable to management, a "decision calculus" approach(Little, 1970) was undertaken to generate a response curve analysis. This allows for a model which is simple, robust, easy to control, adaptive, and communicable to the management.

With this philosophy of decision calculus in mind, a set of managers could be asked to supply estimates to the following set of questions:

What would be the level of physician recommendations for your product if each of the professional marketing variables were completely eliminated respectively?

And what would they be for your product if each of the independent variable levels were increased infinitely?

And what would be the combined effects of such cuts and boosts on physician recommendations for your product?

Figure 4.2

Summary Data

Marketing Variables:	DET	JRN	DM	ALL
at infinity	E_1	E_2	E_3	E_4
at zero	E_5	E_6	E_7	E_8

An a priori weighting system for the managers' responses could be used to determine the overall estimates of these parameters. A summary similar to Fig 4.2 would be produced.

A simple response curve model is hypothesized:

$$REC = a - b_1 e^{-X1/R1} - b_2 e^{-X2/R2} - b_3 e^{-X3/R3}$$

where X_1, X_2, and X_3 are levels of detailing(DET), journal ads(JRN), and direct mail(DM) respectively

This curve was chosen because it is relatively simple yet had the right shape(i.e. concave in all independent variables) and it allows for differential impacts of the variables.

From the summary data: a, b_1, b_2, and b_3 are easily determined.

$$
\begin{aligned}
a &= E_4 \\
b_1 &= E_1 - E_5 \\
b_2 &= E_2 - E_6 \\
b_3 &= E_3 - E_7 \\
E_8 &= a - b_1 - b_2 - b_3
\end{aligned}
$$

The next step is to determine R_1, R_2, and R_3. Four transcendental equations can be generated to solve for these parameters(see derivation in Exhibit IV-12). These four equations are the result of requiring that current awareness matches current expenditures according to the respondent curve. The four equations are:

$$
\begin{aligned}
&(1) \quad \log(R_1) + X_1/R_1 = \log(b_1) - k \\
&(2) \quad \log(R_2) + X_2/R_2 = \log(b_2) - k \\
&(3) \quad \log(R_3) + X_3/R_3 = \log(b_3) - k \\
&(4) \quad (R_1 + R_2 + R_3)e^k = a - REC
\end{aligned}
$$

where X_1, X_2, X_3, and REC are all average monthly levels over the previous year

Use the below iterative process to solve:

1. choose k
2. solve for R_1, R_2, R_3
3. check equality of equation (4)
4. adjust k until approximate solution

This process allows for an approximate response model to be built without collection of large amounts of data. Of course, managerial experience and experimentation should be used to refine parameter estimates over time. Exhibit IV-13 shows the results of this model used with data for Ascriptin. The model predicts response direction fairly accurately but is not as sensitive to large changes in response variables. The lack of robustness in this model is affected by not being able to account for lag effects and seasonality.

Adaptive Control is another method for the development of response functions(Little 1966). In this approach the advertising rate, say detailing, is varied by an amount, Δ , in different markets. It is reduced from its initial level(d_0) to a lower level($d_0 - \Delta/2$) in some markets and is increased to a higher level($d_0 + \Delta/2$) in other markets(n). Based upon this experimentation, both n and Δ are selected to maximize expected profit in the next period, period t+1.

Using the equation:

$$d(t+1) = d_0(t) + c(ms^+ - ms^- - \Delta)$$

where c is a constant and m is the gross margin on sales; s^+ is the sales rate observed where detailing was increased; and s^- is the sales rate observed in markets where detailing was decreased. The equation says that detailing is revised proportionately to profit. A manager simply increases (or decreases) the detailing rate by an amount proportional to observed net profit rate(or loss) due to the advertising change in experimental markets.

The method is both robust and works well even if n and Δ are not optimally chosen. The key point is that a manager could use these periodic measurements and refinements to gain a better understanding of the effects of detailing(or any other marketing variable) on sales.

Section 4.2: Perceptual Maps

A perceptual map is the second key input for building the model, Defender. Analysis using traditional perceptual maps is state-of-the-art methodology as recommended by new product textbooks(Urban and Hauser, 1980; Pessemier, 1982;

Wind, 1982) as well as basic marketing textbooks(Kotler, 1983). Data collection is feasible for traditional maps although their predictive accuracy is not documented as well as for pretest market models.

Hauser and Shugan(1981) suggest the use of "per dollar" perceptual maps. The dimensions of the map are determined by dividing the factor scores for the product by the price of the product. For example, shampoos might be evaluated with respect to "cleanliness per dollar" and "gentleness per dollar". This "per dollar" assumption for maps has had limited testing(Hauser and Gaskin, 1983) and, hence, has become quite controversial in marketing science. See discussions in Rao(1982), Ratchford(1982), and Sen(1982).

Our analysis of the analgesic market employs the use of two perceptual maps. As previously discussed(see Chapter 3), both consumers and physicians are targets of marketing efforts by analgesic manufacturers. Therefore, we developed Defender models for each of these groups.

Our physician study involved a convenience sample of 40 doctors in the Boston area. The study included general/family practioners, doctors of internal medicine, and doctors of osteopathy. The study(see

Exhibit IV-14) included:

(1) Collection of seven attribute ratings on 6 point semantic scales for each product in the evoked set for each physician. These scales are not necessarily ratio-scaled(see later discussion).

(2) The evoked set was defined as those analgesic products(i.e. aspirin or acetaminophen) of which the physician was aware. The percent of non-prescription analgesic recommendations for these products was recorded.

There were only three products tested: aspirin(325mg), regular-strength acetaminophen(325mg), and extra-strength acetaminophen(500mg). The generic products were tested because most physicians' mind set is framed in this manner. The seven attribute ratings were:

-effectiveness as a pain-reliever
-effectiveness as an antipyretic(fever reducer)
-effectiveness in treating osteoarthritis
-effectiveness an anti-inflammatory
-lack of side effects
-toxicity at overdose
-overall safety

The attribute ratings were factor analyzed using principal components and the eigenvalue cutoff rule of one. Three underlying dimensions were revealed: efficacy, few side effects, and non-toxicity(see Table IV-1). A "per dollar" perceptual map is shown in Figure IV-3. Equal prices per product were assumed since it is believed that physicians perceive analgesic dimensions without regard to price. Also, a zero point of (-.6, -.6, and -.25) was used to anchor the

dimensions-- efficacy, few side effects, and non-toxicity, respectively. Zero points are necessary to justify the use of "per dollar" perceptual maps.

Table IV-1

Factor Loadings For Physician Study

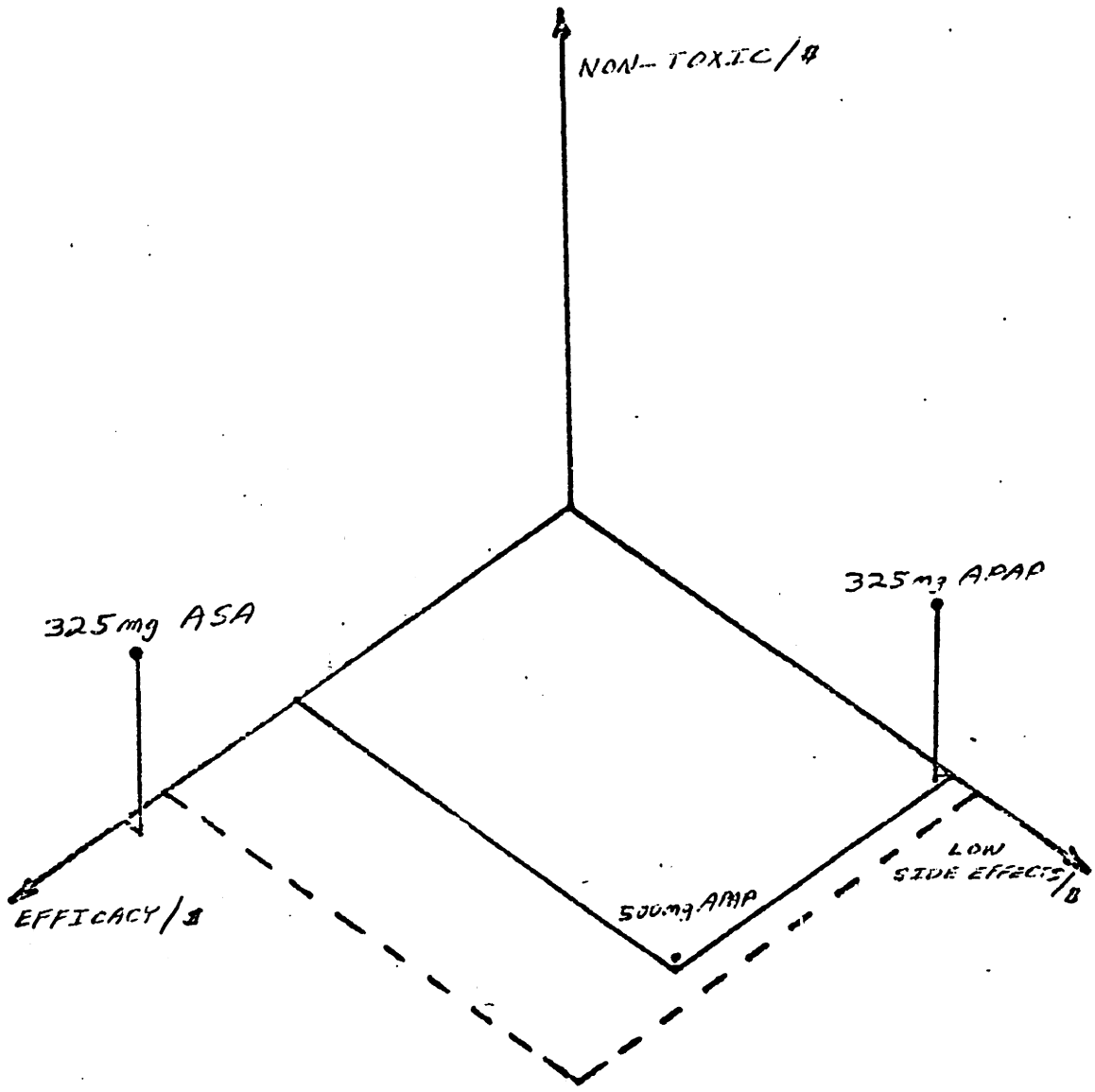
	Factor Loading
1. Efficacy	
Effective as a non-R analgesic	-.720
Effective as an antipyretic	-.703
Effective in treating osteoarthritis	-.811
Effective as an anti-inflammatory	-.747
2. Few Side Effects	
Has side effects	.776
Is safe to use	-.718
3. Non-toxicity	
Toxicity at overdose	.888

The most controversial issue of "per dollar" perceptual maps is dividing the factor scores by the price of the product. Factor scores are not ratio-scaled and are at the best, interval-scaled dimensions. Division assumes the perceptual dimension is a ratio-scaled measure and that a zero-point can be identified, e.g. a "zero cleanliness" for shampoos(of course any shampoo contains some cleansing agent and therefore provides some minimal "cleanliness per dollar"). However, some reference point must be identified to determine a consumer's willingness to pay

Figure IV-3

Physician Study Factor Scores

Factor	ASA325MG	APAP500MG	APAP350MG
Efficacy	1.09	.03	.68
Safe To Use	.02	.92	.93
Nontoxic	.35	.34	.02



for a improved brand relative to that reference point(see Hauser and Gaskin, 1983 for a more detailed discussion).

In order to ensure that all products in "per dollar" perceptual maps have positive scores on each dimension, we have chosen a minimum value among products along each dimension to determine the zero points.

The perceptual map produced from the physician study is intuitively pleasing. Aspirin(ASA) is the most effective and 500mg acetaminophen(APAP) is the next most effective; APAP products have always tried to stress their equipotency with ASA and developed 500mg APAP to improve their position. Both APAP products have equal scores on few side effects and score much higher than ASA; aspirin has many more side effects(mainly gastrointestinal problems). Finally, 500mg APAP scores poorly on non-toxicity in comparison to the other two products; chronic overdose of 500mg APAP causes liver damage leading to death.

Our second study used a convenience sample of 120 consumers, mostly students, in the Boston area. The study(see Exhibit IV-15) included:

(1) Collection of six attribute ratings on a 6 point scale for eight products-- Anacin, Maximum-Strength Anacin, Bayer, Bufferin, Extra-Strength Bufferin, Excedrin, Regular-Strength Tylenol, and Extra-Strength Tylenol.

(2) Current use and last brand purchased information was obtained.

The six attributes were:

-overall effectiveness
-being fast-acting
-having few or no side effects
-effectiveness in reducing fever
-effectiveness in relieving headache pain
-effectiveness in relieving pain other than headache pain

The attribute ratings were factor analyzed using principal components and the eigenvalue cutoff rule of one. Three underlying dimensions were revealed: efficacy, few side effects, and fever-reducing(see Table IV-2). A "per dollar" perceptual map is shown in Figure IV-4. Average prices for each product in 1982 were used to determine map coordinates . A zero point(-.3, -.3, -.2) was used to anchor the dimensions-- efficacy, few side effects, and fever-reducing.

Table IV-2

Factor Loadings for Consumer Study

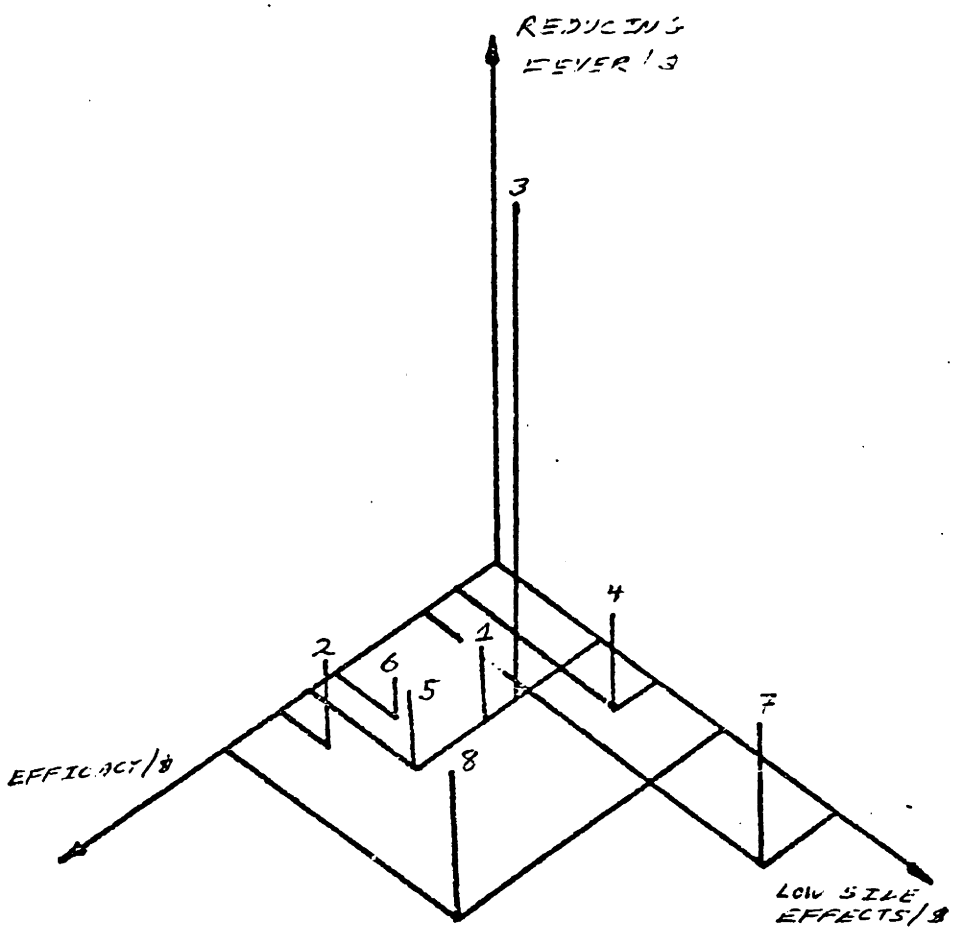
	Factor Loading
1. Efficacy	
Effectiveness	-.820
Fast-Acting	-.791
Stops Headaches	-.803
Stops Non-Headache Pain	-.837
2. Few Side Effects	
Few Side Effects	-.940
3. Reduces Fever	
Reduces Fever	.911

Once again the perceptual map is intuitively pleasing. Extra-Strength Tylenol received the best efficacy rating followed by Maximum-Strength Anacin and Extra-Strength Bufferin; all extra-strength forms exceeded their corresponding regular-strength forms on efficacy. Both Tylenol products and Regular-Strength Bufferin scored well on few side effects; all regular-strength forms scored better on few side effects than corresponding extra-strength forms suggesting a tradeoff between efficacy and side effects. Bayer scored highest on reducing fever, far exceeding all other brands; Bayer has traditionally advertised its fever-reducing ability especially for its childrens' product.

Figure IV-4

Consumer Study Factor Scores

Code-Brand	Efficacy	Safe To Use	Reduces Fever
1. Reg. Strength Anacin	.08	.07	.04
2. Max. Strength Anacin	.15	.03	.04
3. Bayer	.06	.07	.28
4. Reg. Strength Bufferin	.03	.11	.05
5. Ext. Strength Bufferin	.13	.07	.04
6. Excedrin	.11	.04	.01
7. Reg. Strength Tylenol	.05	.24	.08
8. Ext. Strength Tylenol	.19	.16	.08



Section 4.3: Defender Analysis

This section presents the "defenderized" perceptual maps. These snapshots of the marketplace will aid in quantitative analysis for developing defensive marketing strategy against the threat of market penetration by new brands.

Defender makes the following assumptions:

(1) that each consumer chooses the product from his evoked set which maximizes utility.

(2) that utility is linear in the "per dollar" perceptual dimensions. Linear utility implies straight-line indifference curves.

(3) that consumers vary in their tastes.

There is considerable variation across individuals with regards to the brands that they evoke(Silk and Urban, 1978). The Defender model first predicts market share within each evoked set. The category market share is the weighted sum of the market shares of each evoked set.

Although a brand may be dominated in perceptual space by another brand, it may have a non-zero category share because of variation in evoking. Consumers may evoke the dominated brand yet not the dominating brand. They may not evoke the dominating brand because it is underadvertised or may not have been available due to

limited distribution(few brands ever have higher than 90% awareness and/or distribution.

For a three dimensional perceptual map, we can represent tradeoffs between dimensions by the angles, α, and β. Each consumer can be represented by the angle α, which is the angle that his indifference curve makes with the axis of two dimensions. Likewise, β could be used similarly. This provides a $f(\alpha,\beta)$ taste distribution for each consumer for three dimensions(see Hauser and Gaskin, 1983).

The market share of a brand will be the percent of consumers whose taste angle distribution, $f(\alpha,\beta)$, favors that brand. Thus if we know the distribution of all $f(\alpha,\beta)$ within the population, and if we know the perceptual position of all brands, then we can readily compute market share for each brand. Analytical formulae are derived in Hauser and Shugan(1982).

We divide the feasible region of the α-β plane into 441 equal areas and for each area, we compute consumer utility for all brands, and assign to that area, the brand with highest utility. To forecast market share within the evoked set, we sum up the areas that a brand captures, weighting each area by the number of consumers with tastes represented by that

area. Category market share is the weighted sum of all evoked sets.

Section 4.3.1: Physician Study

In the physician study there were two evoked sets: (1) physicians who evoked only 325mg aspirin(ASA) and 325mg acetaminophen(APAP), and (2) physicians who evoked all three products. Market share levels were determined using the "percentage of recommendations made" data from the questionnaire(see Table IV-3).

Table IV-3

Physician Study
Market Share

Evoked Set	Segment Weight	325 ASA	325 APAP	500 APAP
1	96%	50.4	31.4	18.2
2	4%	47.3	52.7	----
overall	100%	50.3	32.1	17.6

The market taste distribution map is shown in Figure IV-5. The taste distributions of each respective product are shown in Figure IV-6.

Figure IV-5

Physician Taste Distribution Map-- Entire Market

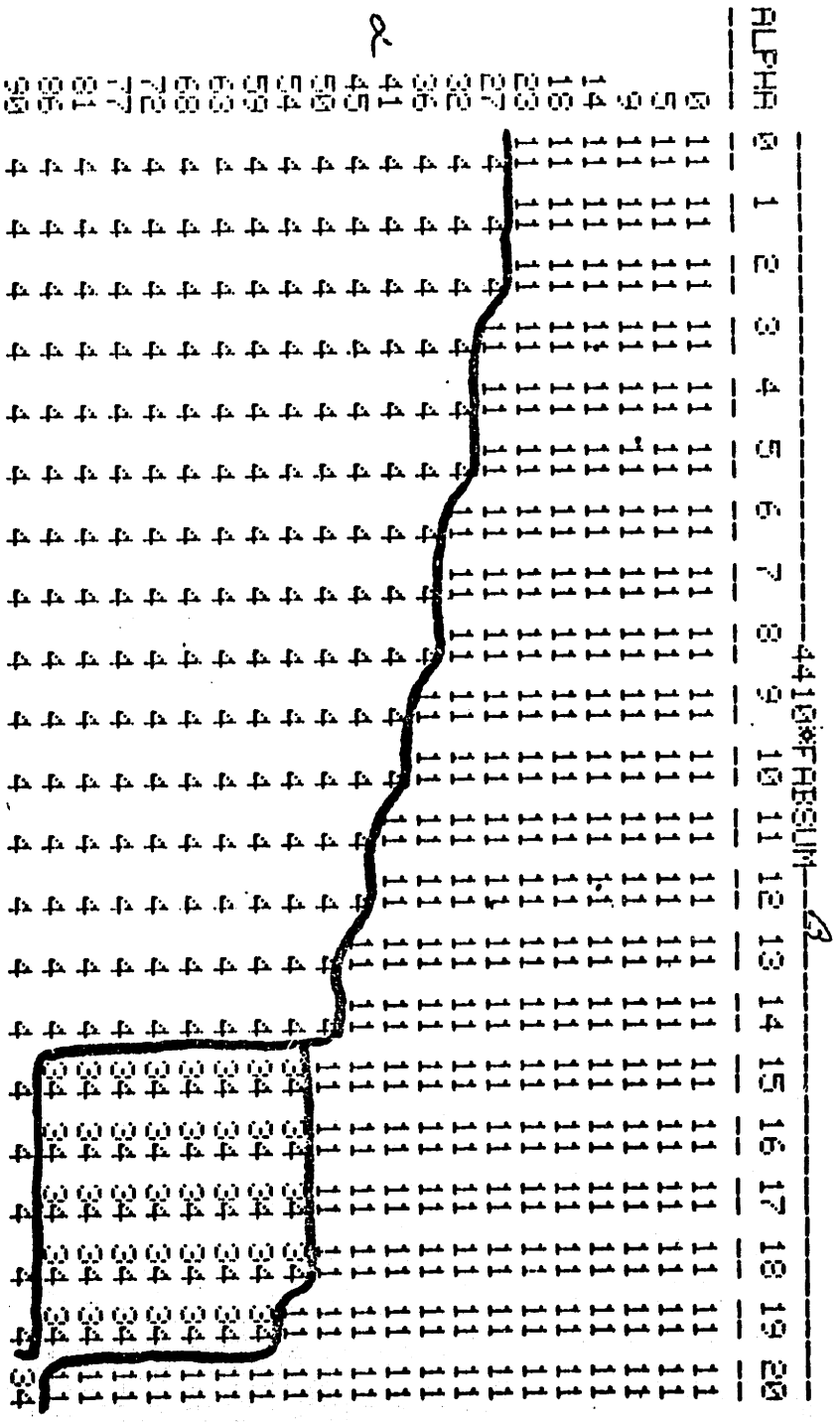


Figure IV-6a

325mg Aspirin(ASA)

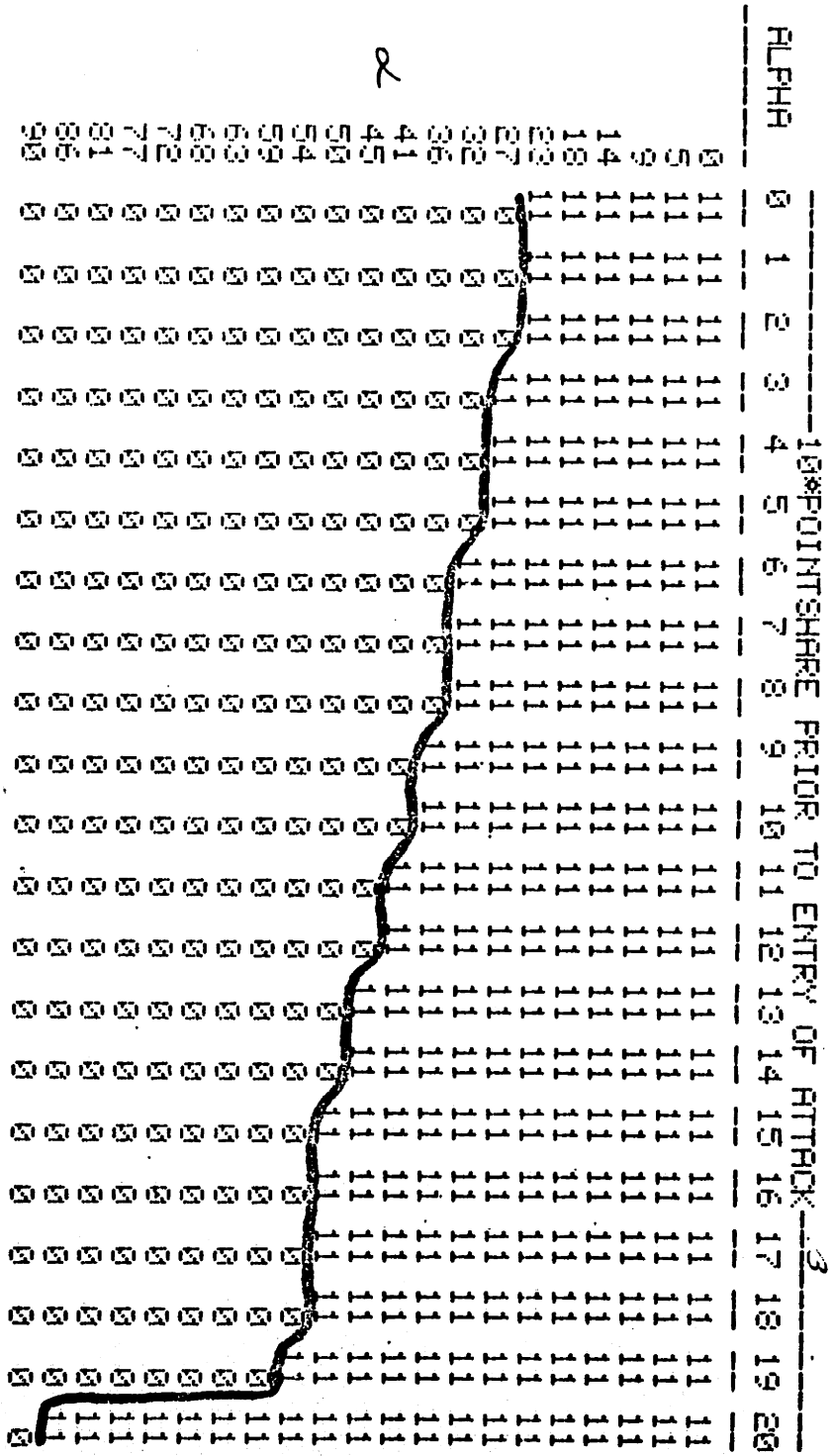


Figure IV-6b

325mg Acetaminophen(APAP)

