THE TREND IN GROSS MARGINS FOR MEDICAID PRESCRIPTIONS FROM 1998 TO 2003: A SIMULATION ANALYSIS

BY

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ABSTRACT

The objectives of this study were to examine the trend in gross margin dollars per prescription and how product mix affected the change. Summaries of the claims activity of Medicaid prescription drugs from 1998 to 2003 were obtained from the State of Wisconsin Department of Health and Family Services (DHFS). The data included all claims from the ambulant patients in Wisconsin. A sample of Top 100 prescription drugs based on the number of prescriptions dispensed from January to June was selected to represent a market basket sample for each year. Only oral dosage forms (capsules and tablets) were included in the study. All drug products were categorized as single source drugs, multiple source drugs with MAC prices, and multiple source drugs without MAC prices.

The gross margin per prescription was defined as the difference between the price and the ingredient cost of the drug dispensed in the prescription. Medicaid reimbursement formula was considered as the price for all prescription products in the three groups. The price was estimated at AWP less 10 percent plus a dispensing fee of $4.38 for single source drugs and multiple source drugs. Two methods, AWP less approach and WAC plus approach, were used to simulate ingredient costs of drugs based on different considerations for each product group. One-way ANOVA was performed to examine differences in means of the gross margin per prescription from 1998 to 2003 for each group, and the comparisons among three groups (single source group, MAC group, and non-MAC group) within each year at a significance level of 0.05.

While the gross margin percentages has decreased consistently from 23.05% in 1998 to 15.95% in 2003, average gross margin dollars per prescription experienced two increasing trends during the 1998-2000 and the 2001-2003 periods, with an average of $8.22. Overall,

single source drugs had higher gross margins than multiple source drugs. The average gross margin per prescription for single source drugs showed a continuous increase since 1998, which was mainly due to the increase in average AWP unit price for single source drugs. On the other hand, multiple source drugs had a steady-drop-steady pattern in gross margin dollars across the study years. Few multiple source drugs contributed to the decline in overall gross margin dollars per prescription in 2001.

Overall, the AWP reimbursement method suggested gross margin dollars would change as ingredient costs change. Although the increase in ingredient costs could partly be attributed to the general inflation, the mix of product still dominated the change in gross margin dollars per prescription for single source drugs across the study years. Unlike AWP reimbursement method, ingredient costs of multiple source drugs were not necessarily related to gross margins under MAC reimbursement payment. However, the timely update of MAC prices would have a direct impact on gross margin dollars for multiple source drugs.

CHAPTER 1

INTRODUCTION

Retail pharmacy gross margins as a percent of sales decreased through the 1990s. The gross margin percent was 30.0% in 1990, and reached a low of 24.9% in 1998(Kreling et al. 2000). This trend continued to the 21st century. Independent pharmacies reported a gross margin of 23.0 percent in 2001 (National Community Pharmacists Association [NCPA] 2002). Since the prescription department has been the largest business segment of retail pharmacies (NCPA 2002), the decrease in prescription gross margin should be the major contributor to this overall decline. On a prescription basis, the gross margin, which is the difference between the price and the ingredient cost of the product, should cover the cost to dispense a prescription and a desired net profit. The decrease in gross margin percent squeezes this difference for a given price, which might result in a decrease in net profits if a pharmacy cannot save some money on the cost of dispensing. Although relatively constant pharmacy net profits as a percent of sales from 1988 to 2001 imply efficient operation (Kreling et al. 2000, NCPA 2002), the decreasing trend in gross margin percentage is not necessarily a desirable situation for retail pharmacies.

The gross margin is determined by the price and the cost of goods. Hence, the decreasing gross margin percentage can be attributed partly to a change in pricing methods of a pharmacy. In addition to adding a markup percentage on the cost of ingredients, a professional fee has been included in the pricing method to recognize the professional function of pharmacies since 1908 (Smith 1986). The impact of this change on the gross margin percentage is based on different characteristics of the markup method and the professional fee method. The markup method bases price and dollar margin on the ingredient

cost of the product dispensed. Consequently, as ingredient cost increases, both price and dollar margin increase proportionally. This protects the pharmacy from declining gross margin percentages in periods of inflation. In contrast, the professional fee system produces a low gross margin percentage on expensive products due to the flat fee component (Carroll 1998). Although the professional fee could be adjusted based on the costs of drugs in a sliding scale method, which also is used widely by retail pharmacies, it is still difficult to maintain a constant gross margin percentage when a flat fee component is included in the pricing method. Overall, gross margin percentage will decrease as the ingredient cost increases under a professional fee system. Therefore, the adoption of professional fee concept, combined with the fact that the retail drug price has grown almost 60% between 1991 and 1998 (Kreling et al. 2000), could be one of the contributors to the decreasing gross margin percentage over the past decade.

The growth of third-party prescription programs could be an other factor influencing the change in gross margin percentage. Direct third-party payments accounted for less than 52 percent of all prescriptions prior to 1990, but they accounted for nearly 71 percent of all prescriptions in 1997 (Baugh et al. 1999). Third-party activity continued its increasing trend by climbing to 76 percent of the total prescription volume for independent pharmacies in 2001 (NCPA 2002). One important characteristic distinguishing the private-pay prescription market and the third-party prescription market is the pharmacy's ability to set a price. Unlike being a price maker in the private-pay market, the pharmacy is a price taker in the insured market. The price of a third-party prescription is based on reimbursement rates set by third-party administrators. Three methods are available for paying pharmacies: capitation, usual and customary (U&C), and reimbursement for cost of the dispensed product plus a fee.

Capitation is a preset, per person per time period payment amount. In a capitation arrangement, a pharmacy is paid a monthly fee for each enrolled person in the plan. This fee covers all drugs and pharmacy services received by the patients, regardless of how many each patient uses. Thus, the pharmacy has a financial incentive to reduce utilization whenever possible and to use generic or less expensive products.

U&C payment is used commonly in physician reimbursement and has been mentioned as a possibility for pharmacy. The usual charge is the price at which the individual provider charges an uninsured patient for a particular service or prescription. In some reimbursement systems, the customary charge is operationally defined as the "nth" percentile of charges for a particular service or prescription in a given area. Usual and customary charges can be regulated in a market that is price competitive. However, the increase in third-party coverage has limited the degree of price competition among pharmacies. Without competition, U&C reimbursement is analogous to giving a blank check to a supplier that charges whatever it wants; thus, this approach is not widespread either (Thomas and Larson 1999).

The most common method of paying pharmacies in third-party programs involves reimbursing the product cost plus paying a dispensing or professional fee. Since it is difficult for a third party to determine the actual acquisition cost (AAC) of a drug, the product cost is reimbursed at an estimated acquisition cost (EAC) or maximum allowable cost (MAC) based on the source of drugs. The dispensing fee usually is the same for every pharmacy (Thomas and Larson 1999). Similar to the private-pay market where the professional fee system prevails, the gross margin percentage also will decrease as the ingredient cost increases under a single-fee schedule of the third party reimbursement method.