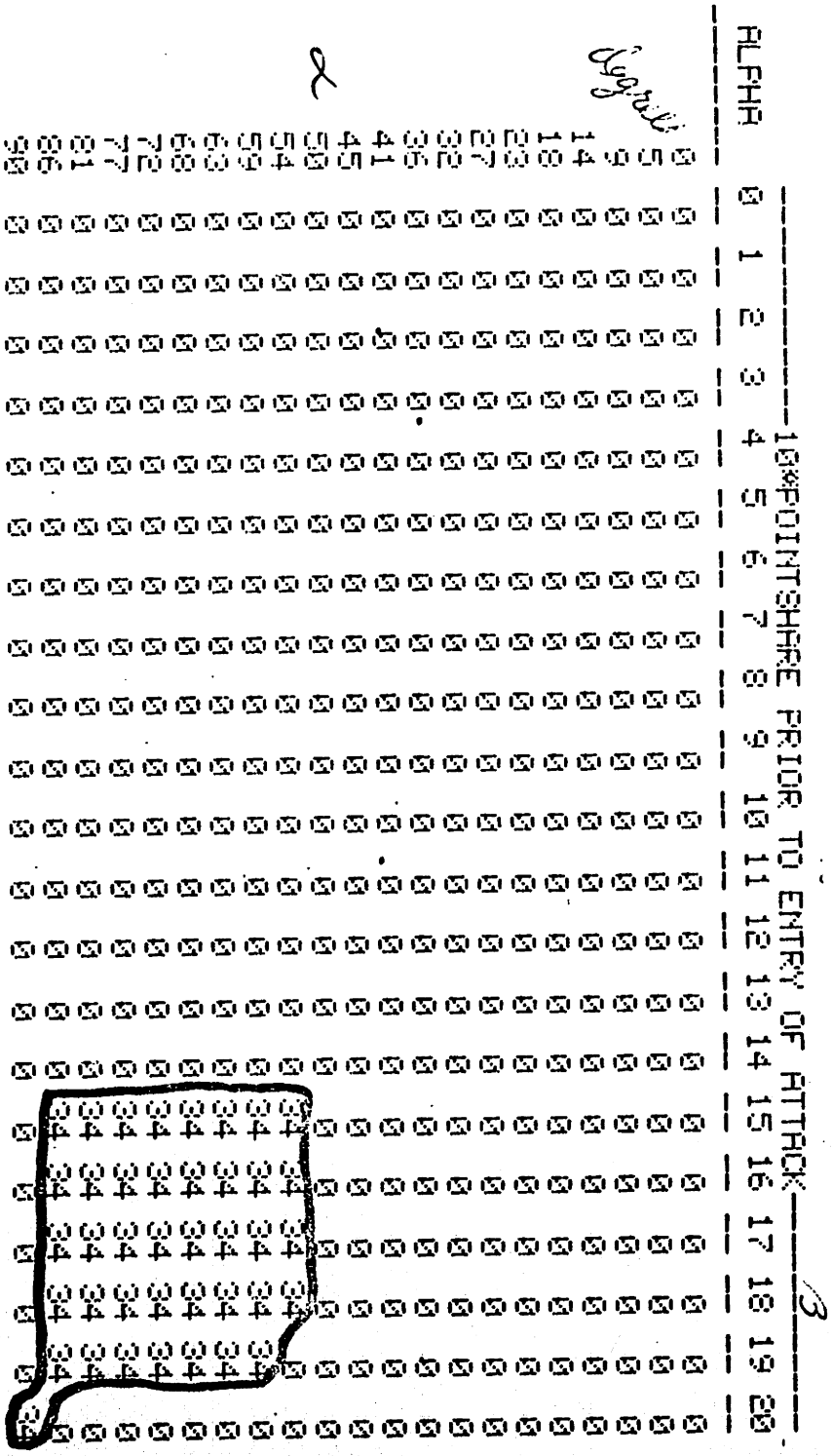
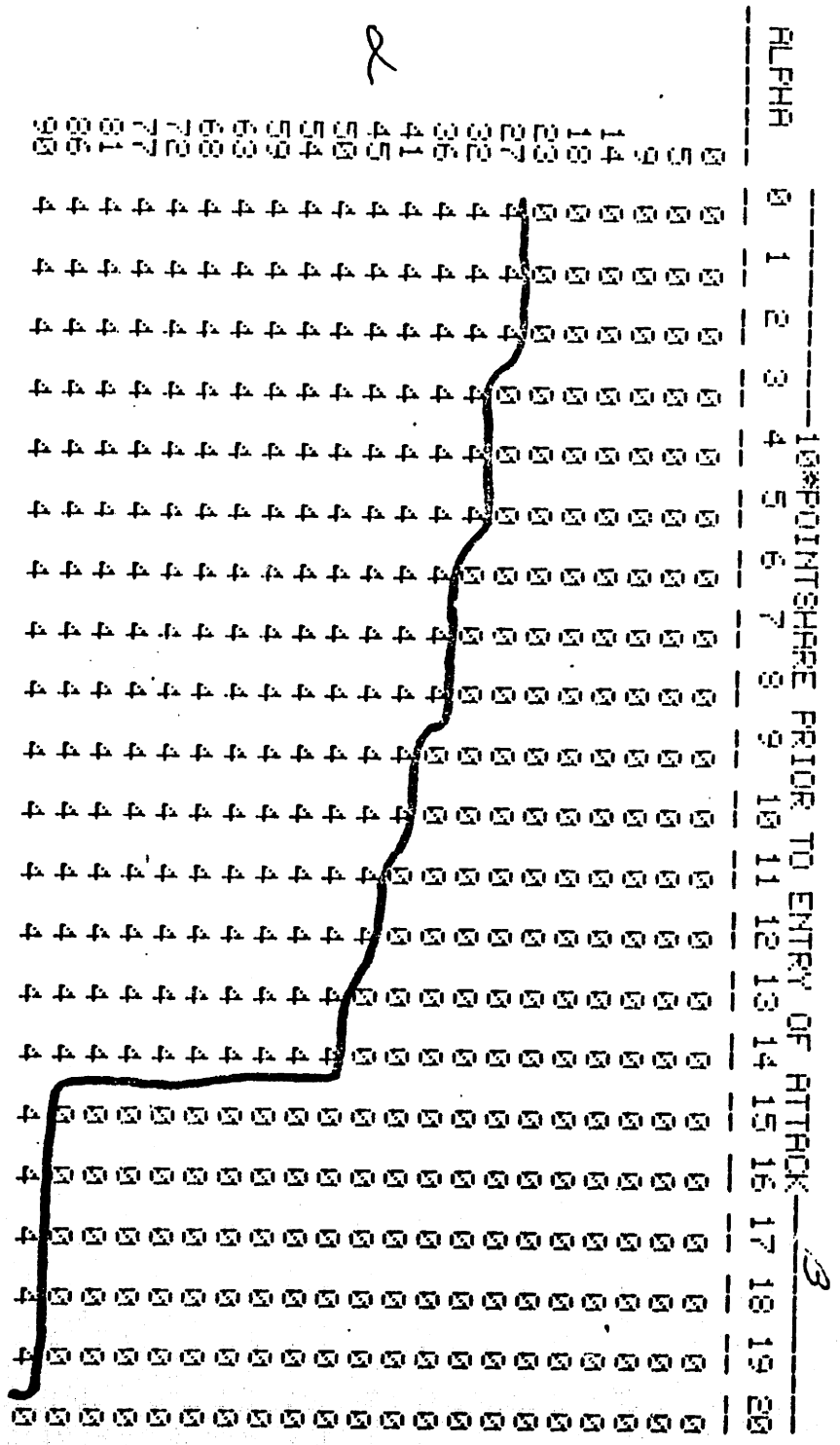


Figure IV-6c

500mg Acetaminophen(APAP)



The taste distribution maps show preferences for $f(\alpha,\beta)$. For the physician study, α is the weight of safety to efficacy and β is the weight of non-toxicity to efficacy. The map has 441(21x21) equal areas representing each $f(\alpha,\beta)$. There is an altitude shown for each area on the map that quantifies the amount of preference for that $f(\alpha,\beta)$. A simple visualization is to imagine a blanket draped over these pieces of furniture(each $f(\alpha,\beta)$) of differing height. The taller the piece of furniture, the greater the preference for that piece of furniture.

The following information is revealed by these maps:

(1) Physicians who recommend 325mg ASA do not care about high side effects, place some emphasis on non-toxicity, and use the product because of its effectiveness.

(2) Doctors who recommend 325mg APAP use the product because of its low side effects and non-toxicity.

(3) Physicians who recommend 500mg APAP use the product because of its low side effect profile and do not worry about its slight toxicity problem.

(4) The entire market is characterized by a high density of doctors who want low side effects and non-toxicity. A second smaller segment is willing to trade-off the low side effects in favor of better efficacy.

The results should be intuitively appealing to the reader in the light of previous discussion. This Defender model presents a clear framework with which to look at the physician market.

Section 4.3.2: Consumer Study

In the consumer study there were 255 possible evoked sets for the eight products. 53 of these possible sets were found in this study. A collapsing procedure reduced the final collection to 23 evoked sets. Market share levels were determined from "last brand purchased" using the data from the questionnaire(see Table IV-4).

The taste distribution of the market is presented in Figure IV-7. The taste distributions of each product are shown in Figure IV-8. For the consumer study, α is the weight of few side effects to efficacy and β is the weight of reduces fever to efficacy.

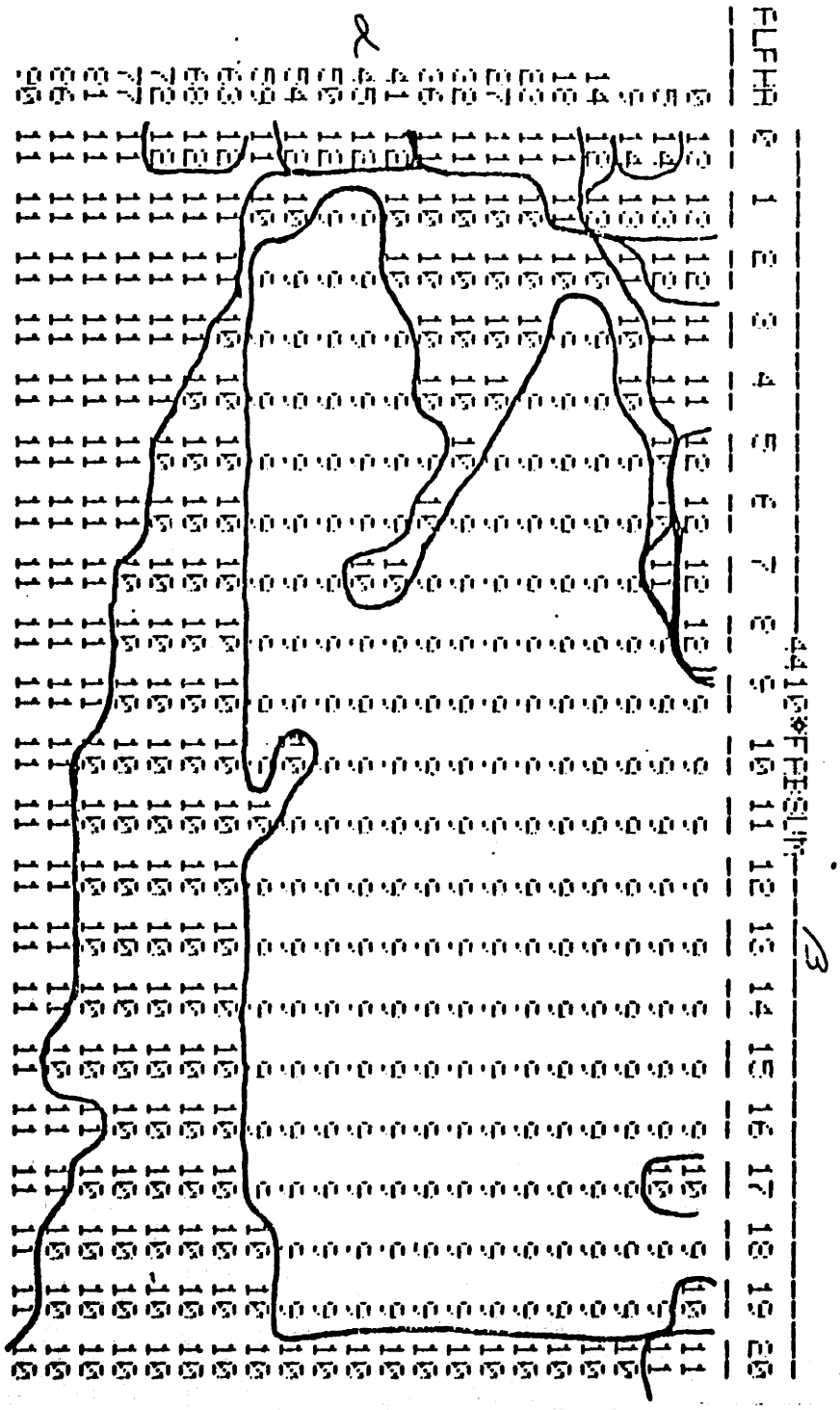
Table IV-4

Consumer Study
Market Share

Evoked Set	Segment Weight	Brand 1	2	3	4	5	6	7	8
1	1%	6	94	--	--	--	--	--	--
2	1	47	--	53	--	--	--	--	--
3	1	50	--	--	50	--	--	--	--
4	1	57	--	--	--	--	43	--	--
5	1	36	--	--	--	--	--	64	--
6	7	100	--	--	--	--	--	--	--
7	1	--	--	--	--	--	--	50	50
8	1	--	100	--	--	--	--	--	--
9	2	--	--	46	54	--	--	--	--
10	1	--	--	67	--	33	--	--	--
11	1	--	--	56	--	--	44	--	--
12	1	--	--	--	--	--	--	80	20
13	3	--	--	33	--	--	--	67	--
14	5	--	--	39	--	--	--	--	61
15	16	--	--	100	--	--	--	--	--
16	1	--	--	--	71	--	29	--	--
17	5	--	--	--	100	--	--	--	--
18	1	--	--	--	--	100	--	--	--
19	1	--	--	--	--	--	47	53	--
20	6	--	--	--	--	--	100	--	--
21	5	--	--	--	--	--	--	83	17
22	12	--	--	--	--	--	--	100	--
23	26	--	--	--	1	--	--	--	99
overall	100%	9	2	22	8	1	8	20	30

Figure IV-7

Consumer Taste Distribution Map-- Entire Market



Portions of the text
on the following page(s)
are not legible in the
original.

Figure IV-8a

Anacin

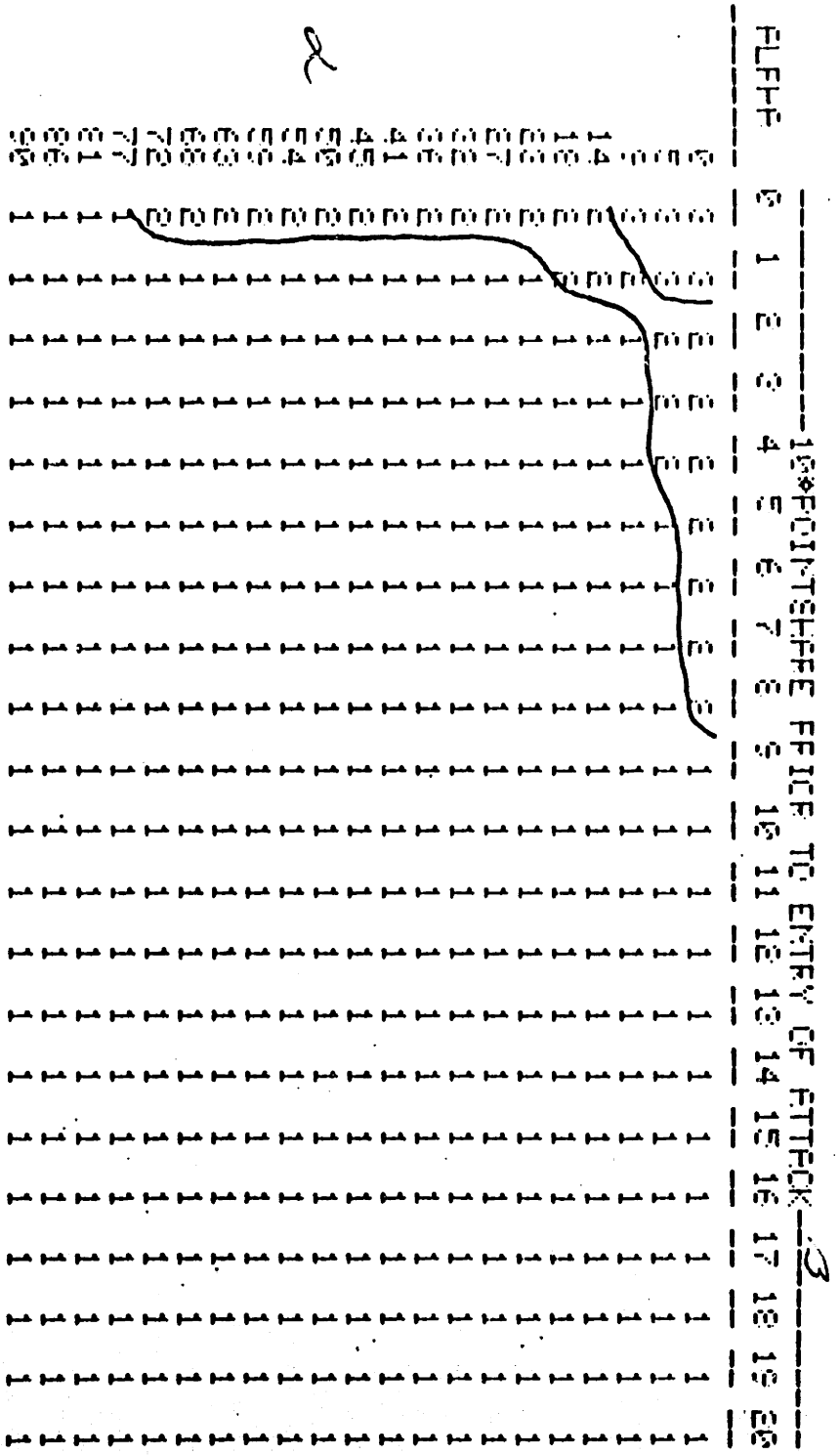


Figure IV-8b

Maximum Strength Anacin

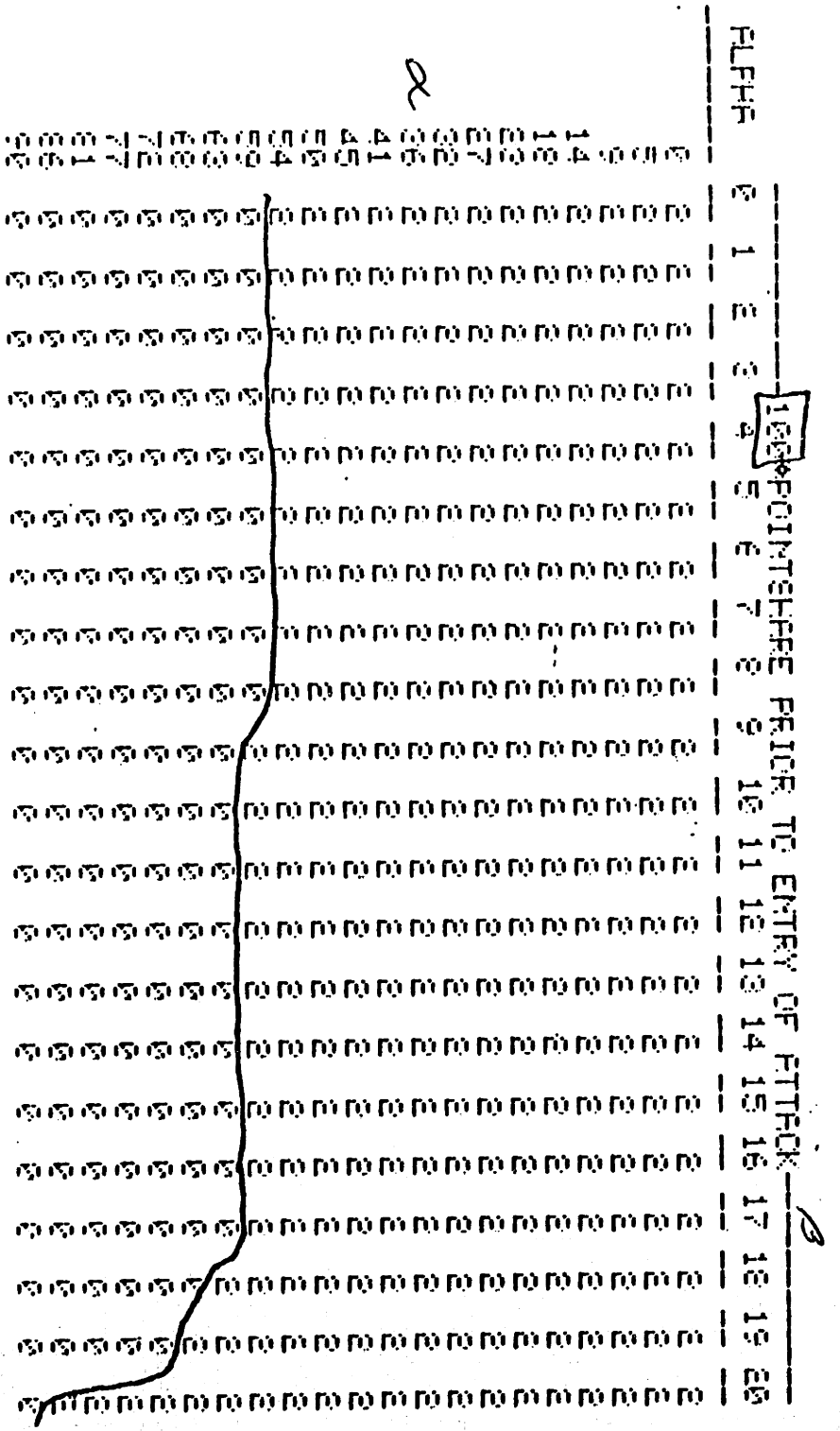


Figure IV-8c

Bayer

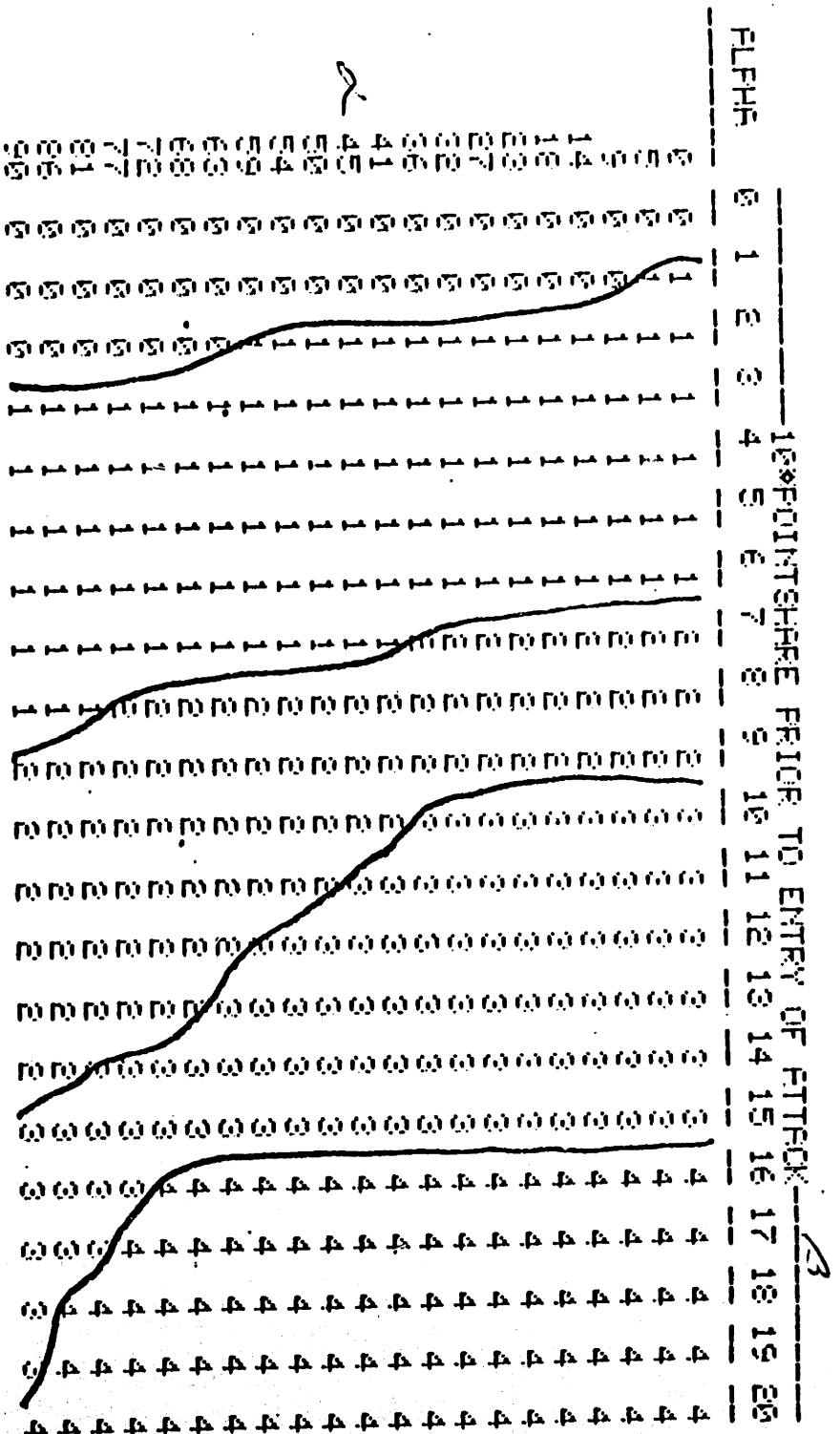


Figure IV-8d

Bufferin

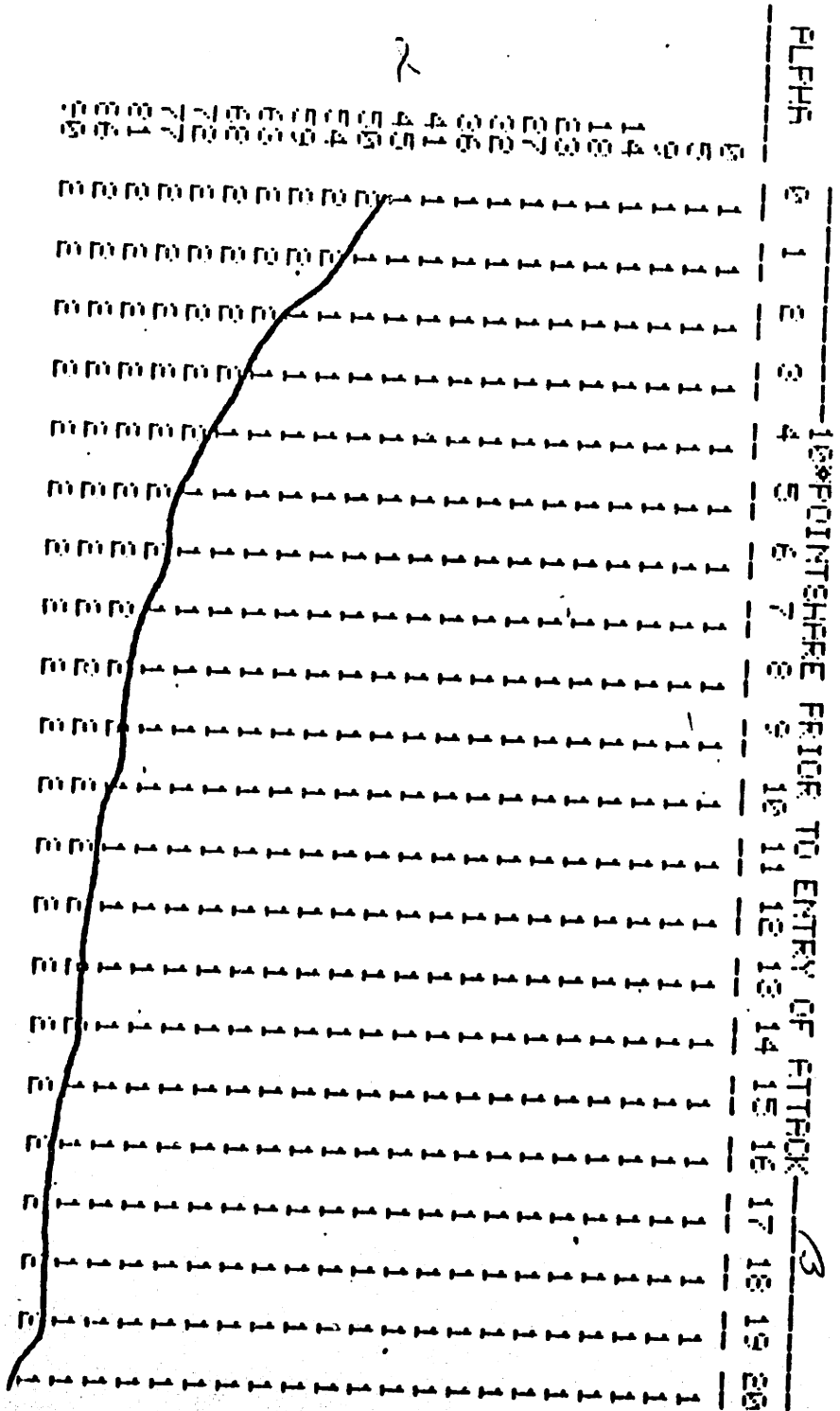


Figure IV-8e

Extra-Stength Bufferin

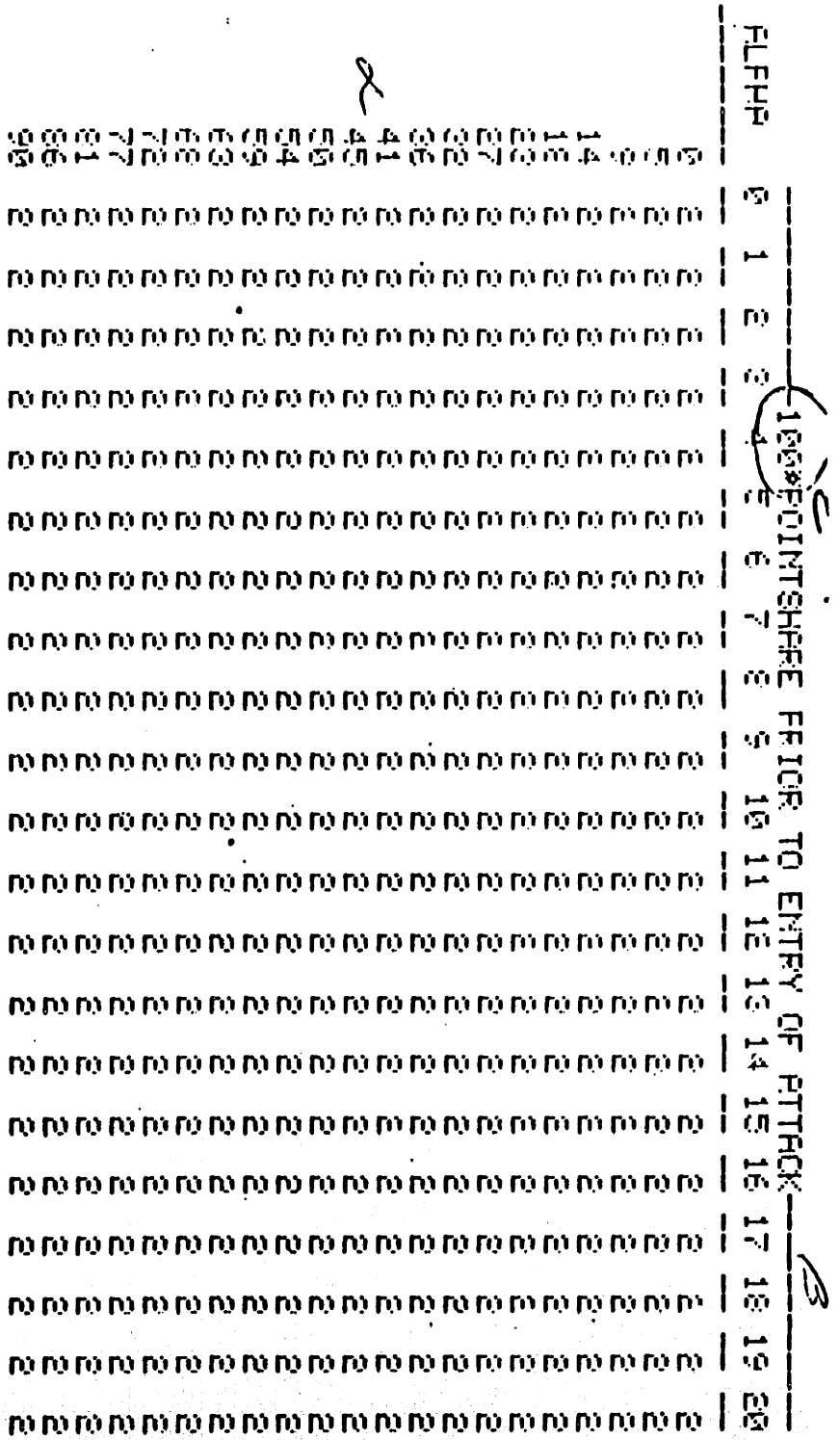


Figure IV-8f

Excedrin

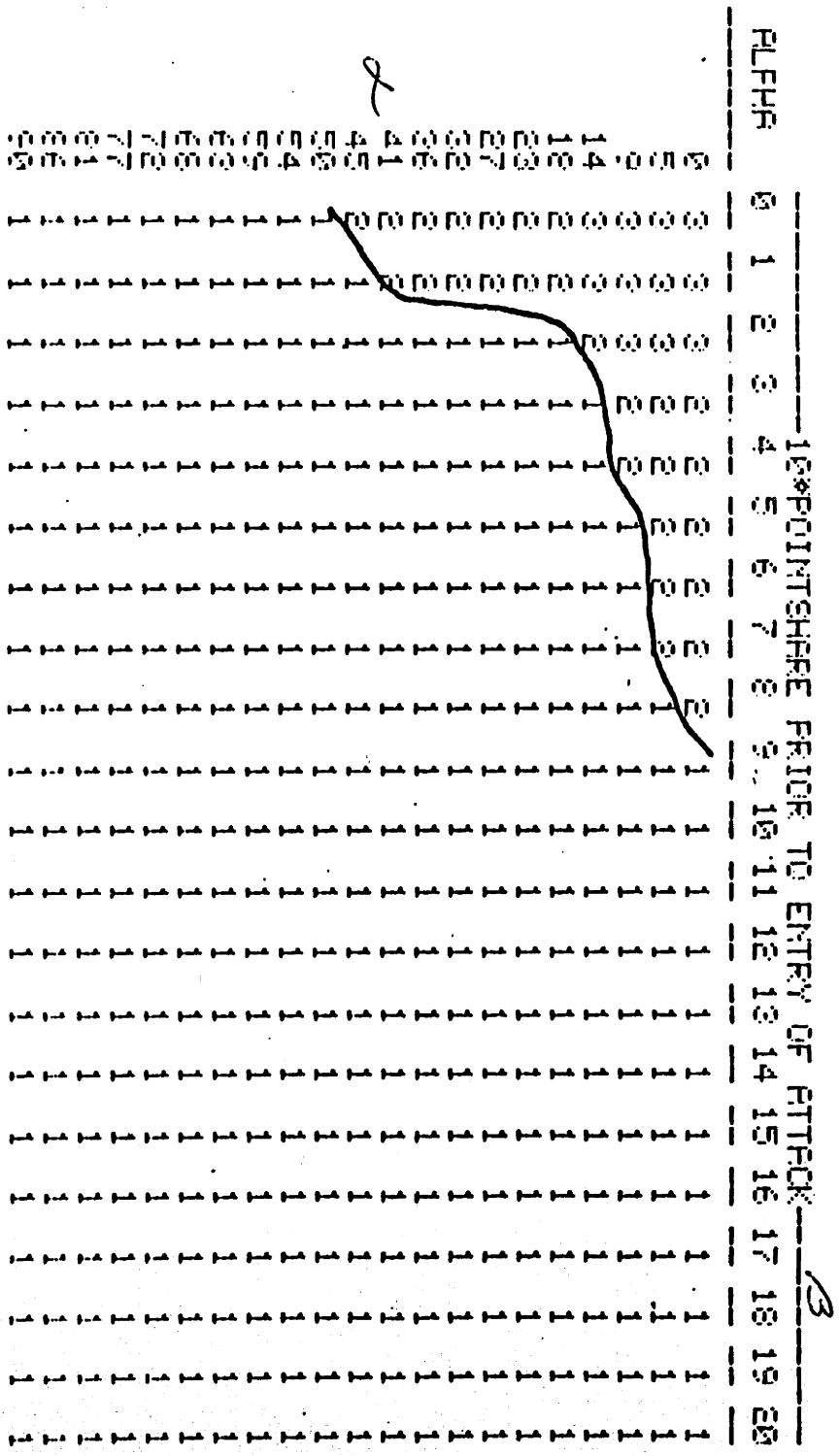


Figure IV-8g

Tylenol

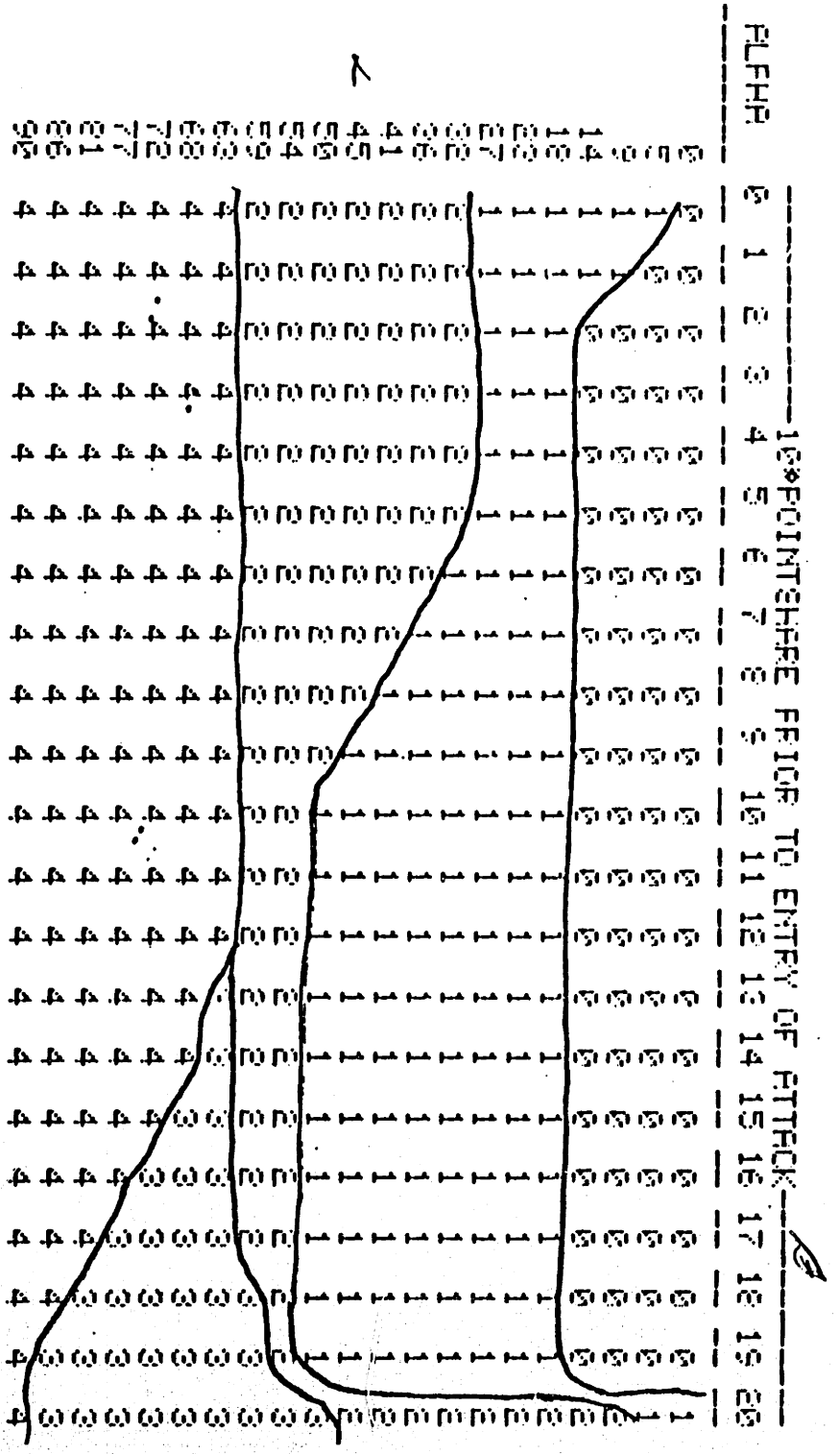
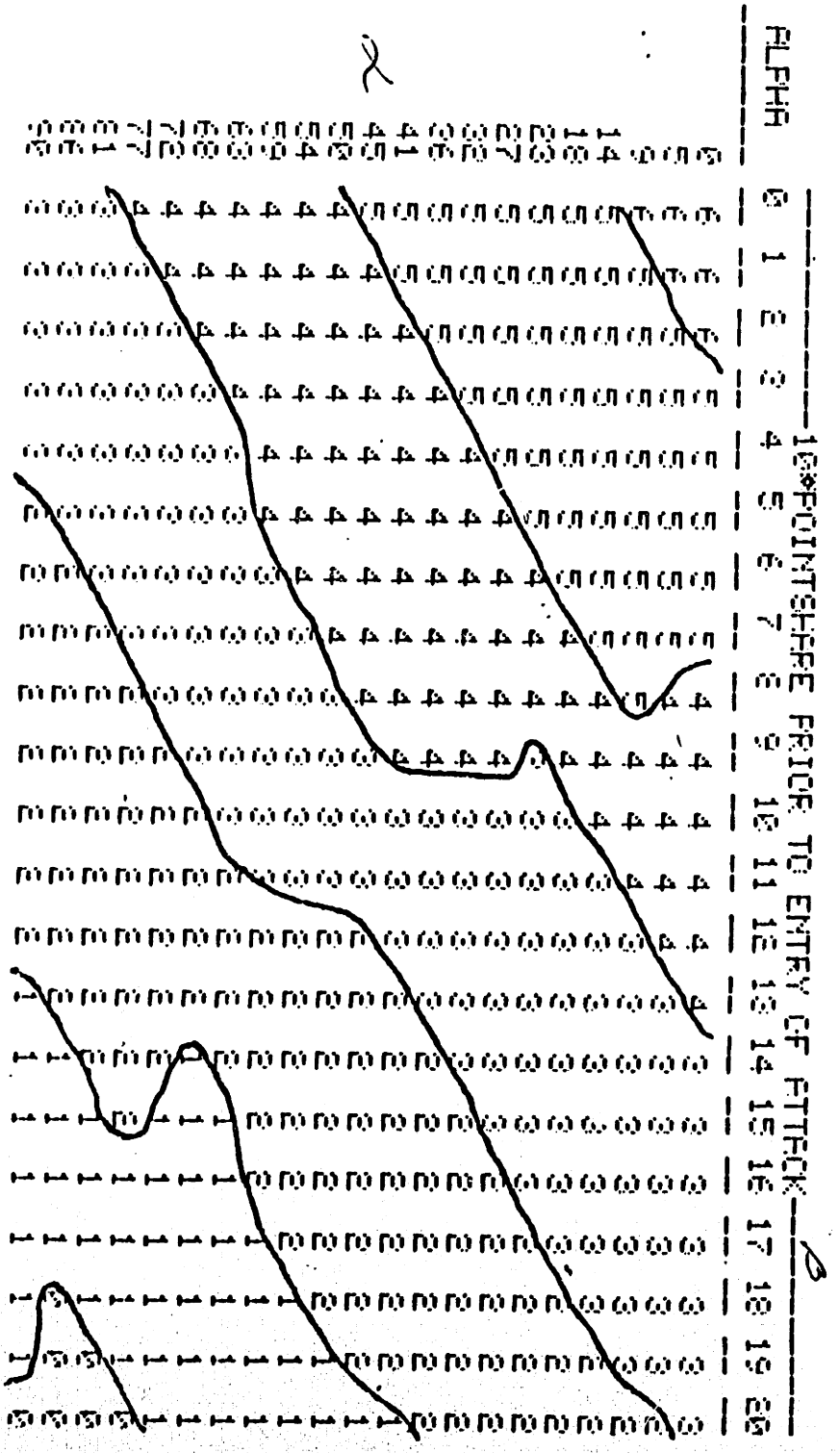


Figure IV-8h

Extra-Strength Tylenol



The following information is revealed by these maps:

(1) The taste distribution of the marketplace is fairly uniform. There is a slightly higher density of people who want strong efficacy without caring about higher side effects.

(2) Regular-Strength Anacin's share comes from consumers who tend to want high efficacy and less concerned with high side effects or low fever-reducing. Maximum-Strength Anacin's share(although very small) comes from people who tend to care little about side effects.

(3) Bayer gets share from people who tend to want good fever-reducing ability.

(4) Bufferin has a very uniform distribution getting slightly more share from consumers wanting low side effects. Extra-Strength Bufferin's share(although very small) is uniformly distributed.

(5) Excedrin users tend to want high efficacy or are willing to trade off for high side effects and low fever-reducing.

(6) Regular-Strength Tylenol gets share from consumers who want low side effects. Extra-Strength Tylenol gets share from consumers who want high efficacy.

Once again these results make sense based upon previous discussion. Defender provides a good model of the tradeoffs that consumers make between analgesic brands. This intuitive "face validity" enables us to have more confidence in our further results.

Tracking studies can be run periodically to monitor changes in the marketplace. In this manner, the impact of new developments(such as new brand entries) can be measured. The next chapter will provide an analysis of the effects of some theoretical attacking brands and will suggest some defensive marketing strategies for the current competing brands.

Exhibit IV-1

Annual Detailing Expenditures for OTC Analgesics

	1978	1979	1980	1981	1982 *
TYLENOL	622	677	924	801	844
TYLENOL EXTRA-STRENGTH	240	365	208	117	363
ANACIN	8	0	0	0	0
BUFFERIN	0	0	1	0	12
BAYER	0	0	66	55	17
ASCRIPTIN	1160	754	760	796	532
GENERIC ASPIRIN	0	0	0	0	0
BUFFERED ASPIRIN	0	0	0	0	0
GENERIC APAP	0	0	0	0	0
PERCOGESIC	636	190	269	295	139
ECOTRIN	39	0	13	0	0
GEMNISYN	NA	NA	NA	1523	275
TOTAL($ 000)	2705	1986	2241	3587	1904

*first nine months

Exhibit IV-2
Annual Journal Expenditures for OTC Analgesics

	1978	1979	1980	1981	1982 *
TYLENOL	776	735	1137	1309	917
TYLENOL EXTRA-STRENGTH	338	424	235	4	928
ANACIN	0	0	0	12	251
BUFFERIN	247	460	275	441	171
BAYER	741	681	1379	940	587
ASCRIPTIN	467	373	387	401	393
GENERIC ASPIRIN	0	0	0	0	0
BUFFERED ASPIRIN	0	0	0	0	0
GENERIC APAP	0	0	0	0	0
PERCOGESIC	96	83	108	110	96
ECOTRIN	40	240	139	0	0
GEMNISYN	NA	NA	NA	458	123
TOTAL($ 000)	2705	2996	3660	3675	3466

*first nine months

Exhibit IV-3
Annual Direct Mail Expenditures for OTC Analgesics

	1978	1979	1980	1981	1982 *
TYLENOL	46	67	23	196	32
TYLENOL EXTRA-STRENGTH	0	146	748	115	71
ANACIN	53	54	46	42	36
BUFFERIN	0	11	39	70	173
BAYER	184	124	607	0	37
ASCRIPTIN	393	99	66	22	4
GENERIC ASPIRIN	0	0	0	0	0
BUFFERED ASPIRIN	0	0	0	0	0
GENERIC APAP	0	0	0	0	0
PERCOGESIC	0	19	0	0	0
GEMNISYN	NA	NA	NA	103	35
TOTAL	676	520	1529	548	388

*first nine months

Exhibit IV-4
Annual Mentions of OTC Analgesics

	1978	1979	1980	1981	1982 *
TYLENOL	4057	3808	4501	5218	4566
TYLENOL EXTRA-STRENGTH	150	283	335	431	504
ANACIN	139	110	69	156	77
BUFFERIN	694	796	790	705	371
BAYER	0	0	0	0	32
ASCRIPTIN	1482	1685	951	1556	1203
GENERIC ASPIRIN	11791	11749	11659	10472	7133
BUFFERED ASPIRIN	166	70	146	135	71
GENERIC APAP	247	242	161	244	116
PERCOGESIC	147	60	73	26	65
ECOTRIN	254	403	310	874	555
GEMNISYN	NA	NA	NA	0	19
TOTAL	19127	19206	18995	19817	14712