The joint effect of the growth in prescription prices and the professional fee component in pricing methods and third-party reimbursement payments has contributed to the decrease in prescription gross margin as a percentage of sales. However, the dollar margin and the percentage margin do not follow the same trend necessarily. The constant increase in pharmacy revenues, combined with the declining trend in pharmacy gross margins as a percentage of revenues, indicates three possible changes in gross margin dollars: gross margins remain the same, gross margins decrease, or the rate of increase in gross margins is smaller than that of revenues. Prescription gross margin dollars could be viewed as the product of the average gross margin per prescription and the total number of prescriptions dispensed. Given the fact that utilization of prescription drugs has accelerated rapidly, the change in the margin dollar of a prescription would explain the rest of the change in total prescription gross margin dollars.

The gross margin on a prescription basis (the gross margin per prescription) is computed as the price, less the acquisition cost. For a given prescription in a pharmacy, the price of the prescription could be different due to customers' insurance statuses in spite of the same acquisition cost of that prescription. For private-pay customers, the pharmacy sets usual-and-customary prices for prescriptions; for customers with prescription coverage, the pharmacy receives a payment from third-party administrators. Levels of prices paid by third-party administrators generally are the lowest or some of the lowest accepted by pharmacies for any types of customers (Kreling et al. 2000). As a result, the margin dollar of a private-pay prescription is higher than that of a third-party prescription in spite of the same ingredient cost.

In regard to third-party prescriptions, the gross margin depends on the source of drugs because the ingredient cost is reimbursed on different bases. As discussed above, the reimbursement payment usually includes two components. The first component is ingredient cost reimbursement. Usually, ingredient costs are reimbursed at an estimated acquisition cost (EAC) for single source drugs or maximum allowable cost (MAC) for multiple source drugs. AWP minus a defined percentage is a common formula used as estimated acquisition costs for single source drugs. The MAC provision, which was first established by the federal government in the 1970s, includes a list of multiple source drugs and maintains the upper limits for state Medicaid program reimbursement. Many third-party plans have adopted a version of a MAC list for generic drugs (Schafermeyer 1996). The second component is dispensing fee reimbursement. This fee is designed to cover the cost of dispensing plus a reasonable net profit. In general, the dispensing fee is a fixed amount regardless of the drug dispensed (Thomas and Larson 1999).

Since neither EAC nor MAC can be directly comparable to AAC, this difference should actually be considered a part of the pharmacy's gross margin (Schafermeyer 1996). In other words, the gross margin of a third-party prescription is the sum of the dispensing fee and the EAC-AAC differential or the MAC-AAC differential. Given the fact that the dispensing fee is the same for all prescriptions, the gross margin of a third-party prescription is mainly influenced by the EAC-AAC differential or the MAC-AAC differential. For the drugs which are reimbursed on an AWP basis, the EAC-AAC differential is the function of AWP because the AAC of these drugs was found to be proportional to the corresponding AWP (Office of Inspector General [OIG] 2002). These relationships are illustrated by the following equations.

Price = Reimbursement Rate = EAC + Dispensing Fee (DF)

EAC = AWP * (1– a%)

AAC = AWP * (1– b%) or AWP = AAC / (1-b%)

EAC-AAC Differential = EAC – AAC = AWP * (b% - a%)

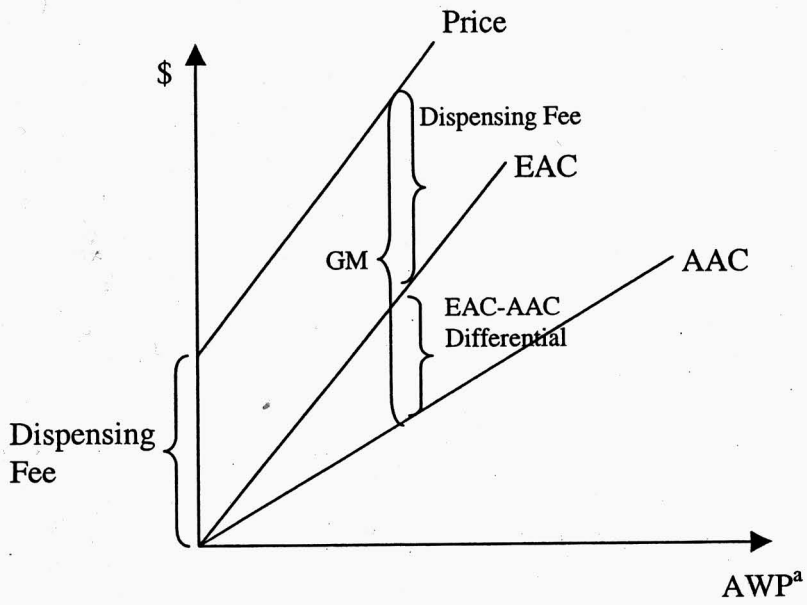
EAC = AAC + AWP * (b% - a%) = AAC + (AAC / (1-b%)) * (b% - a%)

Therefore, EAC = AAC * (1-a%) / (1-b%)

The relationships between price, EAC, AAC and AWP are presented by Figure 1.1. Also, price and EAC can be viewed as the function of AAC since EAC is proportional to AAC. As can be seen from Figure 1.2, the dollar margin for drugs based on AWP reimbursement will increase as the ingredient cost increases; however, the gross margin percentage will decrease as the ingredient cost increases due to a fixed dispensing fee.

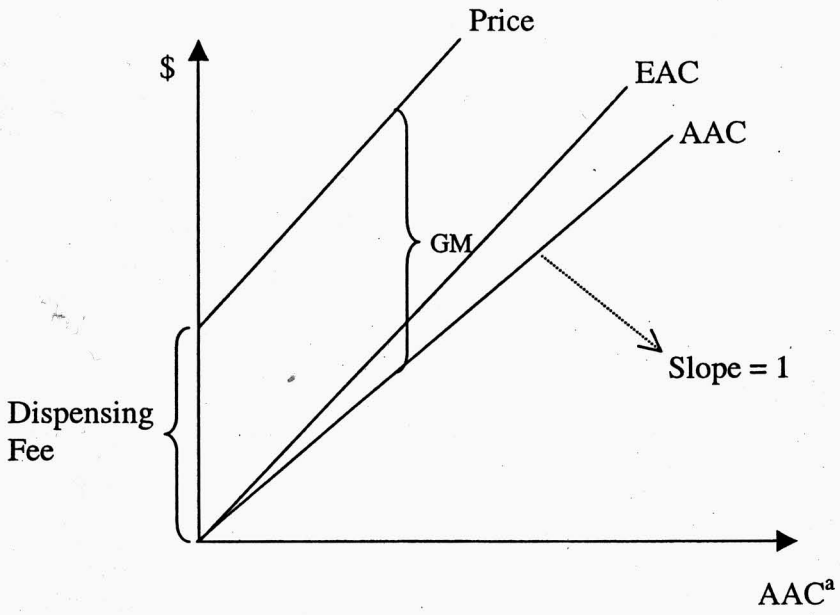
Unlike the brand name market where there is only one seller, there are many manufacturers existing in the generic market. Variation of the AWP for multiple source drugs and variation in differences between AWP and AAC across generic drugs make it complicated to reimburse these drugs on an AWP basis. To reimburse multiple source drugs, the Health Care Financing Administration (HCFA) established a federal upper limit (FUL) for a multiple source drug if at least three generic versions of the product are available. This limit has been determined to be equal to a 150 percent applied to the lowest price listed (in package sizes of 100 unit, unless otherwise noted) in any of the published compendia of cost information of drugs, such as Red Book, Blue Book, or Medi-Span (State Medicaid Manual, Part 6, Payment for Services). Additionally, most Medicaid programs also use Maximum Allowable Cost (MAC) prices to set reimbursement limits on the drugs not on the FUL list, or to set a rate lower than the existing FUL. Therefore, for the drugs which are reimbursed at