*first nine months

Exhibit IV-5a

Smoothed Tylenol Mentions

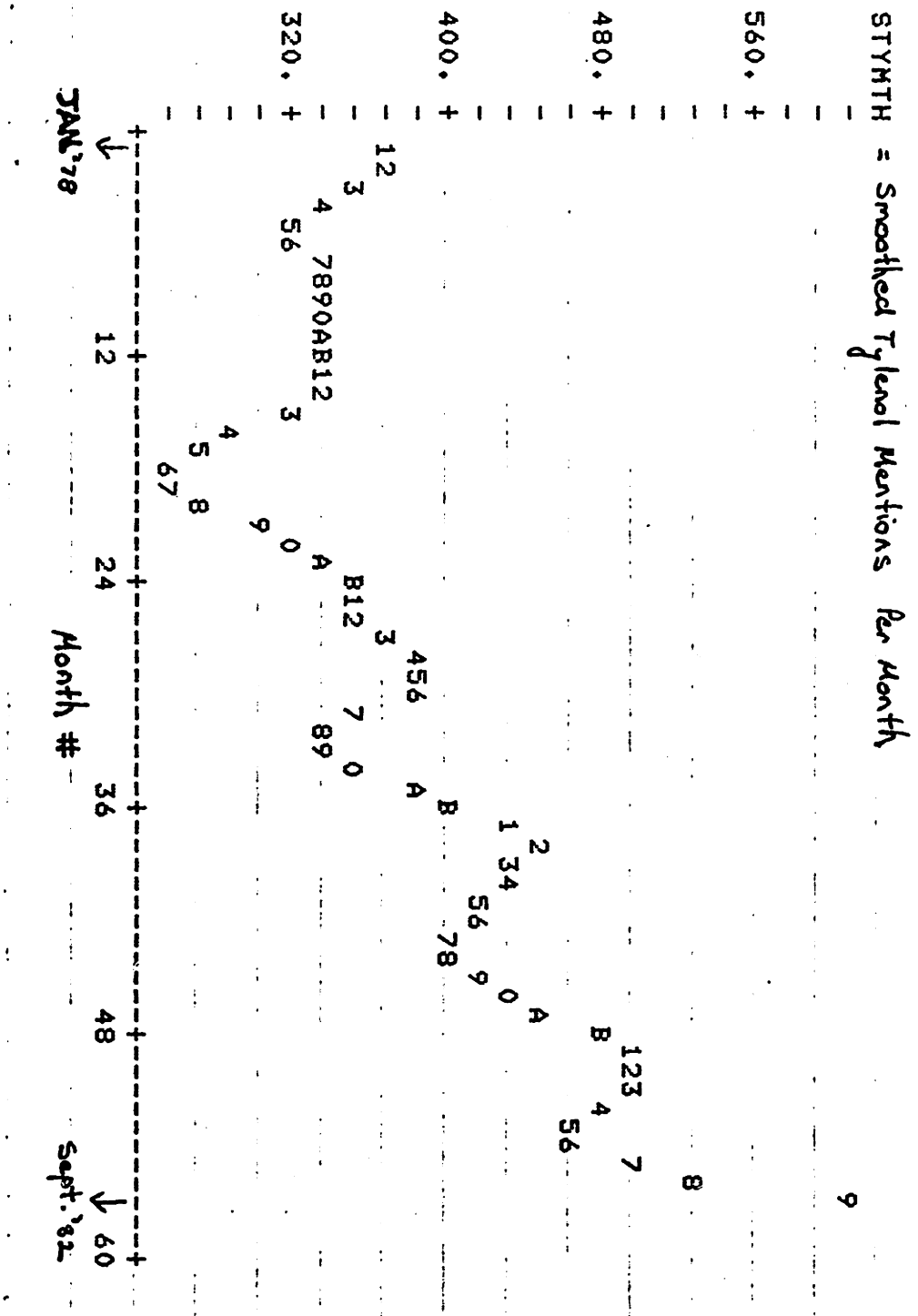


Exhibit IV-5b

Smoothed Tylenol Extra-Strength Mentions

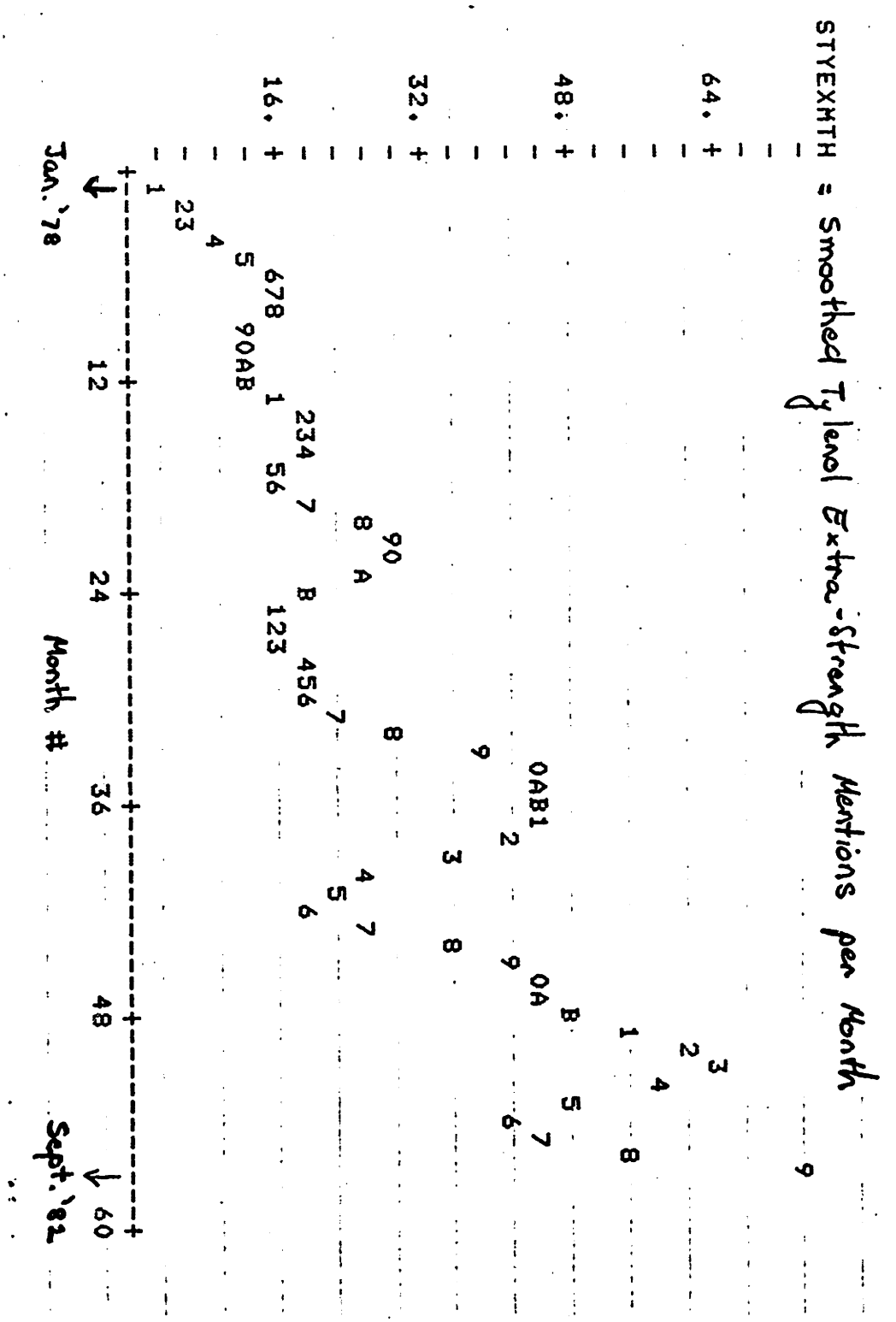


Exhibit IV-5c

Smoothed Total Aspirin Mentions

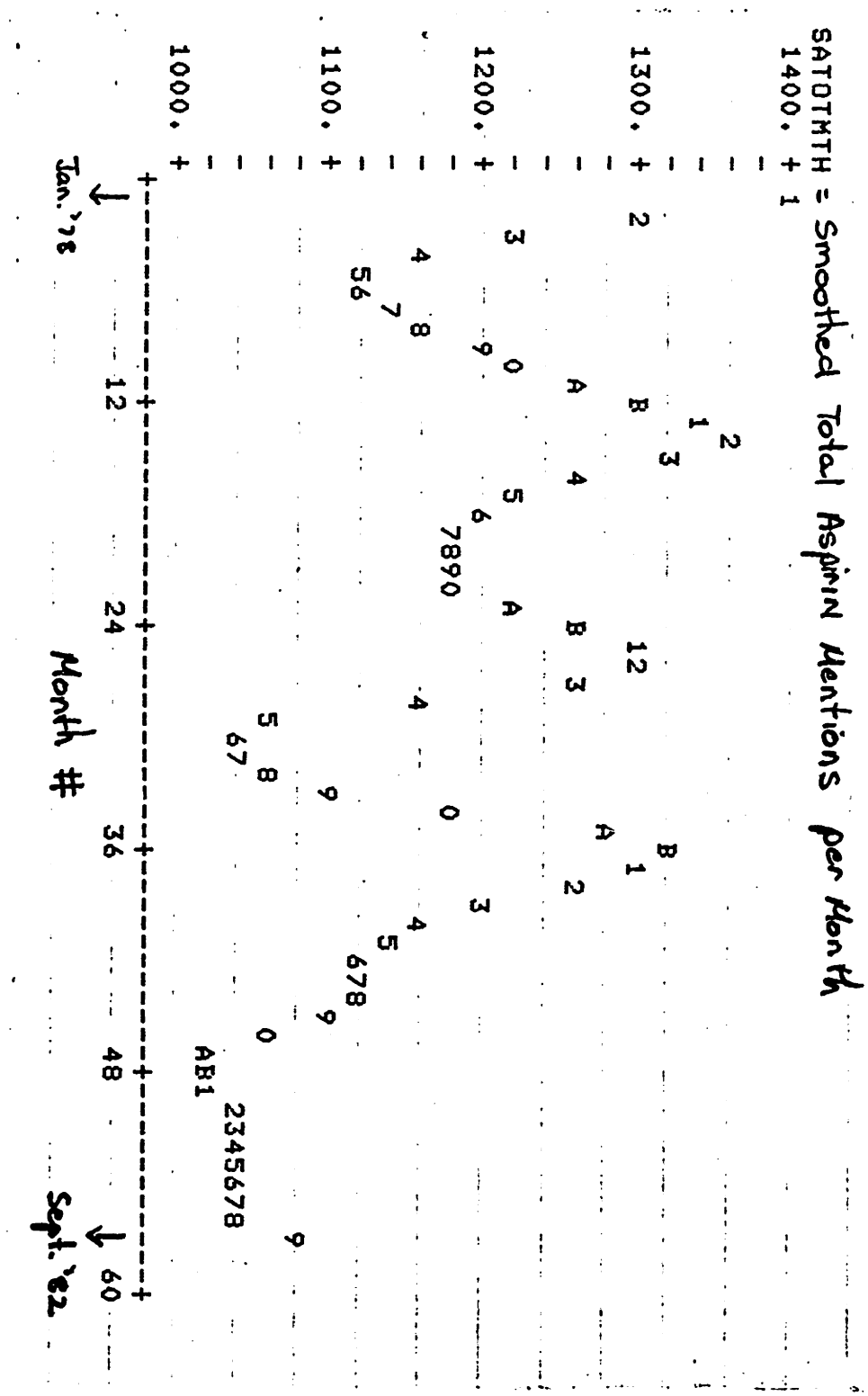


Exhibit IV-5d

Smoothed Total Acetaminophen Mentions

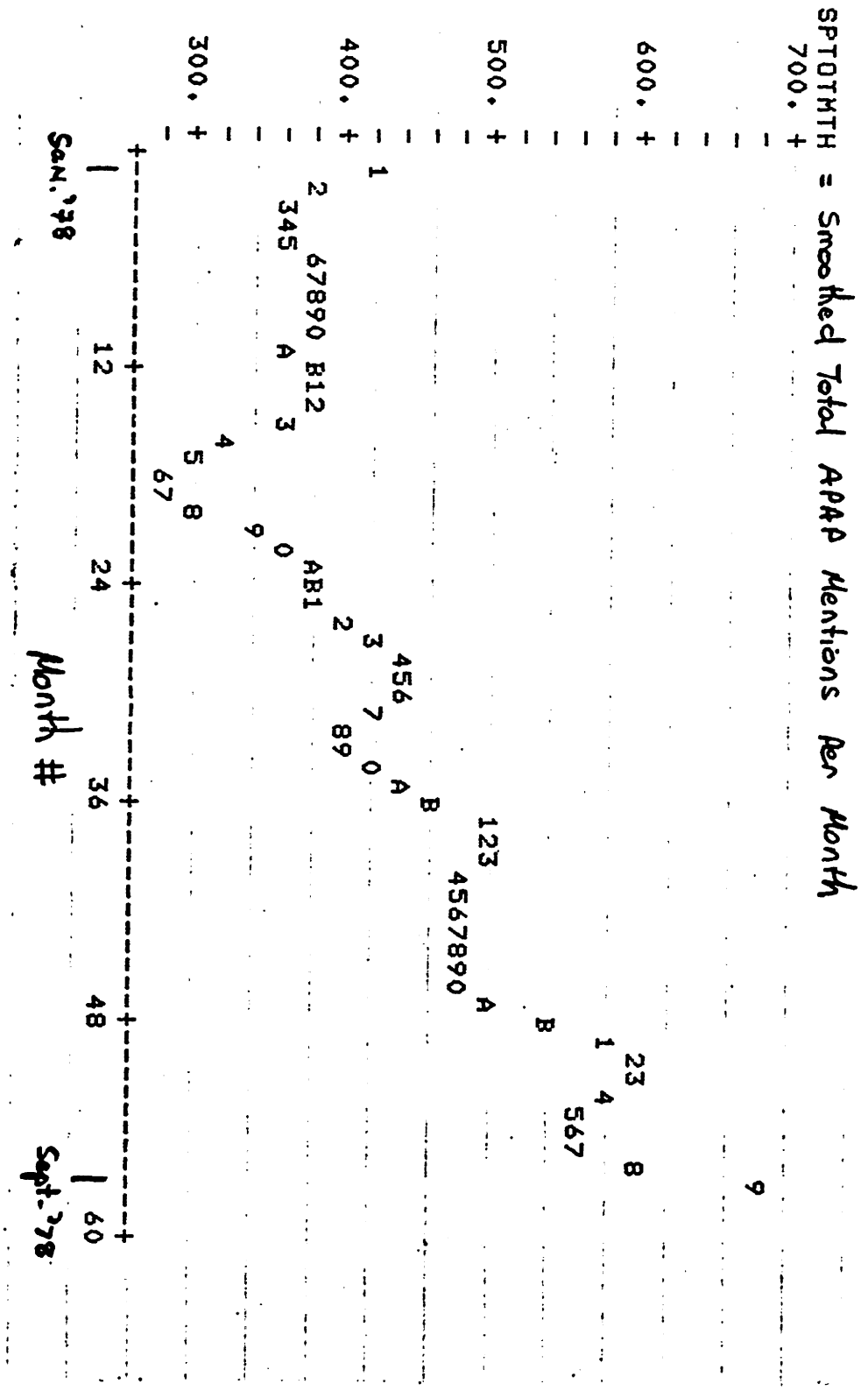


Exhibit IV-5e

Smoothed Total OTC Analgesic Mentions

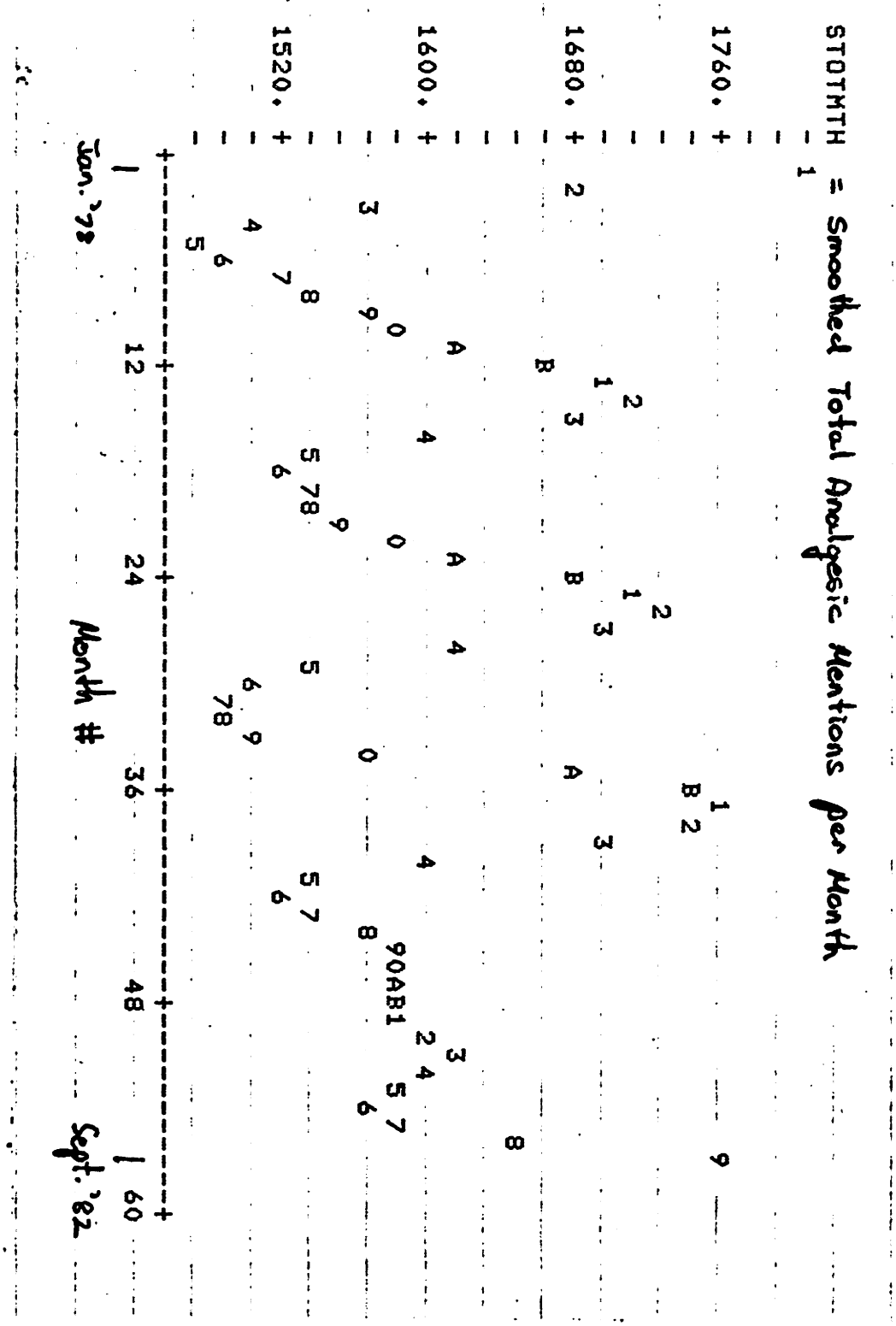


Exhibit IV-6a

Tylenol Mentions
Vs.
Professional Marketing Variables

THE REGRESSION EQUATION IS
Y = 307. + 0.491 X1 + 0.491 X2
+ 0.865 X3

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	307.42	34.63	8.88
X1	TYDET	0.4910	0.3962	1.24
X2	TYJRN	0.4910	0.3337	1.47
X3	TYMAIL	0.865	1.045	0.83

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 95.41
WITH (57- 4) = 53 DEGREES OF FREEDOM

R-SQUARED = 12.0 PERCENT
R-SQUARED = 7.0 PERCENT, ADJUSTED FOR D.F.

Y = Tylenol Mentions Per Month
X_1 = Tylenol Detailing ($000's) Per Month
X_2 = Tylenol Journal Adv. ($000's) Per Month
X_3 = Tylenol Direct Mail ($000's) Per Month

Exhibit IV-6b

Tylenol Extra-Strength Mentions
Vs.
Professional Marketing Variables

THE REGRESSION EQUATION IS

Y = 26.6 +0.0377 X1 +0.0620 X2
+0.0122 X3

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	26.639	4.861	5.48
X1	TYEXDET	0.0377	0.1654	0.23
X2	TYEXJRN	0.06195	0.07204	0.86
X3	TYEXMAIL	0.01218	0.08724	0.14

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS

S = 21.88

WITH (57- 4) = 53 DEGREES OF FREEDOM

R-SQUARED = 2.1 PERCENT

R-SQUARED = -3.4 PERCENT, ADJUSTED FOR D.F.

X_1 = Tylenol Extra-Strength Detailing ($000's) per month

X_2 = " " " Journal Adv. ($000's) per month

X_3 = " " " Direct Mail ($000's) per month

Y = " " " Mentions per month

Exhibit IV-6c

Total OTC Analgesic Mentions
Vs.
Professional Marketing Variables

THE REGRESSION EQUATION IS
Y = 1079. + 0.970 X1 + 0.175 X2
- 0.295 X3

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	1078.74	80.94	13.33
X1	ATOTDET	0.9704	0.6647	1.46
X2	ATOTJRN	0.1751	0.3536	0.50
X3	ATOTMAIL	-0.2951	0.4862	-0.61

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 155.3
WITH (57- 4) = 53 DEGREES OF FREEDOM

R-SQUARED = 4.6 PERCENT
R-SQUARED = -0.8 PERCENT, ADJUSTED FOR D.F.

Y = Total Aspirin Mentions per month
X1 = " " Detailing ($000's) per month
X2 = " " Journal Adv. ($000's) per month
X3 = " " Direct Mail ($000's) per month

Exhibit IV-7a

Tylenol Mentions Vs. Detailing

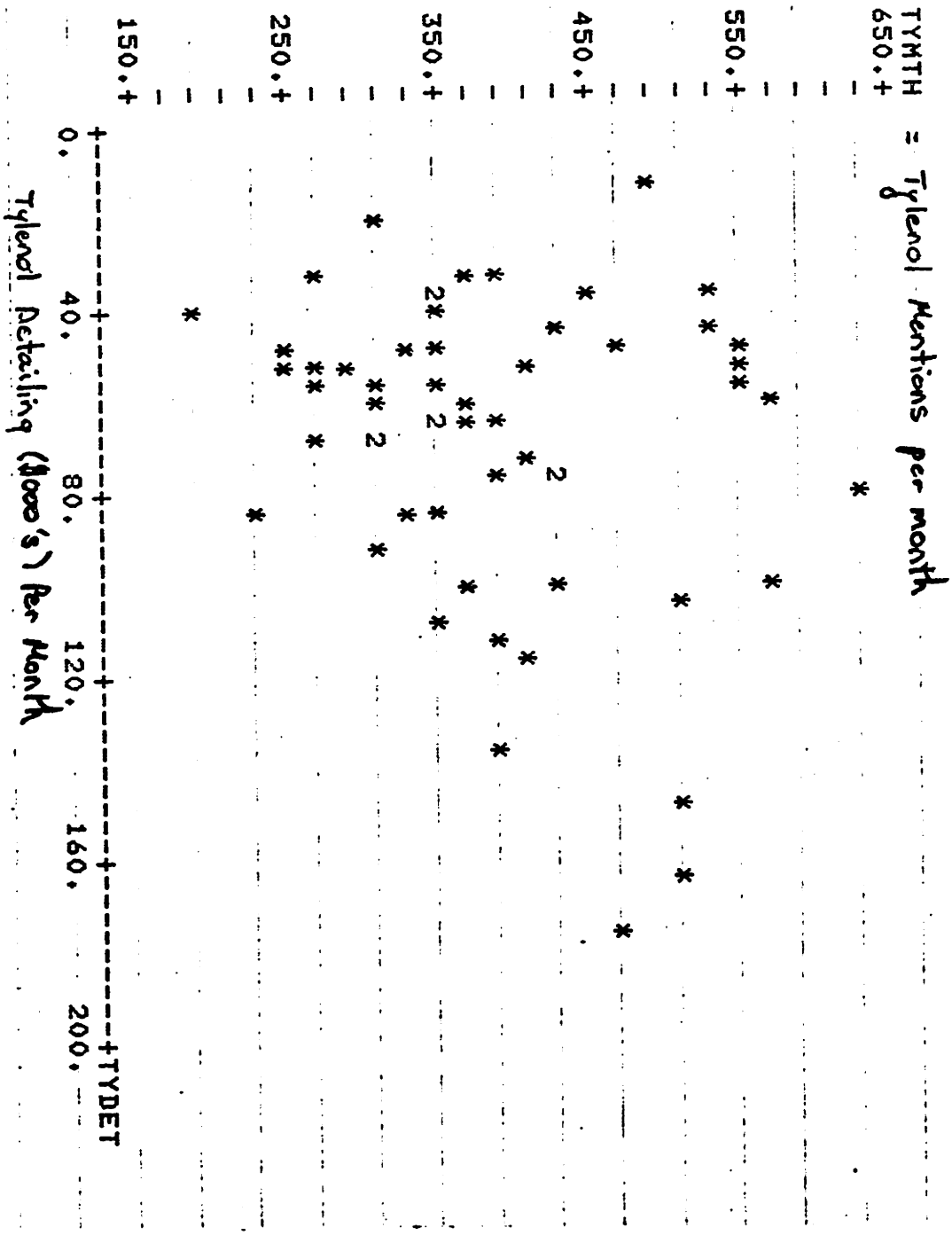


Exhibit IV-7b

Tylenol Mentions Vs. Journal

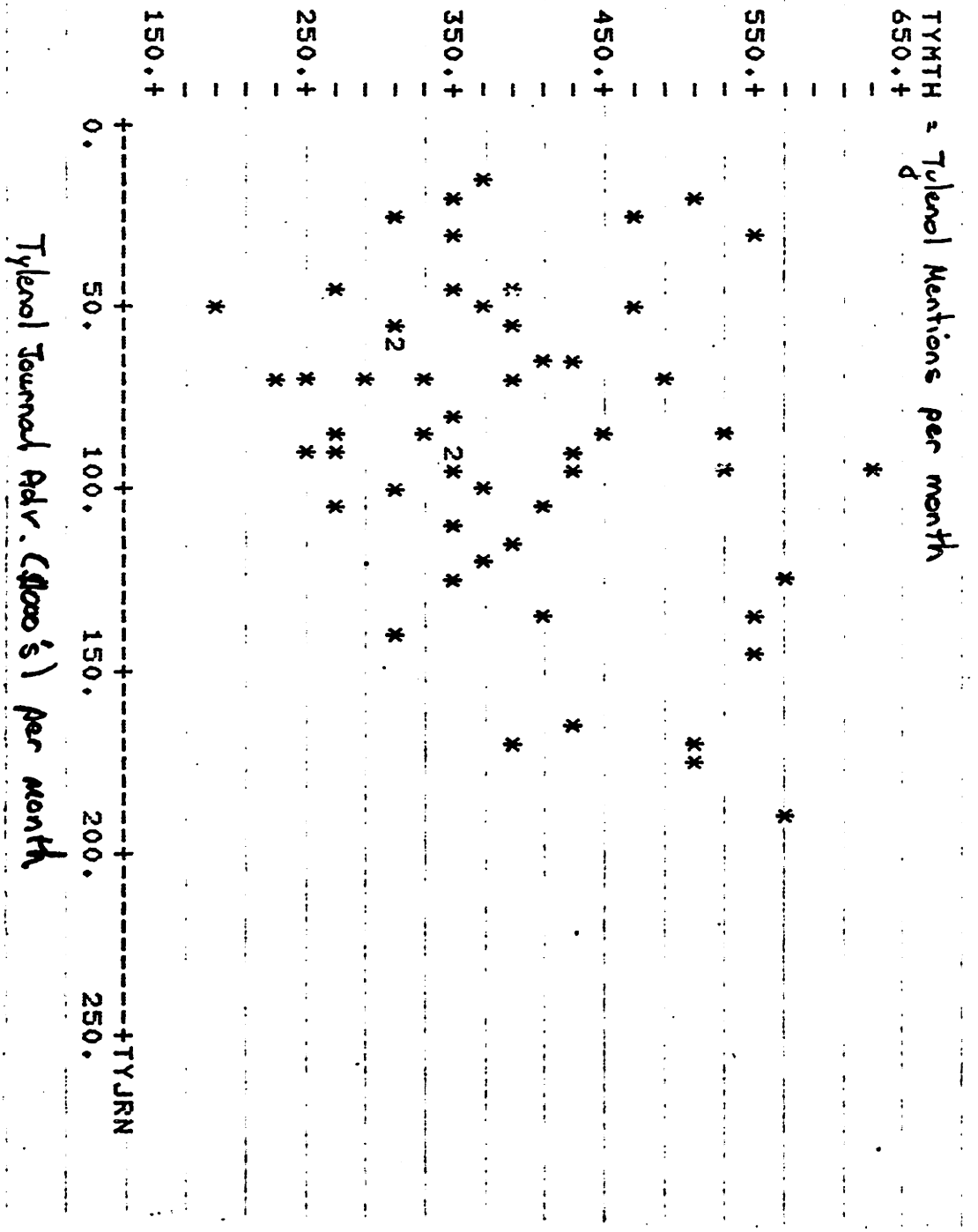


Exhibit IV-7c

Tylenol Mentions Vs. Direct Mail

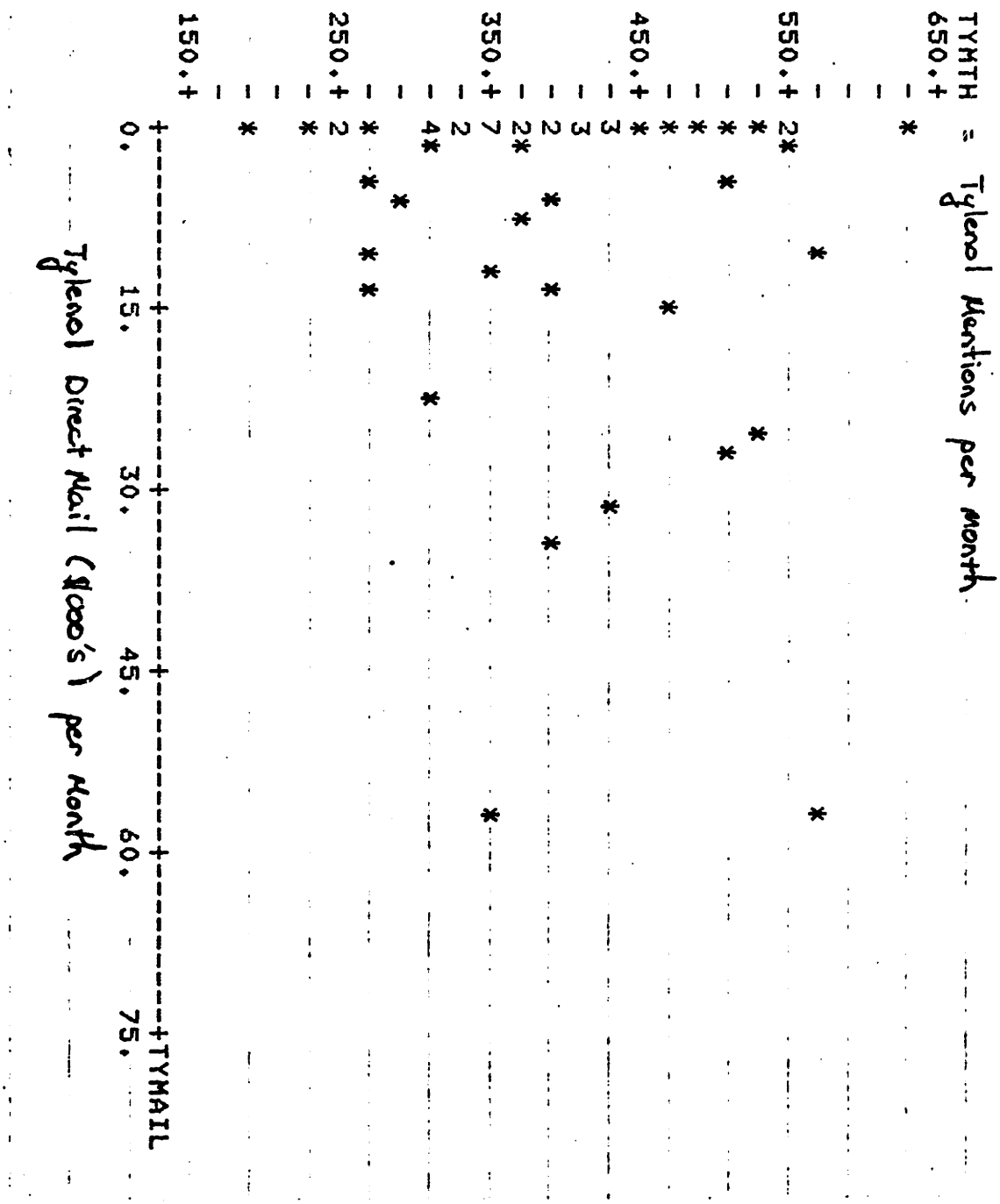


Exhibit IV-7d

Tylenol Extra-Strength Mentions Vs. Detailing

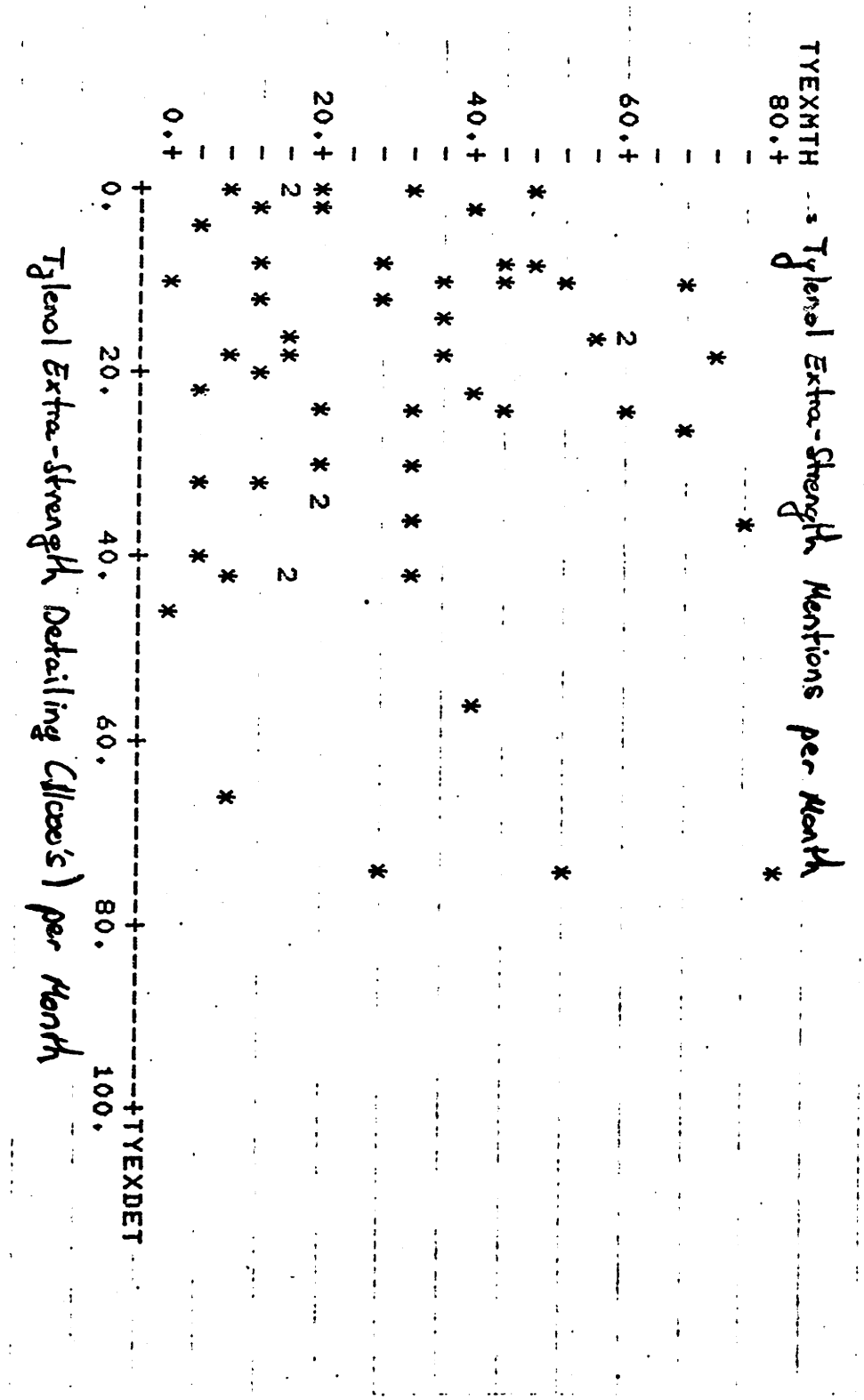


Exhibit IV-7e

Tylenol Extra-Strength Mentions Vs. Journal

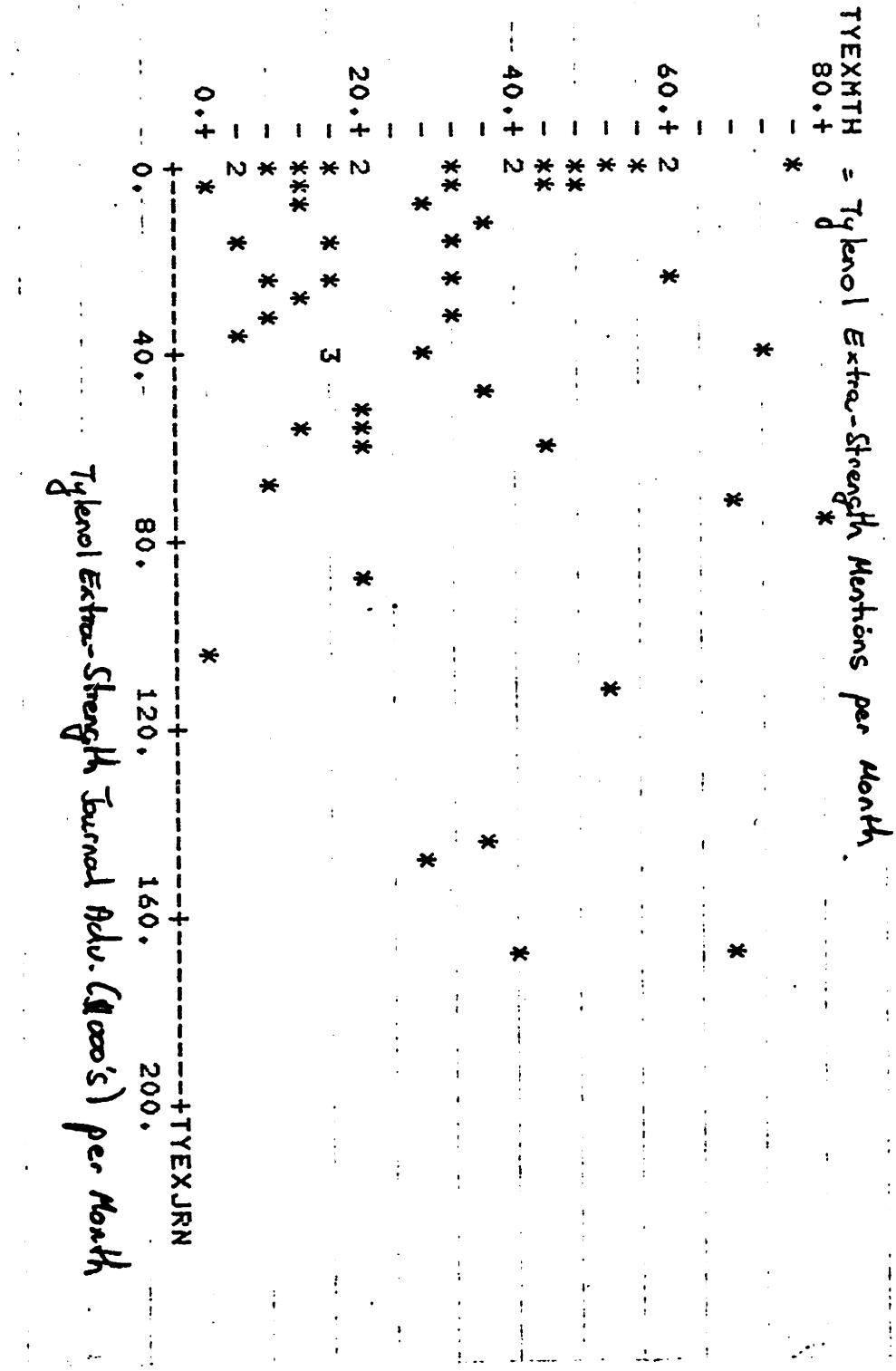


Exhibit IV-7f

Tylenol Extra-Strength Mentions Vs. Direct Mail

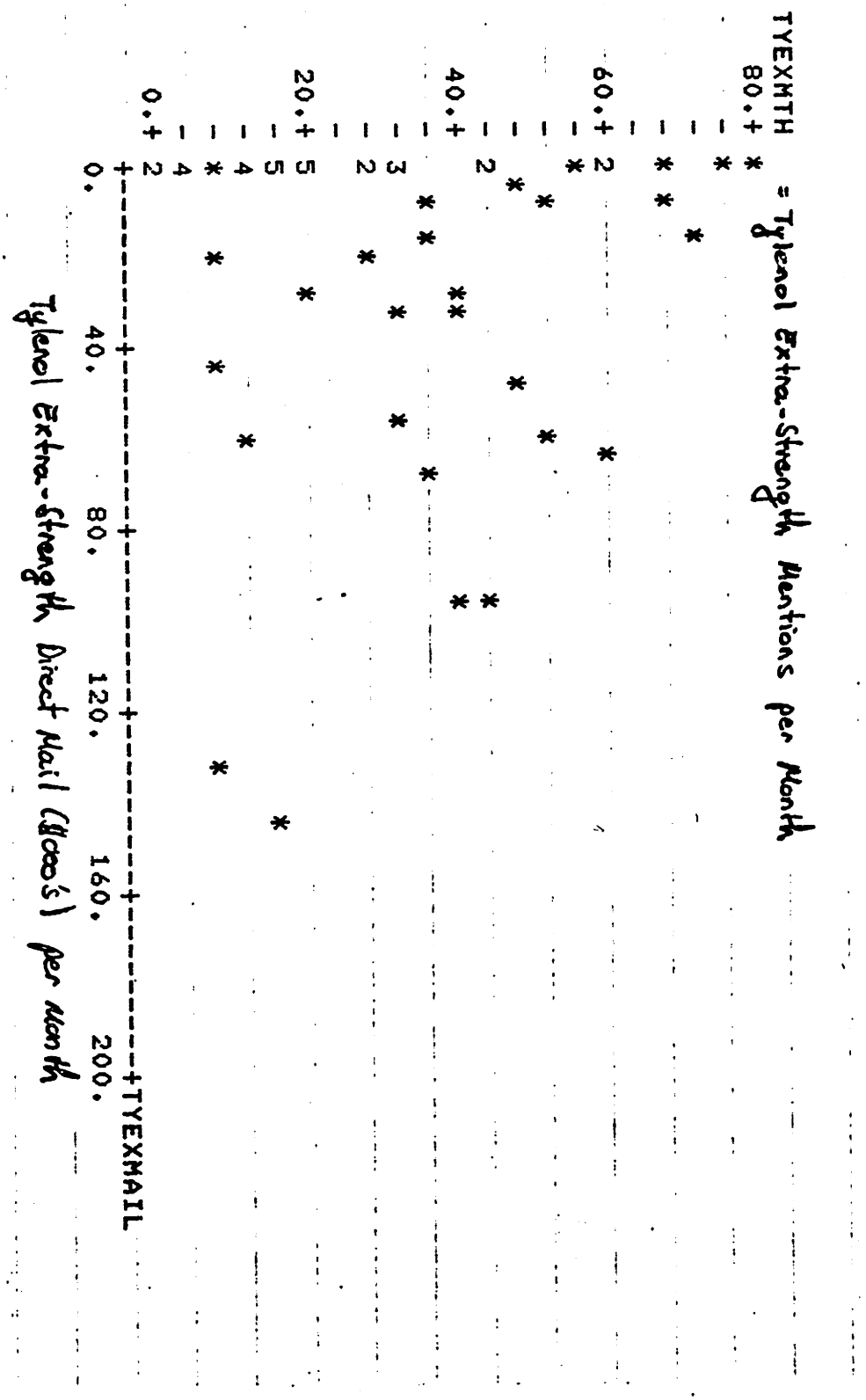


Exhibit IV-8a.

Correlation

Tylenol Mentions
Vs.
Lagged Professional Marketing Variables

	TYMTH
TYDET	0.229
L1TYDET	0.261
L2TYDET	0.377
L3TYDET	0.088
L4TYDET	0.039
L5TYDET	0.448
L6TYDET	0.145
TYJRN	0.293
L1TYJRN	0.247
L2TYJRN	0.308
L3TYJRN	0.306
L4TYJRN	0.477
L5TYJRN	0.545
L6TYJRN	0.308
TYMAIL	0.181
L1TYMAIL	0.137
L2TYMAIL	0.003
L3TYMAIL	0.091
L4TYMAIL	0.339
L5TYMAIL	0.109
L6TYMAIL	0.082

- Tylenol Detailing
  - lagged 1 Month
  - " 2 Months
  - " 3 Months
  - " 4 Months
  - " 5 Months
  - " 6 Months
- Tylenol Journal Adv.
  - lagged 1 Month
  - " 2 Months
  - " 3 Months
  - " 4 Months
  - " 5 Months
  - " 6 Months
- Tylenol Direct Mail
  - lagged 1 Month
  - " 2 Months
  - " 3 Months
  - " 4 Months
  - " 5 Months
  - " 6 Months

Exhibit IV-8b

Tylenol Mentions
Vs.
Significant Lagged Professional Marketing Variables

* For Explanation of Abbreviations see pg. 98

```
THE REGRESSION EQUATION IS
Y =     110. + 0.336 X1 + 0.492 X2
     + 0.496 X3 +  1.09 X4 + 0.528 X5
     - 0.426 X6 + 0.820 X7 - 0.123 X8
     - 0.307 X 9 + 0.113 X10 - 0.318 X11
     + 0.618 X12 + 0.516 X13 -0.0876 X14
     + 0.811 X15 +  1.33 X16 + 0.424 X17
     +  1.06 X18 +  1.55 X19
```

	COLUMN *	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	110.05	92.62	1.19
X1	DATE	0.336	2.068	0.16
X2	TYDET	0.4920	0.4366	1.13
X3	L1TYDET	0.4960	0.4360	1.14
X4	L2TYDET	1.0869	0.5298	2.05
X5	L3TYDET	0.5278	0.6445	0.82
X6	L4TYDET	-0.4264	0.6250	-0.68
X7	L5TYDET	0.8198	0.6278	1.31
X8	TYJRN	-0.1226	0.4405	-0.28
X9	L1TYJRN	-0.3067	0.4440	-0.69
X10	L2TYJRN	0.1129	0.4444	0.25
X11	L3TYJRN	-0.3176	0.4668	-0.68
X12	L4TYJRN	0.6181	0.5032	1.23
X13	L5TYJRN	0.5159	0.4727	1.09
X14	L6TYJRN	-0.0876	0.4336	-0.20
X15	TYMAIL	0.811	1.448	0.56
X16	L1TYMAIL	1.332	1.293	1.03
X17	L2TYMAIL	0.424	1.392	0.30
X18	L3TYMAIL	1.057	1.074	0.98
X19	L4TYMAIL	1.551	1.104	1.40

```
THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 77.42
WITH (  51-20) =  31 DEGREES OF FREEDOM

R-SQUARED = 63.6 PERCENT
R-SQUARED = 41.3 PERCENT, ADJUSTED FOR D.F.
```

Exhibit IV-8c

Correlation

Total OTC Analgesic Mentions
Vs.
Lagged Professional Marketing Variables

	TOTMTH
TOTDET	0.019
L1TOTDET	0.057
L2TOTDET	-0.076
L3TOTDET	-0.054
L4TOTDET	-0.025
L5TOTDET	0.135
L6TOTDET	0.068
TOTJRN	0.096
L1TOTJRN	-0.062
L2TOTJRN	-0.240
L3TOTJRN	-0.111
L4TOTJRN	0.301
L5TOTJRN	0.111
L6TOTJRN	-0.012
TOTMAIL	-0.113
L1TOTMAL	-0.011
L2TOTMAL	-0.050
L3TOTMAL	0.093
L4TOTMAL	0.311
L5TOTMAL	-0.070
L6TOTMAL	0.108