Figure 1.1 The Relationship Between Price, EAC, AAC, and AWP



a. It represents the AWP of a prescription, including the cost of drugs and the prescription size.

Figure 1.2 The Relationship Between Price, EAC, and AAC

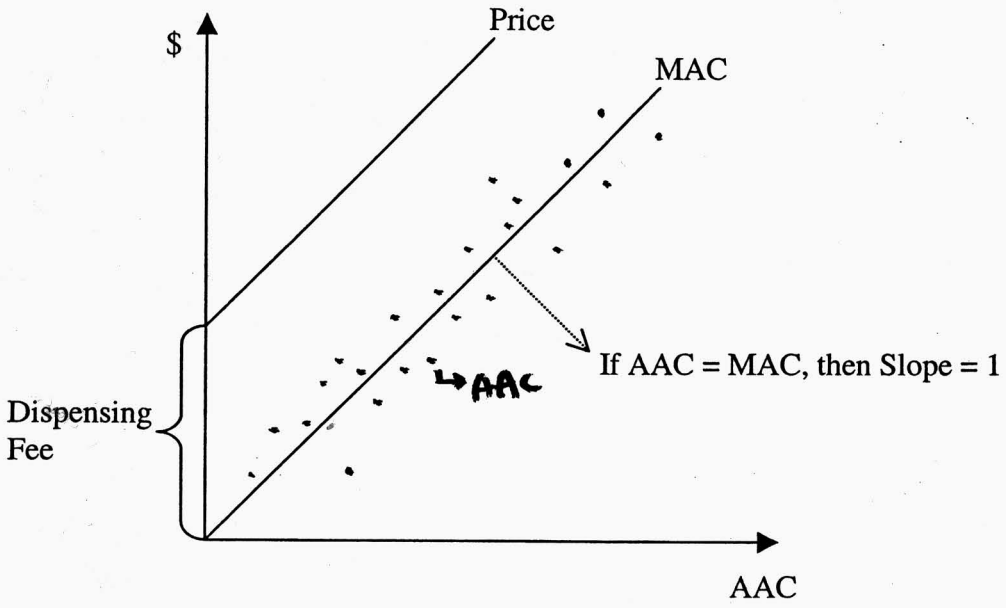


a. It represents the AAC of a prescription, including the cost of drugs and the prescription size.

MAC prices (MAC list drugs), the MAC-AAC differential should be small since MAC limits essentially were set at or near the prices of multiple source products from generic manufactures to achieve savings by taking advantage of the current market prices. Also, the MAC list is updated quarterly to capture changes in the market. Unlike the formulated relationship between the EAC and the AAC for drugs based on AWP reimbursement, the MAC-AAC differential depends on the market structure of multiple source drugs. The number of competitors, the length of patent expiration, and the time entering the market will all have impacts on the MAC-AAC differential. Given together, the gross margin per MAC list prescription is expected to be close to the dispensing fee, but won't have a mathematical function or relationship to the AAC (Figure 1.3).

Overall, the market share between private-pay customers and third-party customers would determine the average gross margin per prescription at the first level. Then, the average gross margin per third-party prescription could be attributed to the mix of brand-name drugs, which are based on AWP reimbursement, and generic drugs, which are based on MAC reimbursement. Finally, within brand-name drugs, the average gross margin per prescription would dependent on the mix of high-cost and low-cost products. Considering the financial impacts on retail pharmacies due to the rapid growth in prescription coverage, the gross margin of a third-party prescription would be the focus of this study. Since a summary of claims activity was available from the Wisconsin Medicaid program, coupled with the similarity of Medicaid payment structure to all third-party plans, the Wisconsin Medicaid program is used as an example of third-party programs in this study.

Figure 1.3 The Relationship between Price, MAC, and AAC



CHAPTER 2

LITERATURE REVIEW

This chapter begins with an overview of pricing behaviors of three firms in the distribution channel of prescription drugs, including the pharmaceutical industry, drug wholesalers, and pharmacies. Next, a description of third party prescription industry is provided. Two subtopics, pharmacy reimbursement and the Medicaid program, will be emphasized in this section. Then a review of factors and studies regarding acquisition costs is provided. Finally, a summary of research objectives is depicted.

Pricing

The price of a prescription for a given drug is influenced by the pricing behaviors of firms at all levels of the distribution channel for prescription drugs (from manufacturers to wholesalers to retail pharmacies). Generally, manufacturers have the largest share for the price of each prescription sold to a customer. In 1998, when a pharmacy sold a prescription to a customer, almost 75 percent ($0.74) of each dollar from the price of the prescription went to the manufacturer. Only a few cents ($0.03) went to the wholesaler for distributing products from manufacturers to pharmacies. The pharmacy retained the remaining portion, about 25 percent ($0.23) of each dollar of a prescription price (Kreling et al. 2000).

Pricing in the Pharmaceutical Industry

Pricing Brand-Name Drugs

A new drug chemical entity commonly enjoys patent protection for 17 years from time of filing the patent. The Hatch-Waxman Act of 1984 allows manufacturers to seek

"restoration" of some of the patent life lost during the extensive approval process. The maximum restored patent life is five years and the maximum total effective patent life (period between approval by FDA and a drug's patent expiration) after any "restored" patent life is 14 years (NIHCM 2002). A patent, which grants a company the exclusivity to sell a particular product in the market, aims to encourage the development of new drugs. However, patent protection does not guarantee complete monopoly power for brand-name drugs. Usually, they face competition from chemically differentiated molecules that might be prescribed to treat the same symptoms. Among 148 new branded chemical entities introduced into the U.S. market between 1978 and 1987, all but 13 had at least one fairly close substitute in their principal therapeutically indications. The average number of substitutes was 1.86 (Lu and Comanor 1998). Thus, the typical market structure for branded drugs is a differentiated oligopoly (Scherer 2000).

Several factors have effects on pricing brand-name drugs, such as competition, patient characteristics, value of therapy, disease characteristics, reimbursement environments, and company abilities. It has been suggested by many researchers that the price levels of current competitors together with the therapeutic value of the new product are the major determinants of launch prices (Kolassa 2002). A study also found that drugs contributing important gains were consistently priced above the prevailing prices in their therapeutic class. Those products offering little or no therapeutic advantage tended to be priced at or below prevailing levels (Lu and Comanor 1998).

Different purchasers pay different prices for brand-name prescription drugs, which economists refer to as price discrimination. It may be an important mechanism for aiding price competition in the pharmaceutical market. The Congressional Budget Office (CBO)

found that purchasers tended to obtain higher discounts from manufacturers on brand-name drugs when generic substitutes were available and when a greater number of therapeutically similar brand-name drugs were available (CBO 1998). This finding suggested that manufacturers' discounts reflected the intensity of competition in the market.

Manufacturers offer discounts on brand-name drugs based both on the volume budget and on the purchaser's ability to influence market share. The CBO (1998) conducted a study to examine price differences between different purchasers. The price comparison was based on the average invoice prices paid by various kinds of purchasers for 100 top-selling drugs sold largely through pharmacies in 1994. The results indicated that hospitals and clinics paid 9 percent less than retail pharmacies in 1994, and health maintenance organizations (HMOs) paid 18 percent less. Federal facilities got the biggest discount, over 40 percent, off the average invoice price paid by retail pharmacies. This finding was consistent with the notion that purchasers are rewarded for their ability to influence the prescription choice of a large patient base.

Manufacturers' discounts on brand-name drugs take a variety of forms. Purchasers can simply negotiate a lower price by direct purchase from manufacturers. Even if 75 percent of prescription drugs are bought indirectly through wholesalers, purchasers can still receive rebates from manufacturers based on the volume of drugs they use over a period of time (CBO 1998). A higher rebate may be rewarded by demonstrating the ability to switch patients to a particular company's drug. Another important form of discounts involves the wholesalers. Manufacturers and wholesalers have developed a computerized system whereby the wholesaler is aware of the most current discounted price negotiated between a manufacturer and a particular purchaser. The manufacturer sells the drug to the wholesaler at

Wholesale Acquisition Cost (WAC), the wholesaler delivers the drug at the discounted price to a particular purchaser, and then receives the amount of the difference between the WAC and the discounted price from the manufacturer. Such discounts handled through a wholesaler are generally known as chargeback (CBO 1998).

Brand-Name vs. Generic Drug Price Competition

Once a patent expires, a new form of competition may emerge. Generic drugs, products with the same active chemical ingredients as the original brand-name drugs, will enter the market. Before 1984, the approval process for a generic drug was nearly as expensive and costly as those associated with a new chemical entity. The Hatch-Waxman Act of 1984 eliminated the duplicative tests that had been required for a generic drug to obtain approval from the Food and Drug Administration (FDA). The Hatch-Waxman Act accelerated the process for approving generic drugs by requiring only that manufacturers demonstrate "bioequivalence" to the original brand-name drugs. Moreover, generic manufacturers were allowed to begin clinical tests before the patent on the brand-name drugs had expired (National Institute for Health Care Management [NIHCM] 2002). In addition to reducing the average delay between patent expiration and generic entry, the act increased the proportion of brand-name drugs that face generic competition once their patents expire. In 1983, only 35 percent of the top-selling drugs with expired patents had generic versions available (Grabowski and Vernon 1986). Today, nearly all do.

The entry of a generic version of a drug product creates two market segments based on consumers' price sensitivities. The consumers who are more sensitive to price are more likely to buy a generic product when it becomes available, while price-insensitive consumers are willing to pay high prices for the security of a brand-name drug. The brand manufacturers

found it more profitable to maintain a smaller market share at high prices than to reduce their prices to the low levels required to match generic competition (Grabowski and Vernon 1996). Several studies have been conducted to examine whether generic entry affected the prices of brand-name drugs. For 18 brand-name drugs that had patents expire between 1983 and 1987, the prices continued to rise faster than inflation after generic entry (Grabowski and Vernon 1992). One study also found that the prices of 32 brand-name drugs which went off patent between 1984 and 1987 increased more quickly than if generic entry had not occurred (Frank and Salkever 1997). Another empirical study examined 30 brand-name drugs which went off patent between 1976 and 1987 (Caves et al. 1991). The information on sales revenue and quantity in this study reflected transaction at the wholesale level. Unlike Frank's study, the results showed that the brand-name price actually increased slightly just after patent expiration, and then declined by only 2 percent with the entry of the first generic manufacturer. The dispute about the direction of pricing behavior of brand-name drugs after generic entry might be due to different study years for brand-name drugs and methods regarding the level of prices examined. Overall, brand-name prices frequently continue to rise after generic entry. However, it is unclear whether they rise more quickly or slowly than would be the case without competition from generic drugs.

However, these studies were based on invoice prices, which were not able to capture the change in discounts. At the same time, a CBO analysis (1998) showed that discounts on brand-name drugs tended to increase after generic entry. The CBO found that the best-price discount was 10 to 17 percentage points greater when two or more generic drugs were available. In conclusion, even if prices of brand-name drugs do rise faster than inflation for

many final purchasers after generic entry, some purchasers pay less for those drugs after generic entry.

Competition among Generic Drugs

The expiration of a brand-name drug's patent usually promotes the entry of more than one generic copy into the market. Under the Hatch-Waxman Act of 1984, the first generic company to file an application with the FDA for a copy of a brand-name drug gets 180 days of "exclusivity", which means that no other generic copy of the brand-name drug can come to market in that period. The 180 days kicks in only when the first generic copy goes on the market. Thus, if the "first filer" company has won the right to the 180 days but does not market the drug for some reason, other companies must simply wait (NIHCM 2002).

Generic drugs tend to enter the market at lower prices than their original brand-name drugs. Caves et al. (1991) found that generic drugs entered the market at 40 to 70 percent of the prices of their branded competitors by examining thirty brand-name drugs which went off patents during the 1976-1987 period. Since generic drugs are essentially the same as the brand-name drugs they copy based on bioequivalence requirement, they can be viewed as homogenous goods. Economic theory suggests that differences between products dampen price competition, so when products are roughly identical, price competition can be intense. Hence, a generic manufacturer is expected to lower prices to maintain the market share when more competitors enter the market. Several studies supported this relationship. As the number of generic manufacturers increased from one to 10, the average generic price fell from 60 percent to just 34 percent of the brand-name price. With 20 manufacturers, the generic price was only 20 percent of brand-name price (Caves et al. 1991). A CBO study (1998) also found that the average price of a generic drug declined as the number of

manufacturers increased by analyzing 112 brand-name drugs with generic versions available sold in retail pharmacies in 1994. The average price for a generic drug with one to five manufacturers ($23.40) was more than that of a drug with 16 to 20 manufacturers ($19.90). In addition, Jambulingam and Kreling (1995) found that the price erosion was directly proportional to the market entry aggressiveness in the first year. The results showed that if more than the median number of generic manufacturers entered during the first year of generic competition, the products were competitively priced and price erosion was rapid. On the contrary, if the number of generic manufacturers was below the median, the average price of generic drugs was close to the brand-name price and further increase in the number of competitors reduced the average generic prices slowly.