* Follows same nomenclature as pg. 98

Exhibit IV-9a

12 Month Moving Average

Tylenol Mentions

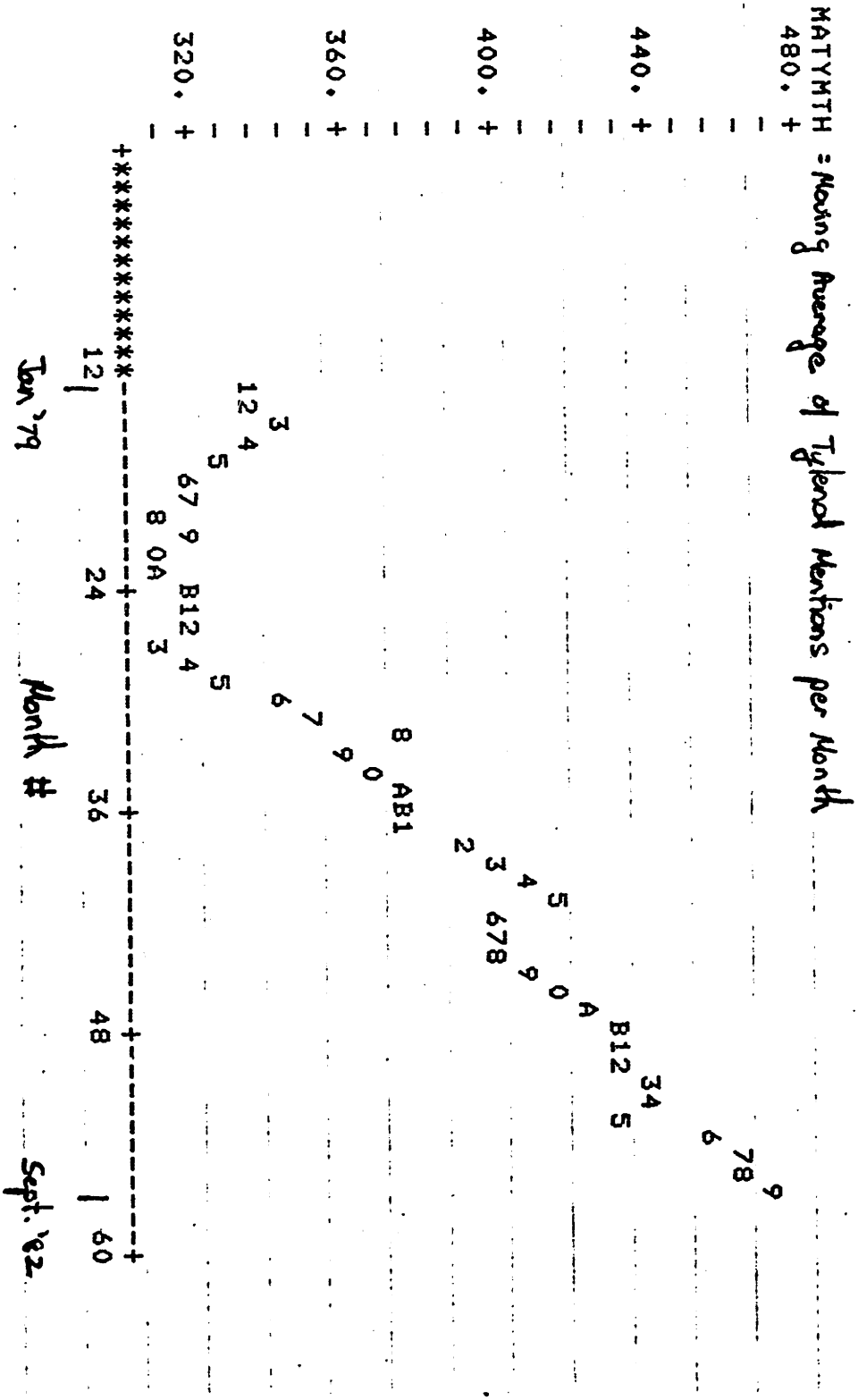


Exhibit IV-9b

12 Month Moving Average

Tylenol Extra-Strength Mentions

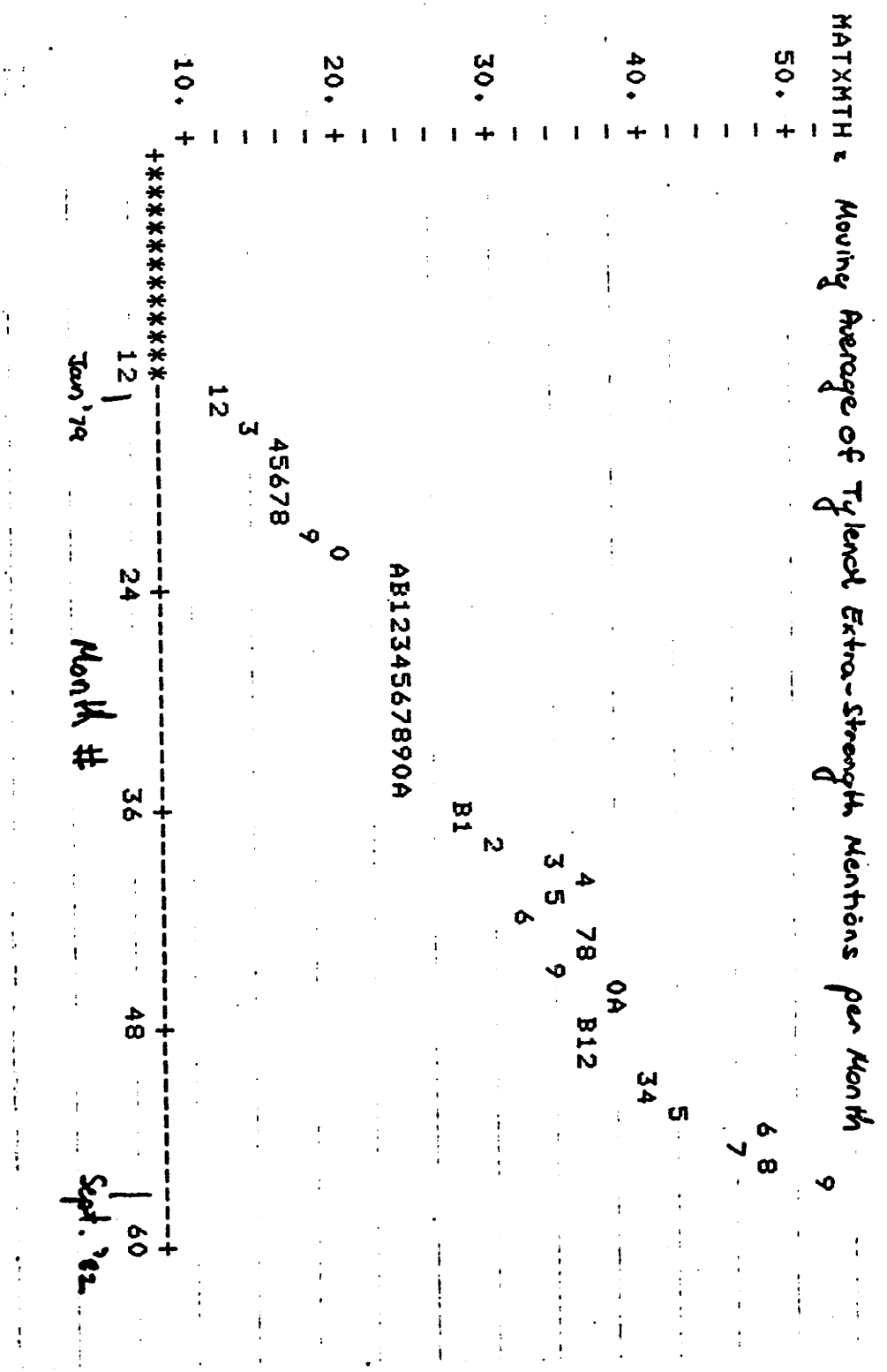


Exhibit IV-9c

12 Month Moving Average

Total OTC Analgesic Mentions

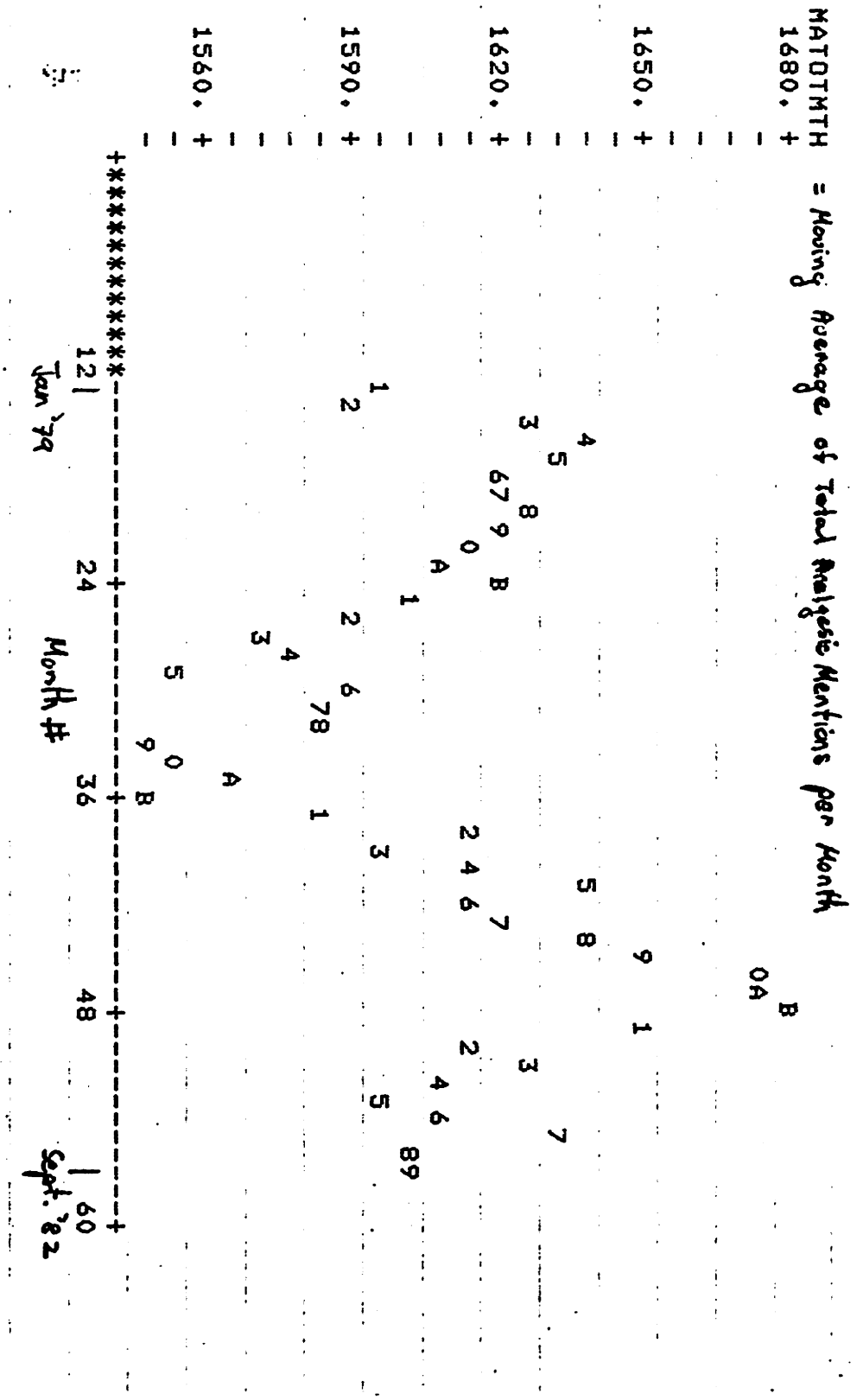


Exhibit IV-9d

12 Month Moving Average

Tylenol Detailing Expenditures

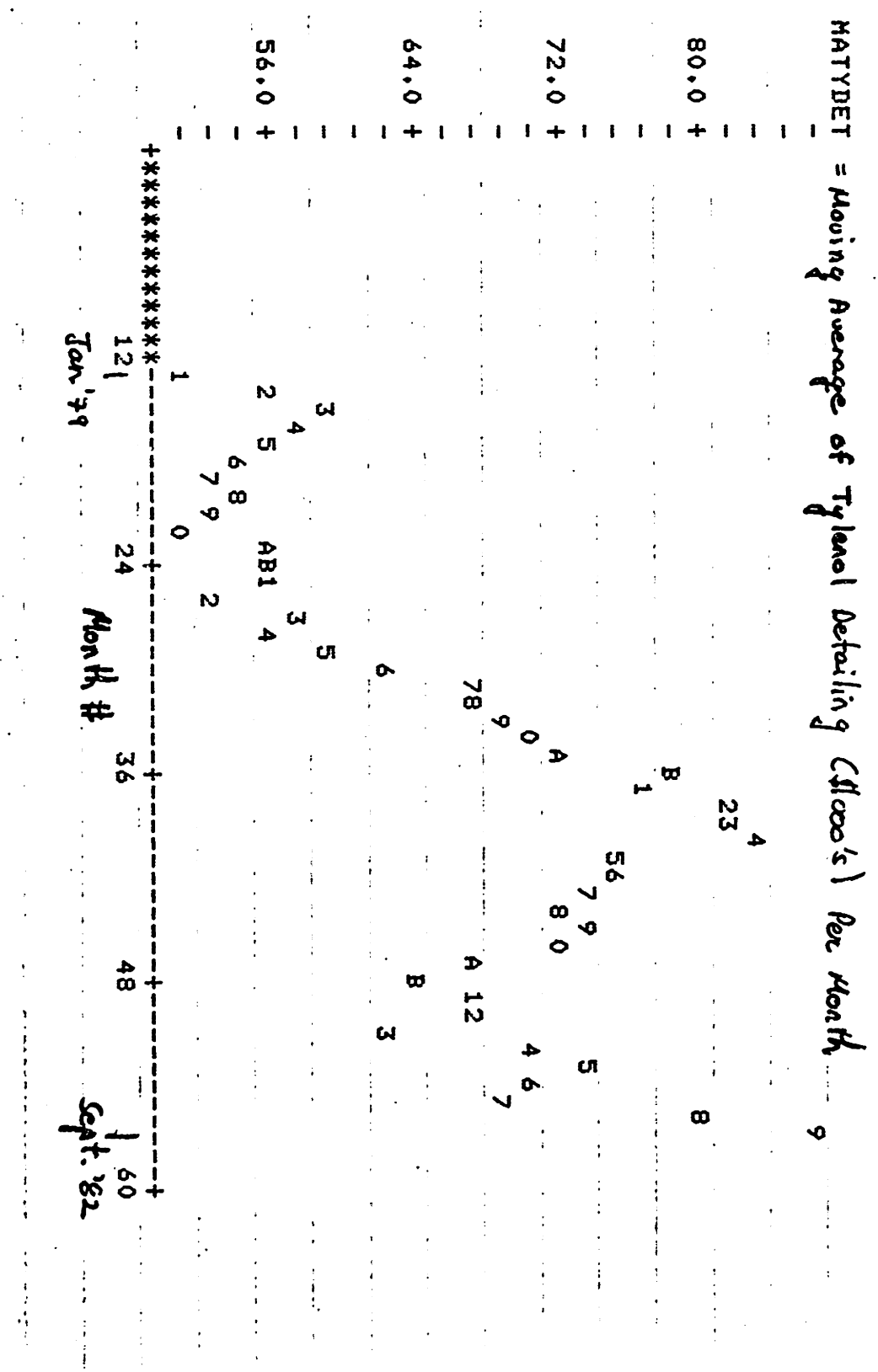


Exhibit IV-9e

12 Month Moving Average

Tylenol Journal Expenditures

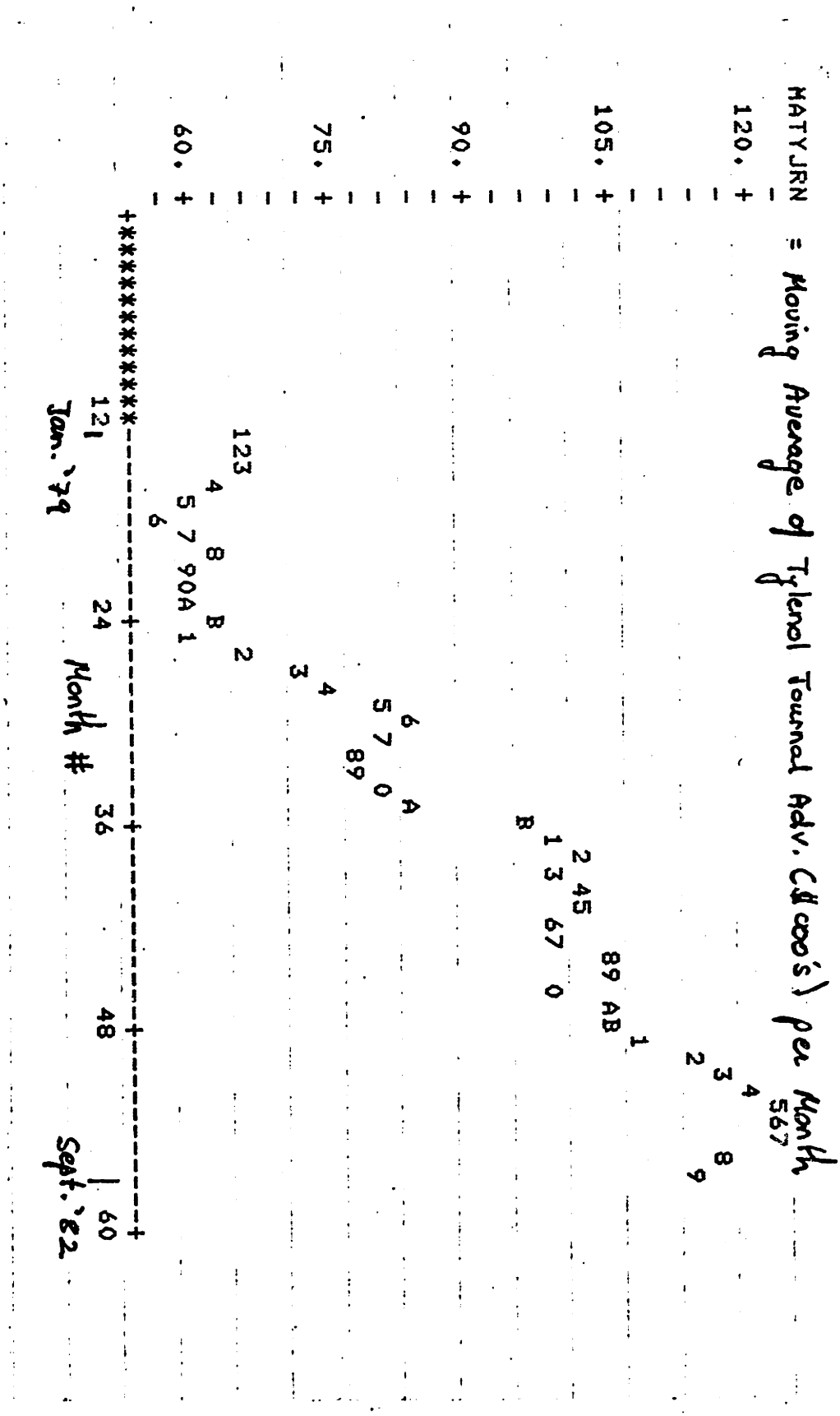


Exhibit IV-9f

12 Month Moving Average

Tylenol Direct Mail Expenditures

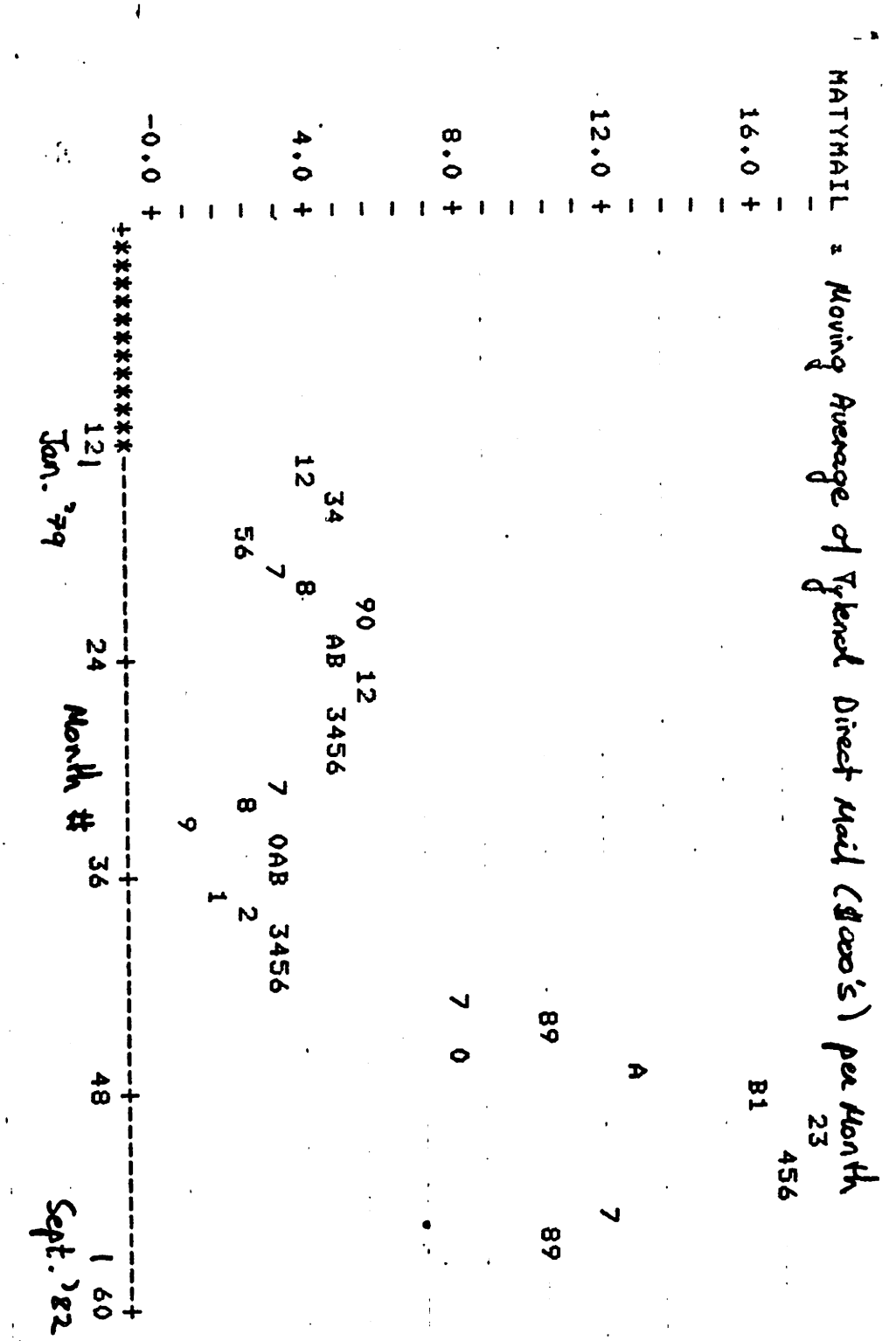


Exhibit IV-9g

12 Month Moving Average

Tylenol Extra-Strength Detailing Expenditures

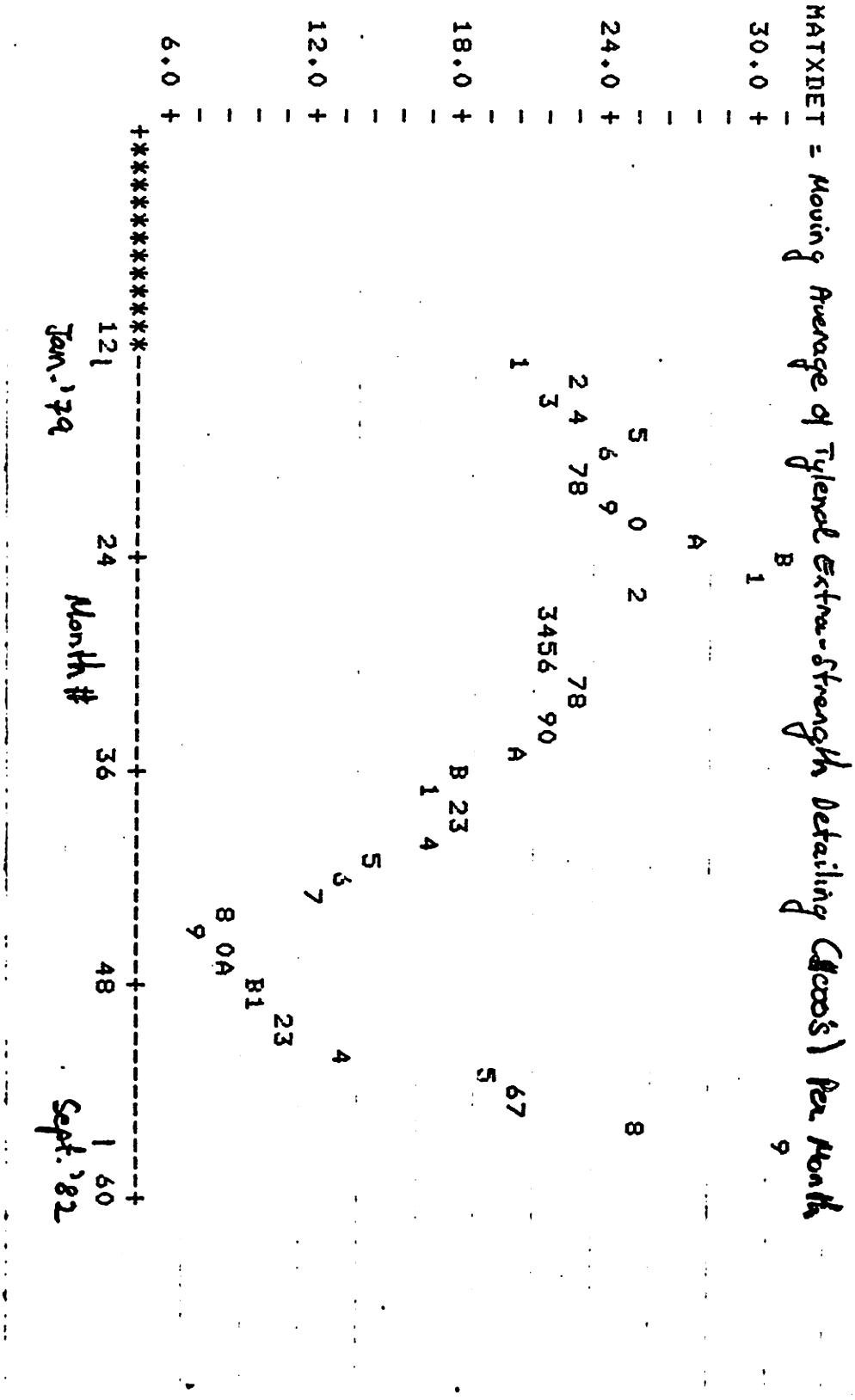


Exhibit IV-9h

12 Month Moving Average

Tylenol Extra-Strength Journal Expenditures

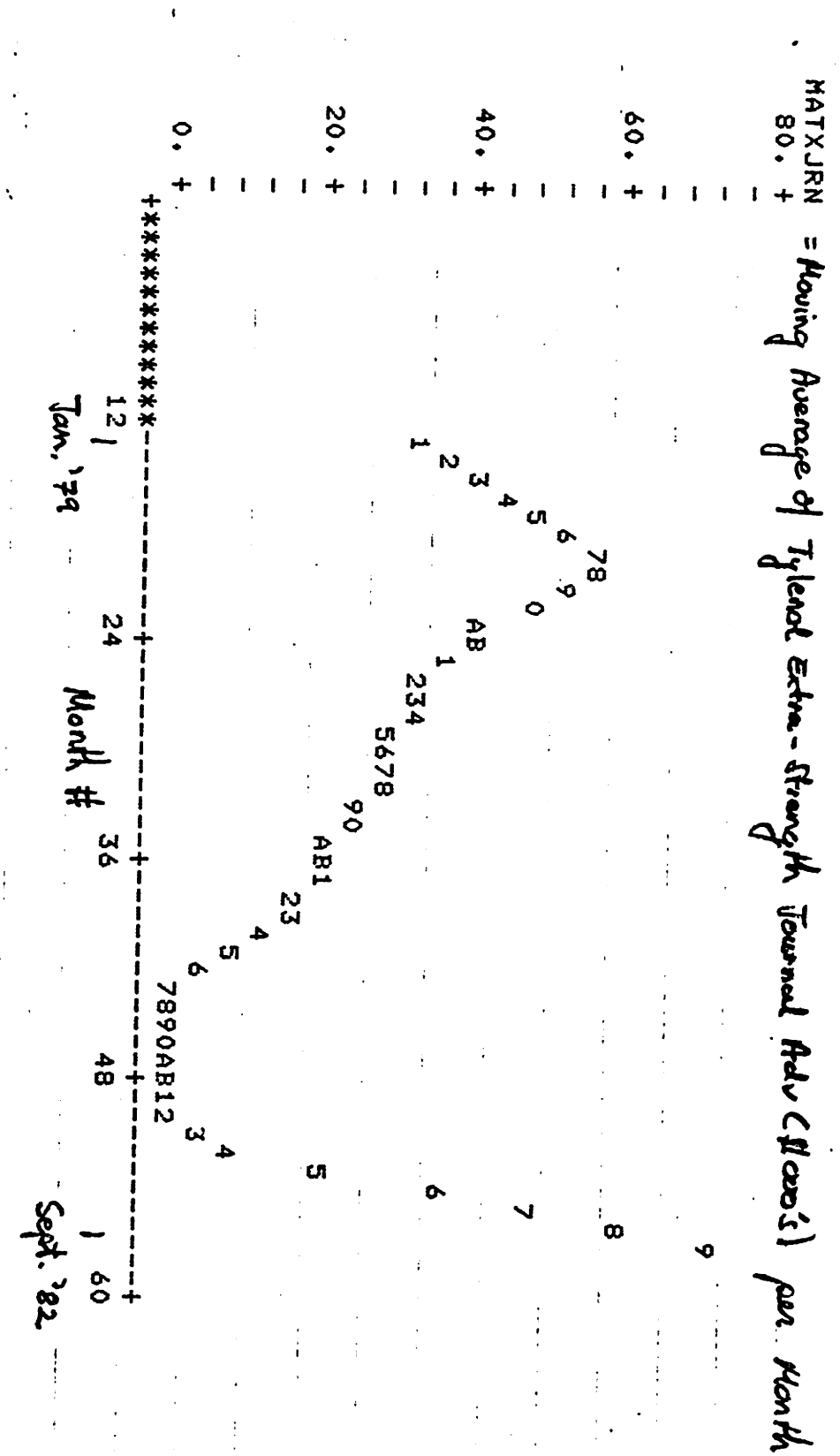


Exhibit IV-9i

12 Month Moving Average

Tylenol Extra-Strength Direct Mail Expenditures

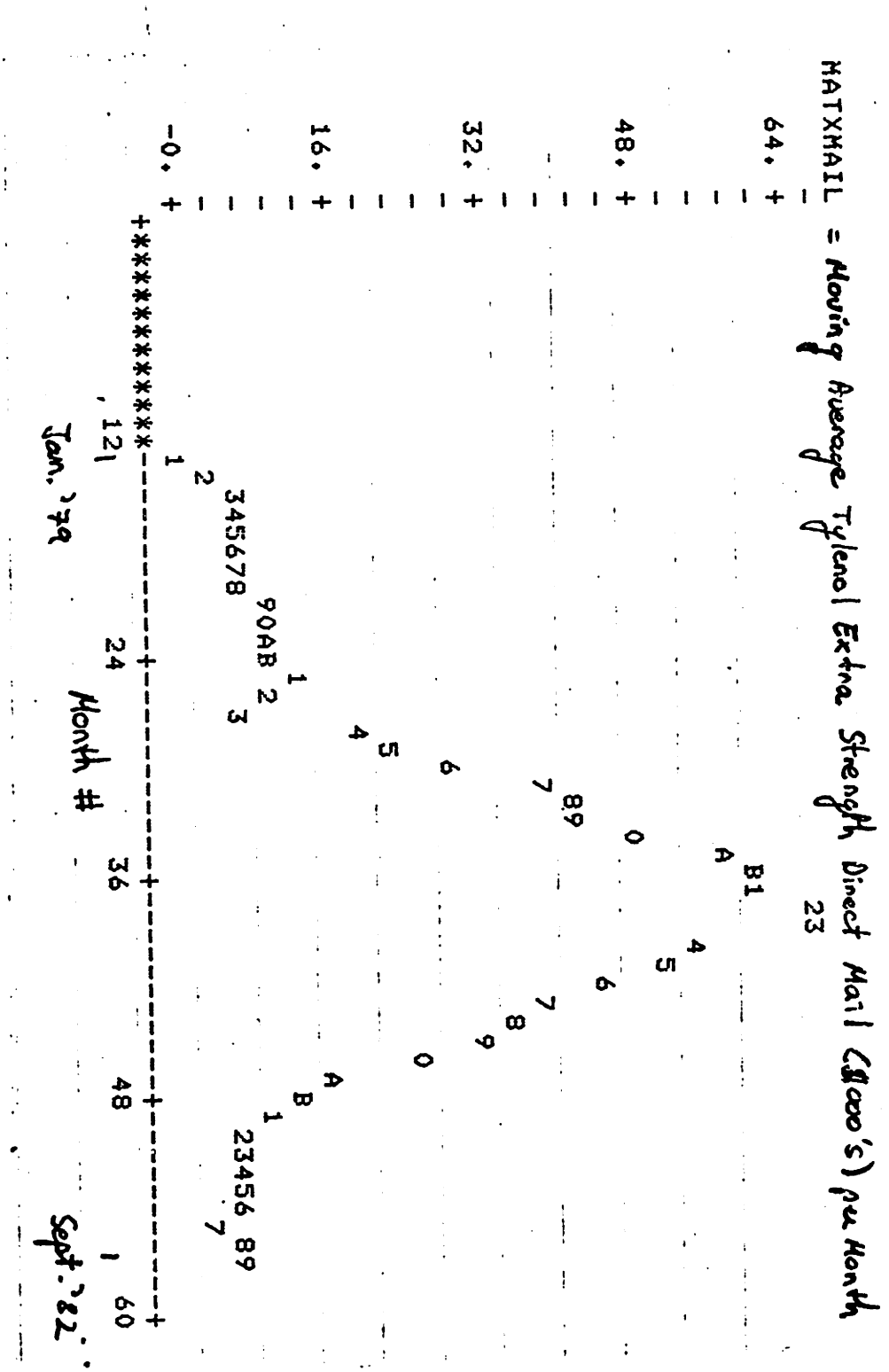


Exhibit IV-9j

12 Month Moving Average

Total OTC Analgesic Detailing Expenditures

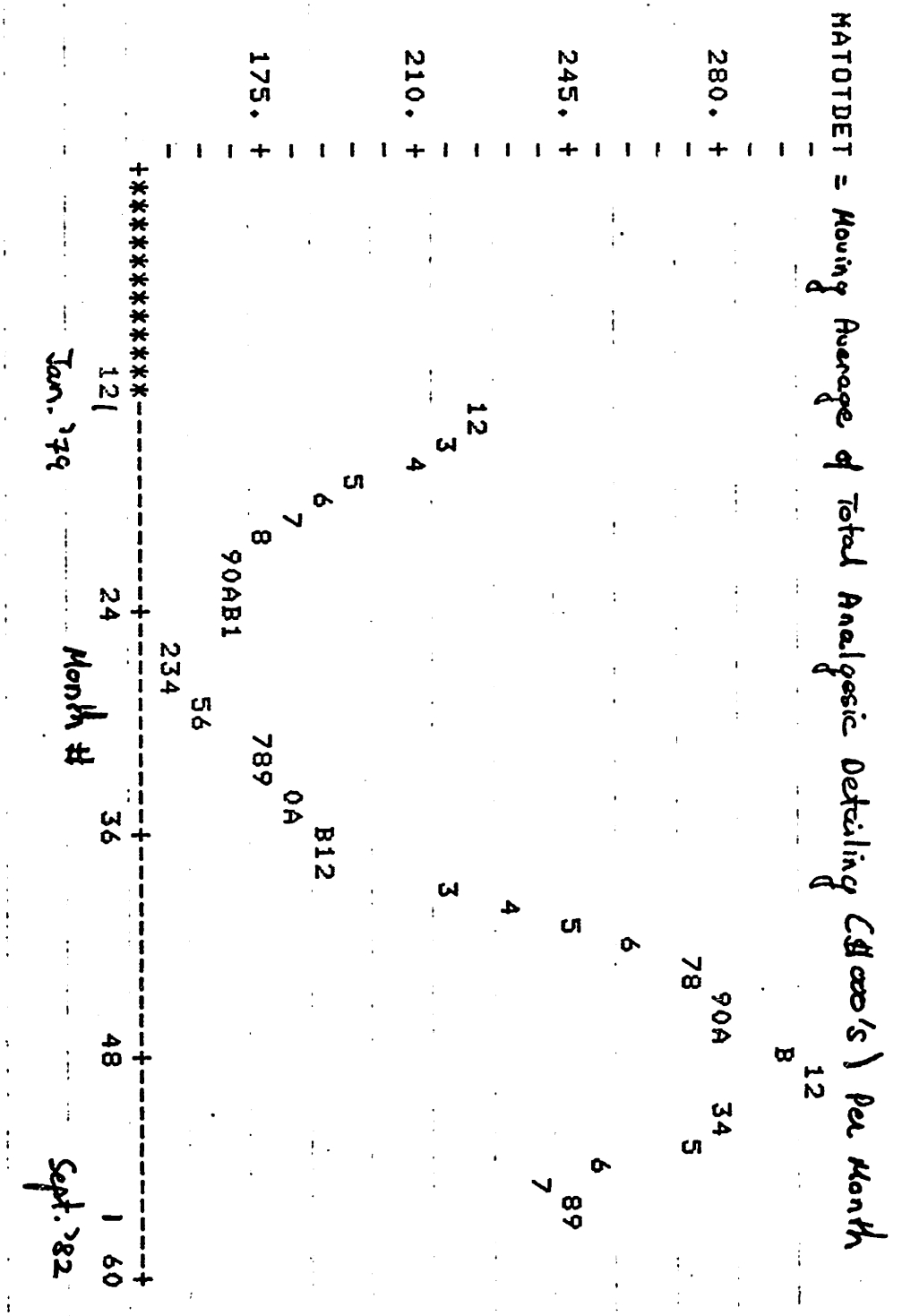


Exhibit IV-9k

12 Month Moving Average

Total OTC Analgesic Journal Expenditures

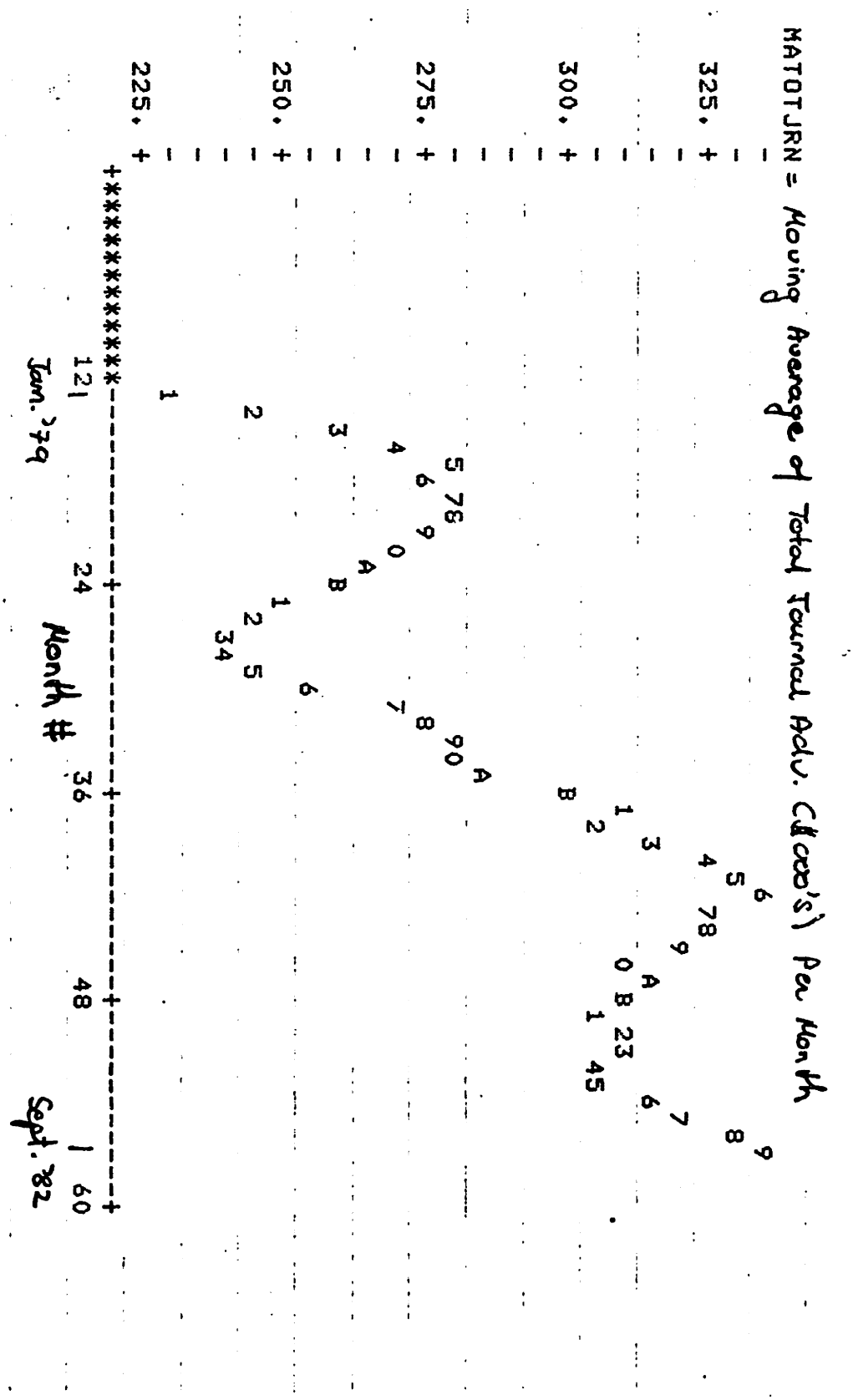


Exhibit IV-91

12 Month Moving Average

Total OTC Analgesic Direct Mail Expenditures

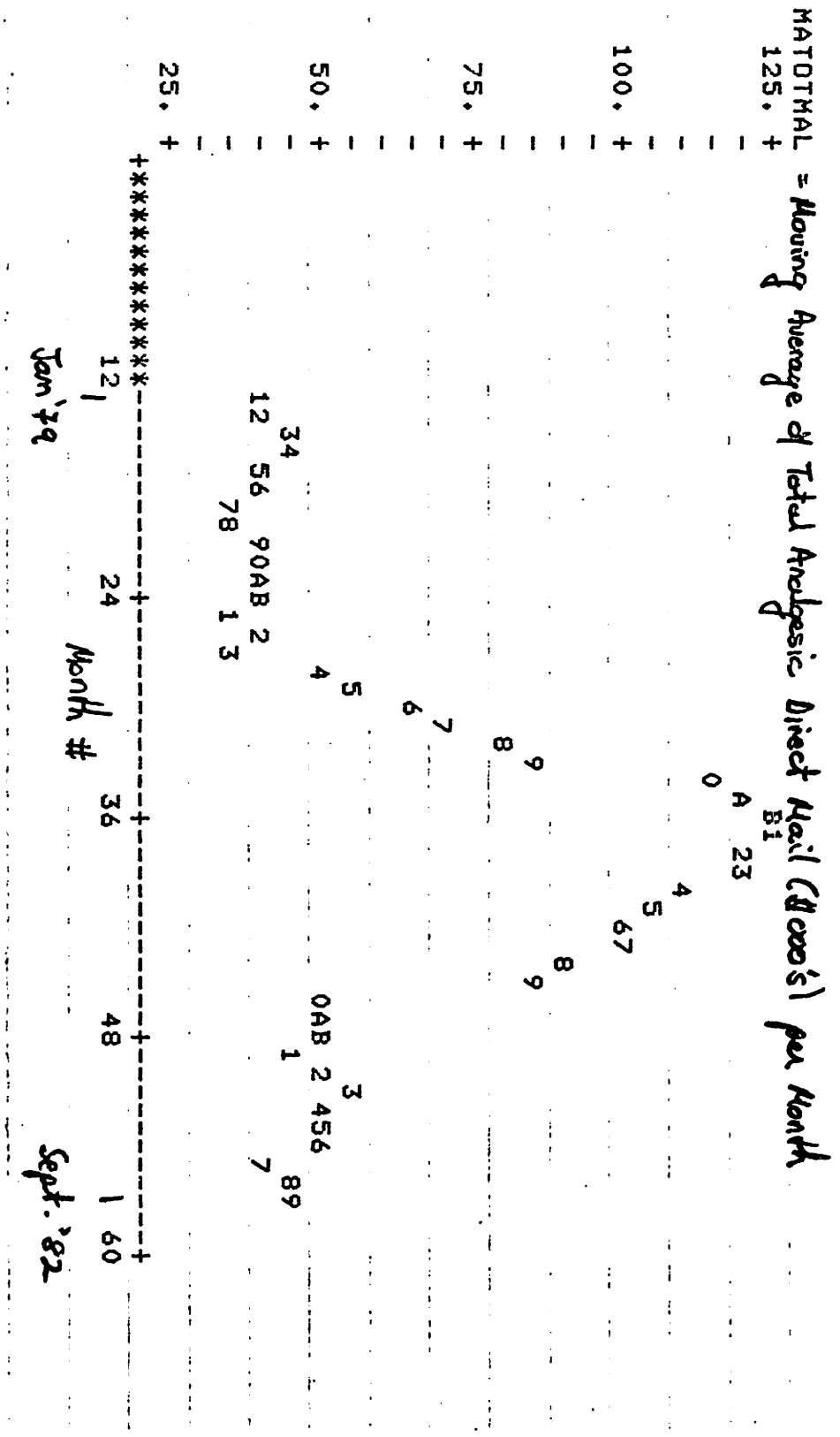


Exhibit IV-10a

Moving Average of Tylenol Mentions
Vs.
Moving Average of Detail Expenditures

```
THE REGRESSION EQUATION IS
Y =     121. +  3.89 X1

                                          ST. DEV.     T-RATIO =
         COLUMN      COEFFICIENT          OF COEF.     COEF/S.D.
         --               120.81           34.61          3.49
X1       MATYDET          3.8856           0.5194         7.48

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 33.88
WITH (  45- 2) =  43 DEGREES OF FREEDOM

R-SQUARED = 56.6 PERCENT
R-SQUARED = 55.5 PERCENT, ADJUSTED FOR D.F.
```

Y = Moving Average Tylenol Mentions per Month
X1 = " " " Detailing ($000's) per Month

Exhibit IV-10b

Moving Average of Tylenol Mentions
Vs.
Moving Average of Journal Expenditures

```
THE REGRESSION EQUATION IS
Y =     179. +  2.25 X1

                                       ST. DEV.    T-RATIO =
       COLUMN      COEFFICIENT         OF COEF.    COEF/S.D.
       --             179.261            9.139       19.61
X1     MATYJRN          2.2503           0.1011      22.27

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 14.52
WITH (  45- 2) =  43 DEGREES OF FREEDOM

R-SQUARED = 92.0 PERCENT
R-SQUARED = 91.8 PERCENT, ADJUSTED FOR D.F.
```

Y = Moving Average of Tylenol Mentions Per Month
X1 = Journal Adv. ($000's) Per Month

Exhibit IV-10c

Moving Average of Tylenol Mentions
Vs.
Moving Average of Direct Mail Expenditures

THE REGRESSION EQUATION IS
Y = 329. + 6.97 X1

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	328.573	9.177	35.80
X1	MATYMAIL	6.966	1.065	6.54

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 36.40
WITH (45- 2) = 43 DEGREES OF FREEDOM

R-SQUARED = 49.9 PERCENT
R-SQUARED = 48.7 PERCENT, ADJUSTED FOR D.F.

X_1 = Moving Average of Tylenol Direct Mail ($000's) Per Month
Y = " " " Mentions Per Month

Exhibit IV-10d

Moving Average of Tylenol Mentions
Vs.
Moving Average of Professional Marketing Variables

```
THE REGRESSION EQUATION IS
Y =     157. +  1.10 X1 +  1.51 X2
     +  2.07 X3
```

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	157.19	17.96	8.75
X1	MATYDET	1.0980	0.6255	1.76
X2	MATYJRN	1.5140	0.3962	3.82
X3	MATYMAIL	2.069	1.067	1.94

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 14.22
WITH (45- 4) = 41 DEGREES OF FREEDOM

R-SQUARED = 92.7 PERCENT
R-SQUARED = 92.2 PERCENT, ADJUSTED FOR D.F.

Y = Moving Average of Tylenol Mentions Per Month
X_1 = " " " Detailing ($000's) Per Month
X_2 = " " " Journal Adv ($000's) Per Month
X_3 = " " " Direct Mail ($000's) Per Month

Exhibit IV-10e

Moving Average of Tylenol Extra-Strength Mentions
Vs
Moving Average of Detailing Expenditures

```
THE REGRESSION EQUATION IS
Y =     42.6 - 0.711 X1

                                         ST. DEV.     T-RATIO =
      COLUMN        COEFFICIENT          OF COEF.     COEF/S.D.
      --                 42.600             4.595          9.27
X1    MATXDET           -0.7110            0.2253         -3.16

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 9.356
WITH (  45- 2) =  43 DEGREES OF FREEDOM

R-SQUARED = 18.8 PERCENT
R-SQUARED = 16.9 PERCENT, ADJUSTED FOR D.F.
```

Y = Moving Average of Tylenol Extra-Strength Mentions per Month

X_1 = " " " " " Detailing ($000's) per Month

Exhibit IV-10f

Moving Average of Tylenol Extra-Strength Mentions
Vs.
Moving Average of Journal Expenditures

```
THE REGRESSION EQUATION IS
Y =    33.5 - 0.178 X1

                                         ST. DEV.     T-RATIO =
        COLUMN        COEFFICIENT        OF COEF.     COEF/S.D.
        --               33.525            2.505        13.38
X1      MATXJRN         -0.17785          0.07639       -2.33

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 9.785
WITH (  45- 2) =  43 DEGREES OF FREEDOM

R-SQUARED = 11.2 PERCENT
R-SQUARED =  9.1 PERCENT, ADJUSTED FOR D.F.
```

Y = Moving Average of Tylenol Extra-Strength Mentions per Month
X1 = " " " " Journal Adv. ($000's) per Month

Exhibit IV-10g

Moving Average of Tylenol Extra-Strength Mentions
Vs.
Moving Average of Direct Mail Expenditures