Pricing in the Drug Wholesaler Industry

Drug wholesalers serve as the middlemen that distribute drug products from manufacturers to pharmacies. In 2002, it was reported that approximately fifty drug wholesalers operate about 230 distribution centers throughout the U.S. market (Siecker 2002). Drug wholesalers deliver more than 250,000 different kinds of pharmaceuticals, nonprescription drugs, and health and beauty aids to more than 100,000 customer locations. The drug wholesaler industry is a very concentrated market, with the top 4 firms accounting for 95 percent of sales in 1998 (Kreling et al. 2000). Prescription drugs, which comprised 79.2 percent of wholesaler sales in 1991 and grew to 88.4 percent of sales in 1998, are the largest market segment in this industry. Sales to independent pharmacies declined from 1991 to 1998; however, sales to chain pharmacies and mass merchandisers remained steady during 1991 and 1998 (Kreling et al. 2000).

A historical term in pharmacy has been Average Wholesale Price (AWP). AWP is a published price reporting sales from wholesalers to pharmacies. Although AWP is the manufacturer's suggested price for drug wholesalers selling the drug to retail pharmacies, it is not the real transaction price in the market. The traditional approach to pricing products taken by wholesalers is to discount a percentage from the AWP or from individual wholesaler list prices. In the 1980s, wholesalers began adopting a newer philosophy toward their role and function in the market. They saw their efforts as providing a "value-added" service function. Congruent with this philosophy, they began using a cost-plus pricing system, which adds a markup percent to their cost, the Wholesale Acquisition Cost (WAC) (Fay 1981). Like AWP, WAC has been a published price, typically that appearing in pricing catalogs and lists from manufacturers to wholesalers. WAC doesn't represent wholesalers' net or true cost.

Generally, list-less and cost-plus systems can be converted into each other (Kreling and Kirk 1986). Jacobs and Brusadin (1986) used seven wholesaler proposals received by a buying cooperative of community pharmacies as the information source to compare wholesalers' net prices, which were pharmacies' acquisition costs. A sample of 507 items was examined by using wholesalers' acquisition costs or list prices of December 1, 1984. No significant differences in wholesalers' net prices were found between wholesalers using the list-less method and wholesalers using the cost-plus method for prescription items that were only available from wholesalers.

Pricing in the Pharmacy

History of Pricing

The prevailing methods of charging for prescription services in the 19th century were based on the quantity and type of preparation dispensed rather than the ingredient costs. This system known as the flat-price system persisted into the 20th century (McEvilla 1962). This practice began to change with the high cost of drugs and chemicals during World War I, and with a reduction in the number of compounded prescriptions. The markup-on-cost method for prescriptions achieved dominance as a result of occurrences in the early 20th century (Myers 1968). Although prescriptions were priced based on the cost of ingredients, the professional fee was still suggested in various pricing schedules developed during that period. Nitardy developed the "Prescription Pricing Schedule" for the National Association of Retail Druggist (NARD) in 1908. The schedule was based on the cost of ingredients, doubling this, and adding a compounding charge as a reward for professional skills and knowledge. Almost every pricing schedule developed since the Nitardy schedule contained a dispensing or professional fee, which included either a nominal or a substantial amount for the professional function (Smith 1986).

The idea that the professional fee should be independent of ingredient costs was discussed in McEvilla's article (1962). Since the professional services provided by the pharmacist are the same regardless of the cost of prescriptions dispensed, the charge for the service should be uniform and added to the cost of the ingredient. The fee, established by the pharmacist, should be sufficient to cover all costs incurred in dispensing a prescription and produce a profit. Jeffries (1953) reported a method that would provide the actual break-even cost of each prescription. To the break-even cost, the pharmacist could add a flat or

percentage fee, representing the net profit for each prescription dispensed. The professional fee method is widely adopted by current third-party administrators, which reimburses pharmacies the ingredient cost plus a flat dispensing fee (Thomas and Larson 1999). However, the most common pricing system used by contemporary pharmacies is the sliding scale method, where the percentage markup and a professional fee vary by the ingredient cost (Carroll 1998). The description of three pricing methods is as follows.

Markup Method

The markup method bases price and dollar margin on the ingredient cost of the product dispensed. Therefore, this system automatically adjusts prices to accommodate changes in ingredient costs. If the cost of the product increases, the dollar margin increases proportionally. This protects the pharmacy from declining gross margin percentages in periods of inflation. However, the markup method subsidizes low-cost products with high-cost products. Also, low-cost products might have margins lower than the cost of dispensing, while high dollar margins from expensive drugs might damage the pharmacy's price image (Carroll 1998).

Professional Fee Method

The professional fee method frequently is used to calculate prescription prices, especially in third-party programs. The professional fee is a set dollar amount which is added to ingredient cost to determine the prescription price. It should be set at a level sufficient to cover the pharmacy's cost to dispense and net profit. Although the professional fee system calls attention to professional aspects of pharmacy, the flat fee component produces low gross margin percentages on expensive drugs. A related disadvantage is that the professional fee disregards the costs of carrying inventory (Carroll 1998).

Sliding Scale Method

The markup method overemphasizes the importance of the product, which results in low-cost drugs being subsidized by expensive drugs, while the professional fee method disregards the higher inventory carrying costs associated with more expensive products. The sliding scale method overcomes both disadvantages by using variable markup percentages or professional fees to calculate prescription prices. If a markup is used, the size of the percentage markup decreases as drug costs increases. If the professional fee is used, a smaller fee is added to cheaper products and a larger fee to more expensive ones. A sliding scale system may also use both a percentage markup and a professional fee. In such combination system, either the fee or the markup or both may be varied. Since the sliding scale method balances the conflicts between inventory carrying costs and reasonable prices on expensive drugs, it is the system that most pharmacies use (Carroll 1998).

Third-Party Prescription Industry

One of the most important trends for community pharmacies over the past decade has been the growth of third-party prescription programs. Direct third-party payments accounted for less than 52 percent of all prescriptions prior to 1990, but they accounted for nearly 71 percent of all prescriptions in 1997 (Baugh et al. 1999). There has been a substantial growth in the private prescription insurance coverage while the Medicaid program consistently accounted for approximately 11% of all dispensed prescriptions in retail pharmacies from 1996 to 2001 (National Association of Chain Drug Stores [NACDS] 2002). The proportion of prescriptions covered by third-party plans is expected to continue growing. Medicare coverage for prescription drugs will contribute to this growth.

The emergence of prescription insurance service benefits resulted in two types of consumers, the private-pay market and the insured market including publicly funded and private service benefit coverage. In the private-pay market, the price of prescriptions is referred to as the "usual and customary" charge, which is determined by the pricing policies of the pharmacy. In contrast, the pharmacy is the price taker in the insured market, receiving reimbursement payments agreed by the pharmacy and the third party administrator. Also, more administrative costs are incurred for third-party prescriptions. For 2001, an average of $0.15 was reported for each third-party prescription transmission (NCPA 2002). To conclude, market segment sizes, required administrative activities, and payment policies will influence the community pharmacy's finance and operation.

Pharmacy Reimbursement

Reimbursement policies directly affect the pharmacy's gross margin. Three general methods are available for paying pharmacies: capitation, usual & customary (U&C), and reimbursement for cost of the dispensed product plus fee (Thomas and Larson 1999). The latter, in a variety of forms, is the most commonly used method. The descriptions of these three methods are as follows.

Capitation

Capitation is a preset, per person per time period payment amount. In a capitation arrangement, a pharmacy is paid a monthly fee for its patients. This fee covers all drugs and pharmacy services received by the patient, regardless of the patient's level of usage. The fewer drugs the patient uses, the more profits the pharmacy earns. Thus, the pharmacy has a

financial incentive to reduce utilization whenever possible and to use generic or less expensive products.

Individual pharmacies bear financial risk under the capitation system. Capitation payment is based on average utilization by a large number of patients. However, most pharmacies only have a small patient base. Within a smaller group of patients, utilization may be much greater or much less than the overall average. Thus, the reward of efficiency under capitation is subject to patient characteristics, sicker or healthier. Also, pharmacies do not directly control prescribing, which is a big factor in drug use (Thomas and Larson 1999).

Usual and Customary (U&C)

Usual and Customary (U&C) reimbursement system may cap the payment at the prevailing price of a particular prescription in a given area. This system defines the usual charge as the price that the individual provider charges for a particular service or prescription, and the customary charge as the prevailing price in the area for that same service or prescription. Some third-party programs use the "nth" percentile of charges for a particular service or prescription in a given area as the customary charge. Any claim submitted by a pharmacy that exceeds this customary charge is reduced to that amount. If the claim is less than the customary charge, the submitted charge is used (Thomas and Larson 1999). Medicaid programs limit prescription payments for single source drugs to the lower of U&C price or the reimbursement formula amount. Unlike the U&C reimbursement system, the U&C price usually is referred to as the price of prescriptions paid by cash customers.

Paying pharmacies on the basis of U&C is not widespread. This method only makes economic sense in the market that is price competitive, which can regulate usual, and thereby customary, charges. Since customers with third-party coverage pay the same copayment

regardless of which pharmacy is patronized, pharmacies only compete with each other in the private-pay market. Thus, the degree of price competition has decreased with the increasing trend in third-party coverage for prescription drugs over the past decade. As a result, the regulation of usual and customary charges by a marketplace is missing (Thomas and Larson 1999).

Product Cost Plus Fee

The most common method of paying pharmacies involves reimbursing the product cost plus paying a dispensing or professional fee. Reimbursement for product cost is commonly based on average wholesale price (AWP). Theoretically, this is the published price of the drug that is paid by pharmacies. In reality, AWP is usually greater than the actual prices that pharmacies pay their wholesalers. Thus, third-party administrators discount a defined percentage off AWP in an effort to reimburse the estimated acquisition cost (EAC). The discounts may differ for single source drugs versus multiple source drugs. In 1994, for example, a publication of the American Pharmaceutical Association (APhA) reported "AWP less 10 percent" for brand-name drugs and "AWP less 45 percent" for generic drugs (APhA 1994). Generally, the same discounts from AWP apply to all pharmacies regardless of the number of prescriptions dispensed (Thomas and Larson 1999).

Some contracts included maximum allowable cost (MAC) provisions for multiple source drugs. The MAC provision was first established by the federal government in the 1970s, including a list of multiple source drugs and the upper limits for state Medicaid program reimbursement (Schafermeyer 1996). A MAC is established for the generic product itself, rather than for each manufacturer's version of the product. In other words, one acquisition cost is used for all prescriptions for a given generic drug, regardless of which

generic manufacturer's product is dispensed. In some benefit designs, physicians can override the MAC rules by specifying to "dispense as written" (DAW). Generally, the MAC level is set by taking the prices of widely available generic manufacturers and using the average or the lowest of these (Thomas and Larson 1999). Since the actual acquisition cost for a drug product depends on the package size, source of supply, and quantity purchased, neither EAC nor MAC can be directly comparable to AAC. This difference should actually be considered a part of the pharmacy's gross margin (Schafermeyer 1996). In other words, ingredient cost reimbursement has a direct impact on the gross margin of a third-party prescription.

The second component is dispensing fee reimbursement. Although this fee is usually the same for every pharmacy, it also can be varied to promote desired behaviors. For example, a higher fee may be applied to prescriptions filled with generic products. Similarly, if other designated services are provided with a prescription, their fee can be increased (Thomas and Larson 1999).

The dispensing fee is supposed to cover the pharmacy's costs of dispensing plus a reasonable net profit. For pharmacies, the dispensing cost is higher for a third-party prescription than a private-pay prescription. The additional costs incurred in third-party prescriptions result from third-party related personnel expenses and from claims submission costs (Carroll 1991). However, the dispensing fee is often lower than the pharmacies' cost of dispensing. Also, the dispensing fee has been consistently stable, or in some cases, has actually declined. This situation is one of the factors contributing to shrinkage of the average pharmacy's gross margin (Schafermeyer 1996).

The overall relationship of third-party payments is showed in Figure 2.1. For a third-party prescription, the gross margin is restricted to the reimbursement formula. Generally, the gross margin consists of a dispensing fee and the difference between the AAC and the EAC or the MAC.