THE REGRESSION EQUATION IS
Y = 28.0 +0.0351 X1

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	27.980	2.326	12.03
X1	MATXMAIL	0.03511	0.07606	0.46

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 10.36
WITH (45- 2) = 43 DEGREES OF FREEDOM

R-SQUARED = 0.5 PERCENT
R-SQUARED = -1.8 PERCENT, ADJUSTED FOR D.F.

Y= Moving Average of Tylenol Extra-Strength Mentions per Month
X1= " " " " Direct Mail ($000's) per Month

Exhibit IV-10h

Moving Average of Tylenol Extra-Strength Mentions
Vs.
Moving Average of Professional Marketing Variables

```
THE REGRESSION EQUATION IS
Y =     44.8 - 0.942 X1 +0.0857 X2
    -0.0021 X3

                                         ST. DEV.    T-RATIO =
        COLUMN      COEFFICIENT          OF COEF.    COEF/S.D.
        --               44.848            6.133        7.31
X1      MATXDET         -0.9419            0.4822      -1.95
X2      MATXJRN          0.0857            0.1691       0.51
X3      MATXMAIL        -0.00211           0.08216     -0.03

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 9.542
WITH (  45- 4) =  41 DEGREES OF FREEDOM

R-SQUARED = 19.5 PERCENT
R-SQUARED = 13.6 PERCENT, ADJUSTED FOR D.F.
```

Y = Moving Average of Tylenol Extra-Strength Mentions per Month
X_1 = " " " " Detailing ($000's) per Month
X_2 = " " " " Journal Adv. ($000's) per Month
X_2 = " " " " Direct Mail ($000's) per Month

Exhibit IV-10i

Moving Average of Total OTC Analgesic Mentions
Vs.
Moving Average of Detailing expenditures

```
THE REGRESSION EQUATION IS
Y =    1520. + 0.412 X1

                                          ST. DEV.    T-RATIO =
        COLUMN       COEFFICIENT          OF COEF.    COEF/S.D.
        --              1519.97            17.49        86.90
X1      MATOTDET        0.41200           0.07900        5.22

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 24.84
WITH (  45- 2) =  43 DEGREES OF FREEDOM

R-SQUARED = 38.7 PERCENT
R-SQUARED = 37.3 PERCENT, ADJUSTED FOR D.F.
```

Y= Moving Average of Total Analgesic Mentions Per Month
X_1 = " " " " Detailing (000's) Per Month

Exhibit IV-10j

Moving Average of Total OTC Analgesic Mentions
Vs.
Moving Average of Journal Expenditures

THE REGRESSION EQUATION IS
Y = 1480. + 0.445 X1

	COLUMN	COEFFICIENT	ST. DEV. OF COEF.	T-RATIO = COEF/S.D.
	--	1480.42	41.30	35.85
X1	MATOTJRN	0.4449	0.1420	3.13

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 28.64
WITH (45- 2) = 43 DEGREES OF FREEDOM

R-SQUARED = 18.6 PERCENT
R-SQUARED = 16.7 PERCENT, ADJUSTED FOR D.F.

Y = Moving Average of Total Analgesic Mentions per Month
X1 = " " " " Journal Adv. ($000's) per Month

Exhibit IV-10k

Moving Average Of Total OTC Analgesic Mentions
Vs.
Moving Average of Direct Mail Expenditures

```
THE REGRESSION EQUATION IS
Y =   1629. - 0.312 X1

                                             ST. DEV.     T-RATIO =
        COLUMN      COEFFICIENT              OF COEF.     COEF/S.D.
        --             1629.02                10.57        154.12
X1      MATOTMAL       -0.3118                0.1498        -2.08

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 30.25
WITH (  45- 2) =  43 DEGREES OF FREEDOM

R-SQUARED =  9.1 PERCENT
R-SQUARED =  7.0 PERCENT, ADJUSTED FOR D.F.
```

Y = Moving Average of Total Analgesic Mentions per Month

X1 = " " " " Direct Mail ($000's) per Month

Exhibit IV-101

Moving Average of Total OTC Analgesic Mentions
Vs.
Moving Average of Professional Marketing Variables

```
THE REGRESSION EQUATION IS
Y =    1481. + 0.254 X1 + 0.355 X2
    - 0.468 X3

                                          ST. DEV.     T-RATIO =
       COLUMN       COEFFICIENT           OF COEF.     COEF/S.D.
       --               1481.12             36.60        40.47
X1     MATOTDET          0.2544            0.1142         2.23
X2     MATOTJRN          0.3554            0.1959         1.81
X3     MATOTMAL         -0.4682            0.1361        -3.44

THE ST. DEV. OF Y ABOUT REGRESSION LINE IS
S = 22.40
WITH (  45- 4) =  41 DEGREES OF FREEDOM

R-SQUARED = 52.5 PERCENT
R-SQUARED = 49.0 PERCENT, ADJUSTED FOR D.F.
```

Y = Moving Average of Total Analgesic Mentions per Month
X1 = " " " " Detailing ($000's) per Month
X2 = " " " " Journal Adv. ($000's) per Month
X3 = " " " " Direct Mail ($000's) per Month

Exhibit IV-11a

Correlation

<u>Residuals Of Moving Averages of Tylenol</u>
Vs.
<u>Residuals of Moving Averages of Prof. Mkt. Variables</u>

Variable	TYRES	Description
		Tylenol Mentions per Month - Residuals
TYDETRES	0.001	Tylenol Detailing per Month - Residuals
TYJRNRES	0.089	Tylenol Journal Adv. per Month - Residuals
TYDMRES	0.045	Tylenol Direct Mail per Month - Residuals

Variable	TXRES	Description
		Tylenol Extra-Strength Mentions per Month - Residuals
TXDETRES	0.043	Tylenol Extra-Strength Detailing per Month - Residuals
TXJRNRES	-0.029	Tylenol Extra-Strength Journal Adv. per Month - Residuals
TXDMRES	-0.024	Tylenol Extra-Strength Direct Mail per Month - Residuals

Variable	NTRES	Description
		Total Analgesic Mentions per Month - Residuals
NTDETRES	-0.029	Total Analgesic Detailing per Month - Residuals
NTJRNRES	0.179	Total Analgesic Journal Adv. per Month - Residuals
NTDMRES	-0.118	Total Analgesic Direct Mail per Month - Residuals

Exhibit IV-11b

Residuals of Moving Averages of Tylenol Mentions
Vs.
Residuals of Moving Averages of Detailing Expenditures

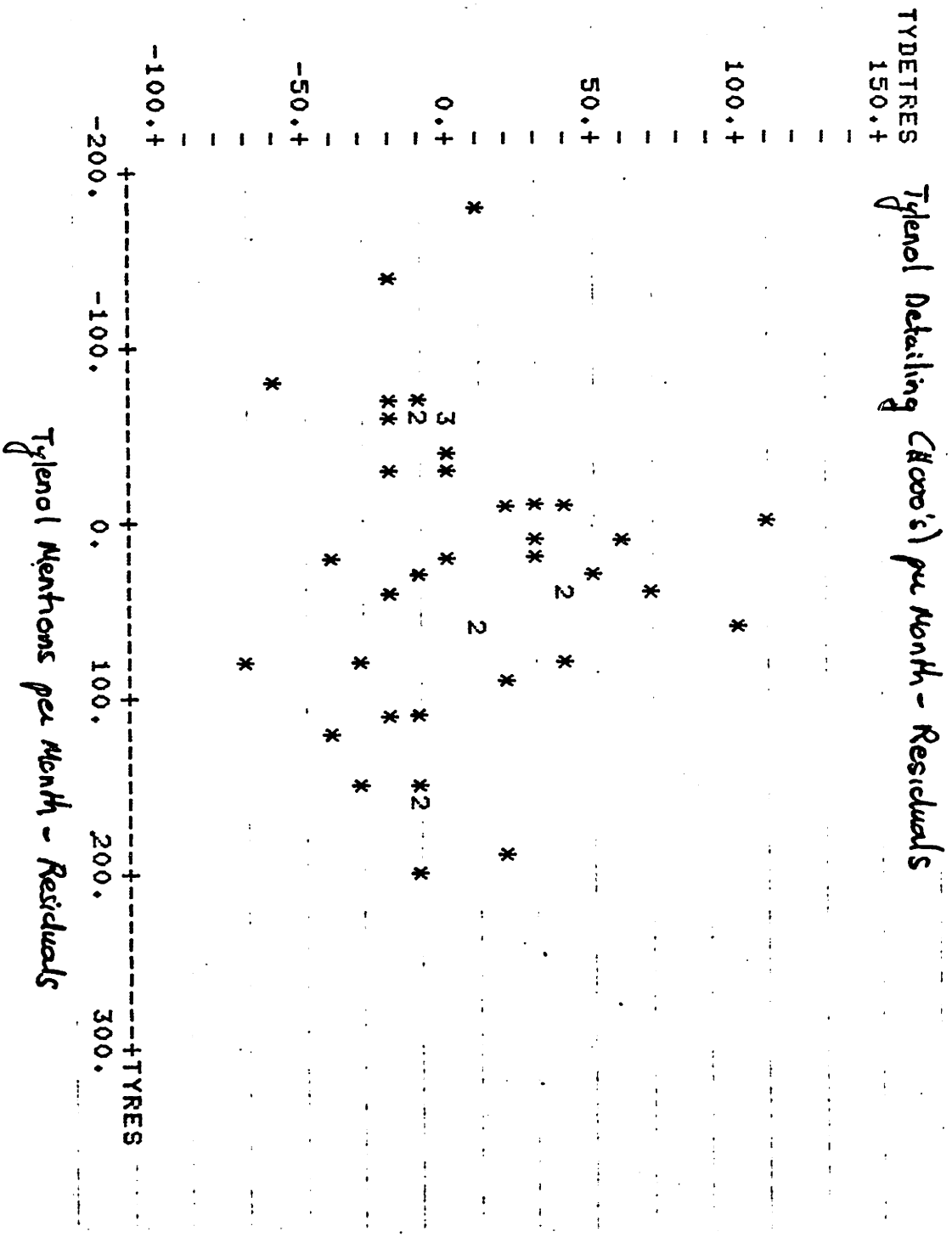


Exhibit IV-11c

Residuals of Moving Averages of Tylenol Mentions
Vs.
Residuals of Moving Averages of Journal Expenditures