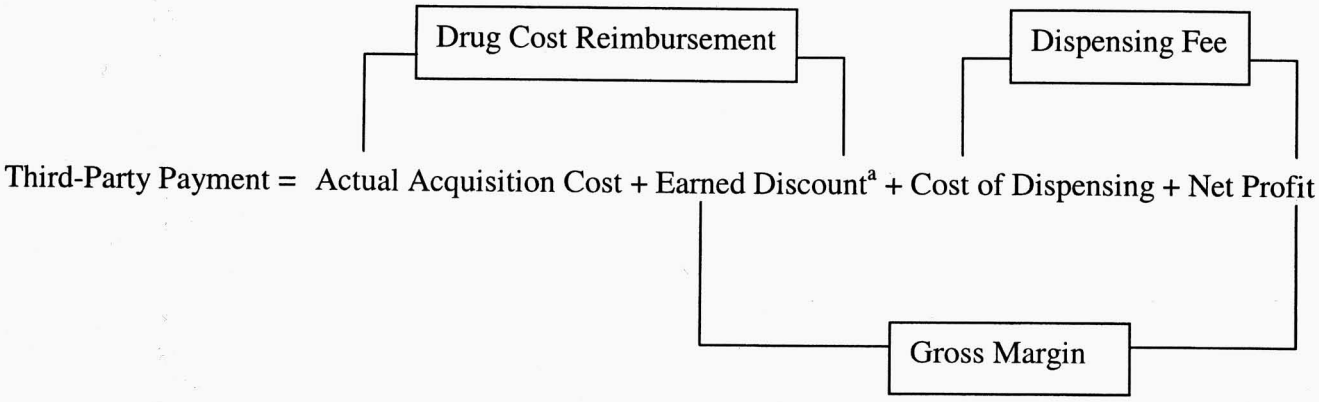
Medicaid Program

Medicaid is a public third-party program, which is financed by both the federal government and the states. It is designed to provide supplemental health-care coverage for certain low-income families with dependent children and low-income persons who are aged, blind, or disabled. States must provide certain services to Medicaid enrollees, including inpatient hospital care, physician services, and outpatient care. Even though coverage for outpatient prescription drugs is an optional benefit, all Medicaid programs cover prescription drugs for at least Medicaid categorically needy eligible persons. This study used Medicaid as a proxy of the third-party programs due to the availability and accessibility of a data set. However, several characteristics, which are unique to the Medicaid program, need to be addressed. More details regarding the trend, prescription drug coverage, and payment policies are as follows.

Market Share

Medicaid is the largest public coverage for prescription drugs, covering just over a tenth (11%) of Americans in 1996 (Kreling et al. 2002). Historically, independent pharmacies provided a larger percentage of their services to Medicaid enrollees than chain stores did. Whereas Medicaid covered 8.9 percent of all retail prescriptions in 1989, Medicaid prescriptions accounted for more than 23.5 percent of all prescriptions dispensed

Figure 2.1 Components of Third-Party Reimbursement



a. Earned discount is defined as the difference between drug cost reimbursement and actual acquisition cost.
Source: Schafermeyer, K.W. (1996). "Third-Party Prescription Program Evaluation." Effective Pharmacy Management, 8th ed., Alexandria, NARD

by independent pharmacies and only 1.2 percent of those dispensed by chain stores (Schondelmeyer and Thomas 1990). In independent pharmacies, Medicaid prescriptions as a percentage of total prescription volume remained steady from 1997 to 2001 at around 23% (NCPA 2002).

Prescription Drug Spending in Medicaid Program

In 1997, prescription drug payments only accounted for 9.7 percent of total Medicaid payments, but it was a rapidly growing part of total Medicaid spending (Baugh et al. 1999). Between 1996 and 2001, Medicaid spending for prescription drugs grew by 144 percent, from $10.2 billion in 1996 to $24.8 billion in 2001. The annual rate of growth in prescription drug expenditures was 9.8 percent between 1996 and 1997; then it grew annually by 20.1 percent, 18.9 percent and 20.9 percent between 1998 and 2000; and jumped by 28.6 percent in 2001 (Teitelbaum et al. 2003). This high rate of growth resulted from steady increases in drug spending for elderly and disabled enrollees. While the elderly and disabled constituted approximately 27% of Medicaid enrollees, they accounted for 80% of Medicaid drug spending in 1998. In contrast, prescription drug expenditures for adults and children grew relatively slowly between 1995 and 1998, mainly due to declining enrollment within these groups (Bruen 2000).

Medicaid Drug Coverage

In general, Medicaid must cover all prescription drugs manufactured by a company that has signed a drug rebate agreement. The Omnibus Budget Reconciliation Act of 1990 (OBRA-90) established the Federal drug rebate program and required that participating states use open formularies. Prior to this legislation, many states had limited formularies. The Omnibus Budget Reconciliation Act of 1993 (OBRA-93) enabled states to limit coverage of

specific drugs and require prior authorization before dispensing any drugs. Most states have established prior authorization programs to limit the use of a select number of drugs, and also place constraints on the number, quantity, and refills of all prescriptions (Bruen 2000).

Payment Policies for Outpatient Prescription Drugs

The product cost plus fee method is used by the Wisconsin Medicaid program to reimburse outpatient prescription drugs. Two different limits apply to ingredient cost reimbursement, one for multiple source drugs with three or more generic substitutes and one for all other drugs. In accordance with the OBRA 90, the ingredient costs for multiple source drugs are based on Federal Upper Limits (FUL) published by the Centers for Medicare and Medicaid Services (CMS), while those for single source drugs are based on the "estimated acquisition costs" in the market. A FUL can be established for a drug if there are three or more generic versions of the product rated therapeutically equivalent and at least three suppliers are listed in the current editions of published national compendia. Specifically, CMS rules stipulate that Medicaid agencies must not pay pharmacies more than 150 percent of the lowest price of a drug listed in any of the published drug cost compendia, such as Blue Book, Medi-Span, and RedBook (State Medicaid Manual, Part 6, Payment for Services). Most state Medicaid programs also utilize Maximum Allowable Cost (MAC) prices in order to set reimbursement limits on the drugs which are not on the FUL list, or to set a rate lower than the existing FUL. Medicaid reimburses pharmacies for a brand-name drug at the same rate that it reimburses for the generic equivalent of the drug if it is on the MAC List, unless the prescriber notes that the brand should be dispensed (Brand Medically Necessary).

In regard to single source drugs and multiple source drugs that are not on the MAC list, payments for these drugs cannot exceed the lower of estimated acquisition cost (EAC)

plus a dispensing fee or the pharmacy's usual and customary charge to private-pay customers. Prior to 1984, most states used 100 percent of AWP for reimbursement of acquisition costs. However, the Office of Inspector General (OIG) issued a report in 1984 which stated that, on average, pharmacies purchased drugs for 15.9 percent below AWP. In 1989, OIG issued a follow-up report which concluded that pharmacies were purchasing drugs at a discount of 15.5 percent below AWP. These results indicated that AWP was not a valid reflection of the costs paid by pharmacies for drugs. In response to this concern, in 1989, Health Care Financing Administration (HCFA) issued a revision to the State Medicaid Manual pointing out that it would not be acceptable for a state to make reimbursement using AWP without a significant discount (OIG 2002). In 2000, in most states, EACs ranged from AWP minus 4% to AWP minus 15.1%, with the most common formula being AWP minus 10%. A few states determine their EAC by using the Wholesale Acquisition Cost (WAC), which is the list price that wholesalers pay manufacturers for the product. These states add a percentage to the WAC to reach the EAC (Schwalberg et al. 2001).

A dispensing fee is paid to pharmacies for covering their costs of dispensing and a reasonable net profit. This fee is determined by the state and must be cited in the State Medicaid Plan. In 2001, dispensing fees ranged from $3.00 in Massachusetts to $5.77 in Louisiana for dispensing an outpatient prescription. Many of the states' dispensing fees have not been changed for several years (Schwalberg et al. 2001).