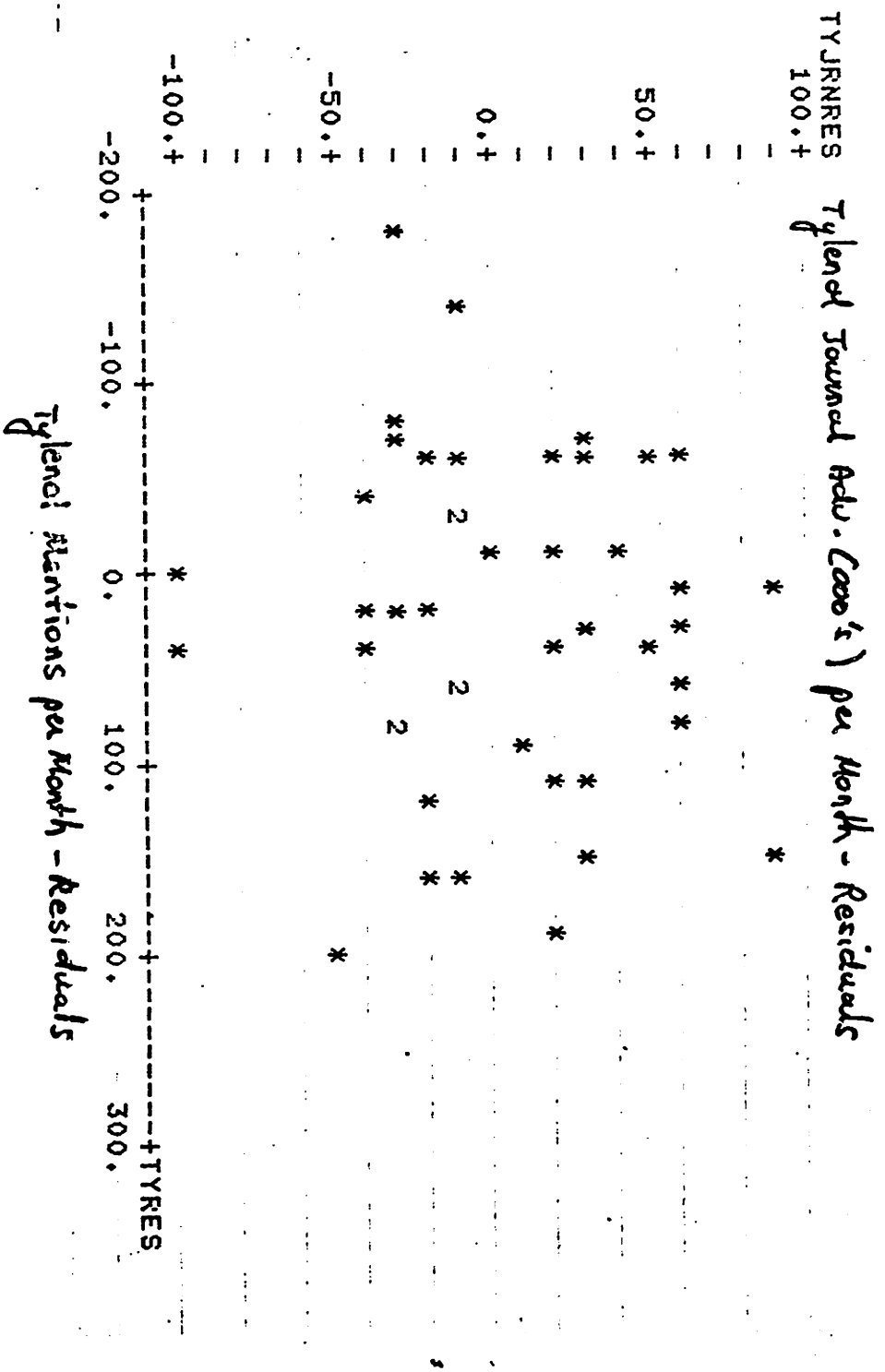


Exhibit IV-11d

Residuals of Moving Averages of Tylenol Mentions
Vs.
Residuals of Moving Avg. of Direct Mail Expenditures

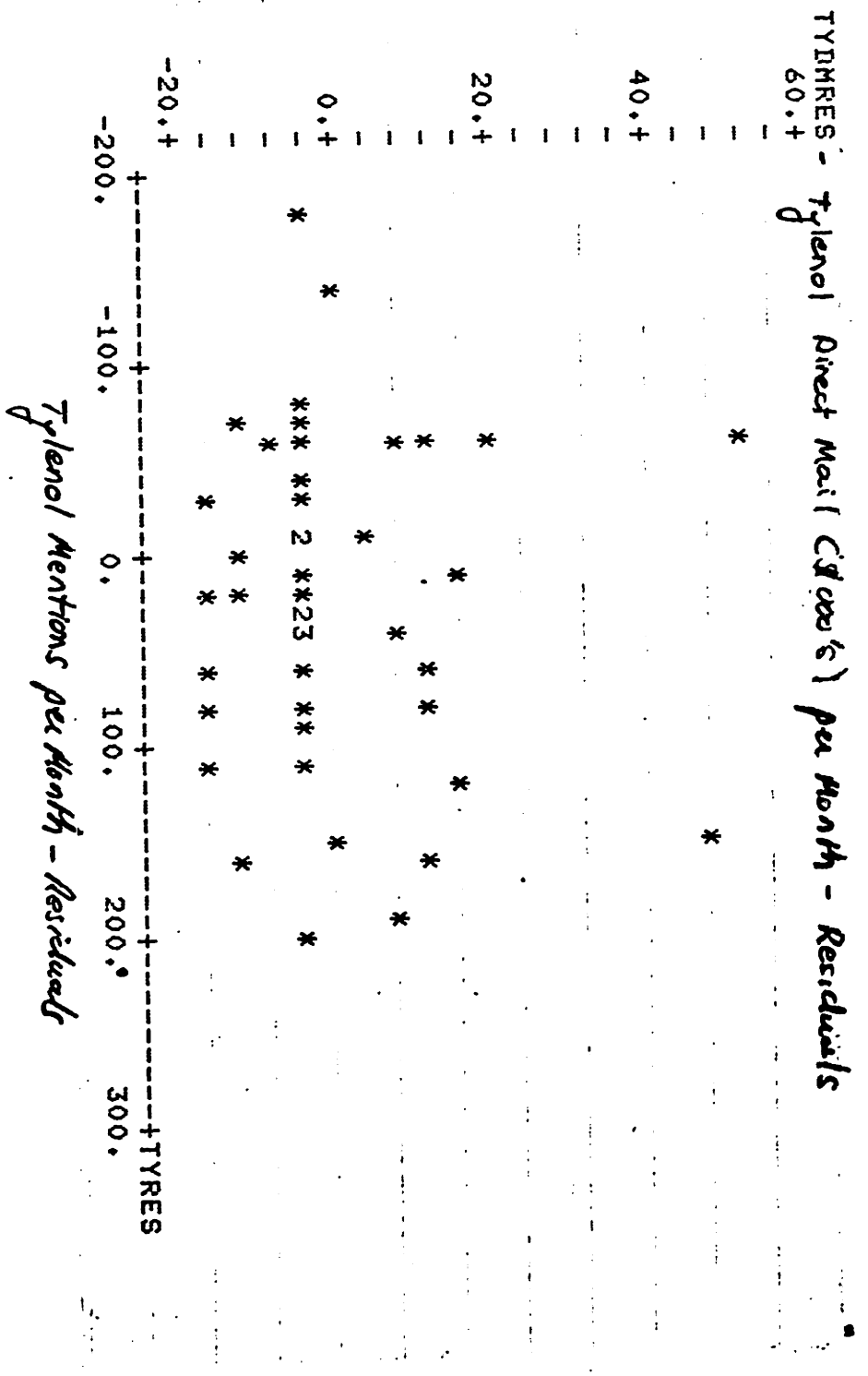


Exhibit IV-12

Derivation of Solution for Decision Calculus

$$REC = a - b_1 e^{-X_1/R_1} - b_2 e^{-X_2/R_2} - b_3 e^{-X_3/R_3}$$

$$\frac{\partial REC}{\partial X_1} = \frac{b_1}{R_1} e^{-\bar{X}_1/R_1} = k$$

assume $\frac{\partial cost}{\partial X_i} = 1, \quad \frac{\partial REV}{\partial X_i} = 0$

then $\frac{\partial REC}{\partial X_i} = 1 / \frac{\partial REV}{\partial y} = \text{constant} = k$

at optimum

$$\log b_1 - \log R_1 - \frac{X_1}{R_1} = k$$

and so on for $i = 2, 3$

$$REC(\bar{X}_1, \bar{X}_2, \bar{X}_3) = a - \left(1 + \frac{R_2}{R_1} + \frac{R_3}{R_1}\right) b_1 e^{-\frac{\bar{X}_1}{R_1}}$$

$$= a - (R_1 + R_2 + R_3) \frac{B_1}{R_1} e^{-\bar{X}_1/R_1}$$

$$= a - (R_1 + R_2 + R_3) k$$

Exhibit IV-13

Decision Calculus Example-- Ascriptin

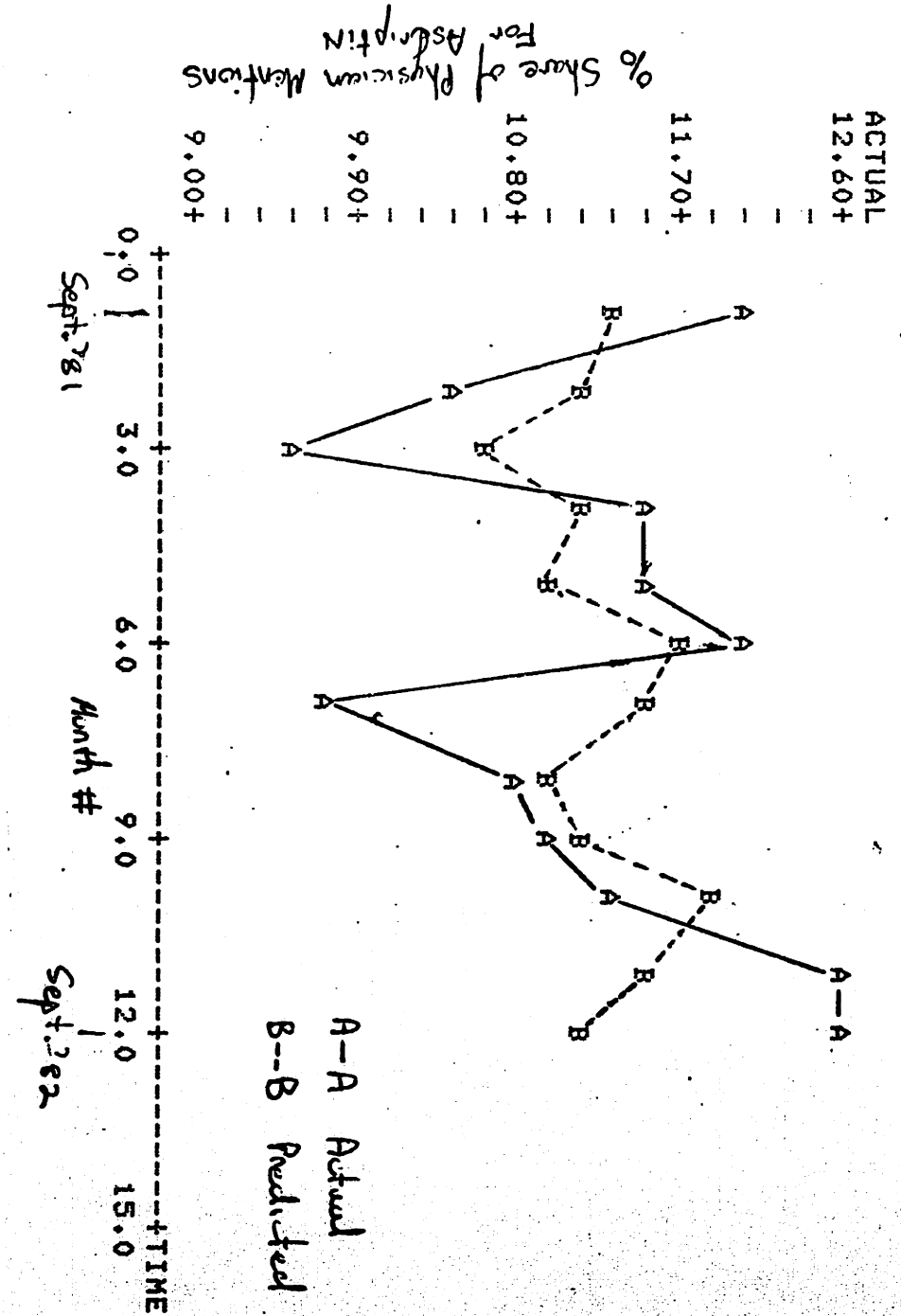


Exhibit IV-14

Excerpts From Physician Questionaire

1. What percent of your non-prescription adult analgesic recommendations are aspirin-based? What percent are acetaminophen based?

2. What percent of the non-prescription adult acetaminophen-based products you make in a week are:

a. 325 mg. (i.e. regular strength)

b. 500 mg. (i.e. extra strength)

3. Now doctor, I would like you to rate the efficacy of the following products in several categories. The products are 325 mg of aspirin, 500 mg. of acetaminophen and 325 mg. of acetaminophen. Using a scale of 1 to 6, with 1 being not at all effective, 6 being extremely effective and 2 through 5 representing various degrees in between, how effective is your normal recommended dosage using 325 mg. aspirin with regard to (Insert therapy). How effective is your normal recommended dosage using 500 mg. acetaminophen (For same therapy)? How effective is your normal recommended dosage using 325 mg. of acetaminophen (For same therapy)?

As a non-prescription analgesic (1 2 3 4 5 6)

As an antipyretic (1 2 3 4 5 6)

In treating osteoarthritis (1 2 3 4 5 6)

As an anti-inflammatory for non-arthritic inflammation (1 2 3 4 5 6)

3a. Regarding 325 mg. aspirin, how would you rate the frequency of side effects at recommended doses? Using a scale of 1 to 6 with 1 being lack of side effects and 6 being a great many side effects, how would you rate 325 mg. aspirin? 500 mg. acetaminophen? 325 mg acetaminophen?

325 mg. aspirin (1 2 3 4 5 6)

500 mg. acetaminophen (1 2 3 4 5 6)

325 mg. acetaminophen (1 2 3 4 5 6)

Exhibit IV-14 cont.

3b. With regard to toxicity at overdose, using a scale of 1 to 6 with 1 being no toxicity at all and 6 being a great deal of toxicity at overdose, how would you rate 325 mg. aspirin? 500 mg. acetaminophen? 325 mg. acetaminophen?

325 mg. aspirin (1 2 3 4 5 6)

500 mg. acetaminophen (1 2 3 4 5 6)

325 mg. acetaminophen (1 2 3 4 5 6)

3c. Using a 6 point scale, how would you rate the overall safety of 325 mg. aspirin with 1 being not at all safe and 6 being extremely safe? 500 mg. acetaminophen? 325 mg. acetaminophen?

325 mg. aspirin (1 2 3 4 5 6)

500 mg. acetaminophen (1 2 3 4 5 6)

325 mg. acetaminophen (1 2 3 4 5 6)

Exhibit IV-15

Excerpts From Consumer Questionaire

1. What brand of pain reliever do you, yourself use most often ? (Note; This is an open ended question.)

2. The last time a pain reliever was bought for your own use, what brand was bought? (Note; This is an open ended question.)

3. Now I would like you to rate some OTC pain relievers in several categories. Using a scale of 1 to 6 with 1 being an excellent rating and 6 being a very poor rating, how would you rate (Product) in terms of (Attribute). The question is asked with regard to a given attribute (these are listed below) for the following 8 products: Anacin, Maximum-Strength Anacin, Bayer, Bufferin, Extra-Strength Bufferin, Excedrin, Regular-Strength Tylenol, and Tylenol Extra-Strength.

The attributes that are to be rated are;

1. Overall Effectiveness

2. Being Fast Acting

3. Having Few or No Side Effects

4. Effectiveness in Reducing Fever

5. Effectiveness in Reducing Headache Pain

6. Effectiveness in Relieving Pain Other Than Headache Pain

CHAPTER 5

RECOMMENDATIONS AND CONCLUSIONS

This chapter attempts to synthesize the preceding analysis and make some defensive marketing recommendations for the competing brands within the analgesic market. Recommendations center around strategy formulation rather than implementation. These opinions are based strictly on our observations and analysis of the marketplace. We simply try to highlight areas of interest that might influence the nature of the analgesic marketplace.

This chapter is divided into three sections. The first section highlights results based upon the qualitative analysis of the industry. Section two presents Defender results of theoretical attacking brands. The final section points to the implementation of a continual Defender tracking system and to future areas of examination.

Section 5.1: Qualitative Insights

Three defensive strategies will be presented in this section. Bayer has been losing market share faster then any other aspirin product over the last several years.

Although it is perceived as a very safe product, it also is visualized as the least effective of the brand aspirins. This loss of perceived effectiveness has rendered Bayer to severe competition from generic aspirin(perceived as having equal effectiveness as Bayer and sold at a lower price).

We suggest a repositioning of Bayer as a "non-caffeine" brand aspirin. Recently consumer opinion of caffeine use has been exploited by the soft drink industry. Bayer could use a similar strategy employing a message as being a pure aspirin product with no caffeine. This may create a new important dimension of purity in the consumer's mind set for analgesics.

A second strategy is suggested for the entire aspirin category. Although not fully substantiated, benefits from the blood thinning qualities of aspirin have yet to be exploited to the consumer market. These benefits revolve around reduced chances of stroke and heart failure. Aspirin makers are undoubtedly waiting for better substantiation of these claims, but research efforts to support these claims could be increased. The impact of such claims could regenerate a declining aspirin submarket, especially among the growing 55+ population segment.

Finally, we suggest the introduction of an arthritic product by the makers of Excedrin and Tylenol. If this strategy were employed by either of these two manufacturers, then it would be advisable to use new brand names. Neither of these manufacturers seem ready to compete in this growing segment.

Section 5.2: Quantitative Implications

Defenderized perceptual maps have been presented in the previous chapter. A key feature of the Defender model is the prediction of market share estimates for attacking brands and the source(i.e. existing competing brands) of these gains.

The position of the attacking brand(we will call it ATTACK) is estimated from a basic perceptual mapping study. The map is "defenderized" and new market share estimates are predicted. These results are compared to pre-launch Defender maps. Analysis shows the loss of market share from existing brands to ATTACK. Six theoretical attacking brands were analyzed in our Defender model for the consumer market. Table V-1 presents the results. The table shows pre-launch positions and market shares of the existing brands. Theoretical positions of ATTACK were developed and estimates of new market shares were made using Defender. Only efficacy and low side effects

dimensions of ATTACK are varied. It was decided to hold the fever-reducing dimension constant at the industry average.

Table V-1

Effects of ATTACK
Market Shares

Brands	ATTACK brands						
	0	1	2	3	4	5	6
R.S. Anacin	9.0	0.0	0.0	0.0	0.0	1.0	0.0
M.S. Anacin	1.7	0.3	0.0	0.0	0.0	0.0	0.0
Bayer	21.7	19.3	16.0	15.6	16.0	16.0	12.0
R.S. Bufferin	8.1	1.4	0.0	0.0	1.0	0.0	0.0
E.S. Bufferin	1.6	0.2	0.0	0.0	0.0	0.0	0.0
Excedrin	7.9	0.4	0.0	0.0	0.0	2.0	0.0
R.S. Tylenol	20.0	19.2	16.0	13.8	16.0	22.0	1.0
E.S. Tylenol	29.8	29.9	30.0	23.0	23.0	22.0	1.0
ATTACK	---	29.0	38.0	47.6	45.0	52.0	86.0

Brand Positions (effectiveness, low side effects)

R.S. Anacin	(.08,.07)
M.S. Anacin	(.15,.03)
Bayer	(.06,.07)
R.S. Bufferin	(.03,.11)
E.S. Bufferin	(.13,.07)
Excedrin	(.11,.04)
R.S. Tylenol	(.05,.24)
E.S. Tylenol	(.19,.16)
ATTACK 1	(.10,.10)
ATTACK 2	(.14,.16)
ATTACK 3	(.12,.20)
ATTACK 4	(.21,.10)
ATTACK 5	(.03,.26)
ATTACK 6	(.21,.25)

The theoretical brands were created to examine the effects of attacking various positions on the perceptual map. ATTACK brands 1 and 2 introduce products with modest levels of both efficacy and low side effects. ATTACK brands 3 and 5 test the effects of brands with levels of low side effects. ATTACK brand 4 introduces a high efficacy product. ATTACK brand 6 is a superstar product with high efficacy and low side effects.

It must noted that these new market share estimates assume that ATTACK is evoked by every consumer. This is obviously an unrealistic assumption and market share estimates must be readjusted.

For example, assume ATTACK is to obtain 70% awareness and 60% distribution (typical estimates for strong new product launches). Market share should then be adjusted to 42% of the above estimates for ATTACK. The remaining 58% share of ATTACK is redistributed proportionately to existing brands based on pre-launch share weightings.

The following observations are made:

1. Anacin, Maximum Strength Anacin, Regular-Strength Bufferin, Extra-Strength Bufferin, and Excedrin are quite vulnerable to our theoretical ATTACK brands.

2. Regular-Strength Tylenol is vulnerable to ATTACK brands(3, 5, 6) which achieve similar or better position on low side effects. Extra-Strength Tylenol

is hurt by ATTACK brands(4, 6) that position closely on efficacy and by ATTACK brands(3, 5, 6) that position well on low side effects while maintaining some minimal level of efficacy.

3. Bayer is equally and modestly affected by all ATTACK brands.

From this analysis the following strategies are suggested:

1. Aspirin brands except Bayer, cannot afford to have other brands similar to Tylenol outposition them. Efforts to block these entries(probably acetaminophen products) should be initiated or new products to achieve these positions should be considered by the manufacturers of these brand aspirins.

2. Tylenol must be wary of new entries which achieve similar positions. Their strategy of two products, one for low side effects(Regular-Strength Tylenol) and one for high efficacy(Extra-Strength Tylenol) seems to be quite appropriate. They should not allow these products to be outpositioned on either of these two dimensions, respectively.

3. Bayer may be vulnerable to new products that reduce fever. Anacin, Bufferin, and Tylenol might consider development of such an entry. This strategy should only be employed using new brand names to avoid consumer confusion.

Section 5.3: Future Work

The use of this Defender model presents some intriguing findings. Periodic monitoring of the marketplace can be cost-effectively achieved using this analysis. New developments can be quickly and easily monitored.

For example, this model could quickly and easily measure the effects of the introductions of such new

acetaminophen products as Panadol, Datril, and Anacin-3. Current competitors could determine the effects of these new entries on their franchises and use the model to aid management in developing appropriate defensive strategies.

This thesis calls for the development of a decision support system(DSS) to monitor the market. Three inputs should be part of this DSS:

-qualitative analysis of the industry

-response curves for marketing variables

-a Defender monitoring model

The synthesis of this DSS should aid in timely and effective decisions by management.

This thesis has further developed the discussion of Defensive Marketing Strategy. Several areas of concern in the analgesic market lend themselves to further analysis(i.e. the relationship between physician recommendations and consumer purchase behavior). In addition, this is one of the few empirical applications of Defender. Based upon our intriguing results, we would like to challenge others to follow in our (and those who preceded us) footsteps in furthering the discussion of Defensive Marketing Strategy.

BIBLIOGRAPHY

Adams, W., The Structure of American Industry, Fifth Edition, (New York, N.Y.: Macmillan), 1977.

Beshel, J.J., "Defensive Marketing Strategy In the Prescription Analgesic Market", Master's Thesis, Sloan School of Management, M.I.T., June 1982.

Business Week, "A Bitter Pill for Aspirin Makers," July 25, 1982, p. 78.

Business Week, "A Death Blow for Tylenol?," Oct. 18, 1982, p. 151.

Hauser, J.R. and S.M. Shugan, "Defensive Marketing Strategies," Working Paper, Sloan School of Management, M.I.T., Revised Sept. 1982.

Hauser, J.R. and S.M. Shugan, "Defensive Marketing Strategies, Part II, "Paper presented at the ORSA/TIMS Joint National Conference in Houston, Texas, October 11-14, 1981.

Hauser, J.R. and S.P. Gaskin, "Defensive Strategy Models: Application and Predictive Test," Working Paper, Sloan School of Management, M.I.T., February, 1983.

IMS America U.S. Pharmaceutical Market

Kneale, D., "Rivals Go After Tylenol's Market, But Gains May Only Be Temporary," Wall Street Journal (WSJ), Dec. 2, 1982.

Kneale, D., "Tylenol's Rivals Have A Sharper Tone In Wake of Tragedy," WSJ, Dec. 9, 1982.

Kneale, D., "Tylenol's Orders Fall 25% But Competitors Lack Enough Products To Fill Market Gap," WSJ, Dec. 13, 1982.

Kolter, P., Principles Of Marketing, Second Edition, (Englewood Cliffs, N.J.: Prentiss-Hall), 1983.

Little, J.D.C., "A Model of Adaptive Control of Promotional Spending," Operations Research, 14, No. 6 (November-December 1966), pp. 1075-98.

Little, J.D.C., "Models and Managers: The Concept of A Decision Calculus," Management Science, 16, No. 8 (April 1970), pp. 466-85.

LNA, (Leading National Advertisers), Analgesic Review.

Nielson, A.C., NAT Bi-Monthly Period.

Pessemier, E.A., Product Management: Strategy and Organization Second Edition, (New York: Wiley/Hamilton, 1982).

Rao, V.R., "Pricing Research in Marketing: The State of the Art," Working Paper, Cornell University, Ithaca, N.Y., September 1982 and Forthcoming Journal Of Business.

Ratelford, B.J., "Economic Approaches to the Study of Market Structure and Their Implications for Marketing Analysis," Analytic Approaches to Product and Market Planning: The Second Conference, Marketing Science Institute, Cambridge, MA, 1982.

Sen, S., "Issues in Optimal Product Design," Analytical Approaches to Product and Market Planning: The Second Conference, Marketing Science Institute, Cambridge, MA 1982.

Shocker, A.D., and V. Srinivasan, "Multiattribute Approaches for Product Concept Evaluation and Generation: A Critical Review," Journal of Marketing Research, Vol. 16, May, 1979, pp. 159-180.

Silk, A.J. and G.L. Urban, "Pretest Market Evaluation of New Package Goods: A Model and Measurement Methodology," Journal of Marketing Research, Vol. XV, May, 1979, pp. 171-191.

Urban, G.L., and J.R. Hauser, Design and Marketing of New Products, (Englewood Cliffs, NJ: Prentice Hall, 1980).

Wind, Y.J., Product Policy: Concepts, Methods and Strategy, (Reading, MA: Addison-Wesley), 1982.

Young, J.G., "Responsive Marketing Strategies," Master's Thesis, Sloan School of Management, M.I.T., June 1982.