Adequacy of Medicaid Payment

The adequacy of Medicaid payment has a direct impact on the pharmacy's financial operation. A study was conducted to compare pharmacies' acquisition costs for prescription drugs with potential Medicaid prescription ingredient cost reimbursement amounts computed

as AWP less 10.5% or WAC plus 5.01% (Kreling 1991). On average, amounts based on either of these drug ingredient cost reimbursements were higher than acquisition costs. The WAC plus payment represented a closer estimation. The results also suggested that it might be feasible for pharmacies to purchase most non-innovator multiple source drugs at MAC prices.

Adams et al. (1994) evaluated the adequacy of Medicaid payments to pharmacies. In that study, several data sources were used to develop 1991 estimates of average pharmacy ingredient and dispensing costs. A simulation was used to estimate the amounts states pay. Nationally, simulated payments averaged 96% of estimated costs overall, but were lower for dispensing costs (79 percent) and higher for ingredient costs (102 percent).

Acquisition Costs

Factors Affecting AAC

The cost of ingredients is one of the factors determining the dollar margins for a prescription. The price at which pharmacies actually purchase the product is referred to as the actual acquisition cost (AAC). This is the true ingredient cost of the product. Although it is a simple concept, in practice, it is difficult to determine the AAC of a given product. The AAC of a given product depends on several factors, like the source of purchase, the quantity of purchase, and the type of pharmacy. A discussion of these factors follows.

Source of Purchase

Pharmacies can order prescription drugs directly from pharmaceutical manufacturers. Wisconsin retail pharmacies reported about 12 percent of total purchases from manufacturers in 1993. Pharmacies can also purchase prescription drugs from wholesalers. In 1993, primary

wholesalers were extensively used by all types of pharmacies in Wisconsin except large chain pharmacies, which depended on company-owned warehouses, and nearly 83 percent of purchased prescription drugs in Wisconsin independent pharmacies was from a primary wholesaler (Doucette and Wiederholt 1993).

Theoretically, the product may have a lower AAC if purchased directly from manufacturers than if purchased from wholesalers (Carroll 1998). However, wholesalers have continually reduced their operation costs and prices to the point that their customers routinely buy prescription products for the same or lower prices than they can get directly from the manufacturers (Siecker 2002). One study also found that, in order to gain a larger share of pharmacies' total purchases, the wholesalers reduced their gross margins on the products which could also be purchased from manufacturers so that their net prices were equivalent to or below the manufacturer's direct prices to the pharmacy (Jacobs and Brusadin 1986). In addition, membership in a cooperative buying group was found to be a significant factor affecting acquisition costs (Kreling 1991).

Quantity of Purchase

Price discounts could be obtained when purchasing larger volumes (Carroll 1998). As with manufacturers, quantity discounts from wholesalers to pharmacies for prescription drugs are usually reflected in line invoice cost, but many drug wholesalers also give a percentage discount for volume of purchase within a specified time period (Gagnon and Rodowskas 1974). Quantity and cash discounts tend to be wrapped into one with current wholesaler terms, but they also vary by volume of purchases (Kreling 1987).

Type of Pharmacy

Norwood and Lipson (1977) conducted a study to examine the AWP-AAC differential by pharmacy type. Chain pharmacies had differentials significantly greater than those observed for independent and franchise operations. Also, the results indicated that promotional-discount pharmacies had larger differentials than did professional and traditional-community types of operations. The number of direct purchase accounts also was associated positively with AWP-AAC differentials.

Non-traditional pharmacies, such as hospital pharmacies, are able to purchase drugs at substantially greater discounts than other retail pharmacies due to their great purchasing power (OIG 2002). Hospital pharmacies were purchasing a very high percentage of pharmaceuticals directly from manufacturers in order to obtain major discounts. Such discounts were based on bids and contracts. Although the emergence of the hospital charge-back system created by wholesalers introduces wholesalers into the mix to handle distribution of pharmaceuticals, the buyer-seller relationship still exists between manufacturers and hospital pharmacies (Siecker 2002). This trend was confirmed by the decreasing percentage of sales to hospital pharmacies by manufacturers since 1980 (Kreling et al. 2000).

Studies Regarding the AWP-AAC Differential

Since the third-party EAC reimbursement is predominately based on a discounted AWP, the AWP-AAC differential has been one of the important factors affecting the gross margin of a third-party prescription. Norwood and Lipson's study (1978) found that the AWP-AAC differential was related to product source. Those drugs which were available

from multiple sources had differentials which were significantly greater than those drugs available from only one source of supply.

The Office of Inspector General (OIG) has conducted a series of studies of pharmacy acquisition costs for prescription drugs. A 1997 report was based on Calendar Year (CY) 1994 data and included comparisons of 18,973 invoice prices for brand-name products and 9,075 invoice prices for generic products. The report showed an average discount of 18.3 percent below AWP for brand-name drugs and 42.5 percent below AWP generic products (OIG 1997). A 2002 study, which was based on CY 1999 data, reported a similar trend but different sizes of percentage discounts. The OIG estimated that pharmacies purchase brand-name drugs at an estimated average discount of 21.8 percent below AWP and generic drugs at a discount of 65.9 percent below AWP (OIG 2002).

A follow-up study provided extended analyses of the OIG report in 2002. The prescription drugs were grouped based on both the source and the status of federal upper-limits (FUL) list. On average, pharmacies purchase single source innovator drugs at an estimated discount of 17.2 percent below AWP, multiple source drugs without FULs at an estimated discount of 44.2 percent below AWP, and multiple source drugs with FULs at an estimated discount of 72.1 percent. A further breakdown of multiple source drugs without FULs showed that the estimated discount for innovator multiple source drugs to be 24.4 percent and 54.2 percent for non-innovator multiple source drugs (OIG 2002). Since the FUL was only established for drugs which have at least three generic equivalents available, the sizes of percentage discounts actually reflected the intensity of price competition in the market. These results were also consistent with the findings of earlier studies, the price of

generic drugs declines as the number of competitors increases (Caves et al. 1991, CBO 1998).

Product Mix

On a prescription basis, the change in the average cost or price is attributed to inflation and the mix of products. The annual increases in manufacturer prices have been significantly lower than the increases in average retail prescription drug prices since 1992. The increase in manufacturer prices could be considered as an indicator of inflation. Therefore, the difference between manufacturer price increases and retail price changes reflected the additional impact of newer, more expensive drugs (Kreling et al. 2000).

New drugs tend to be priced higher than older drugs. In 1998, drugs on the market fewer than 10 years accounted for 75 percent of the Top 20 drugs by sales. However, they comprised only 45 percent of the Top 20 drugs when ranked by number of prescription dispensed (Kreling et al. 2000). Generally, new drugs peak in cost impact 5 or 6 years after reaching the market. In an annual summary for 2002, Express Scripts reported that drugs introduced in 1992 and thereafter accounted for 57.7 percent of 2002 per member per year (PMPY) costs. In contrast, the annual impact of drugs introduced in 2002 was marginal, with only one percent of the overall 18.5 percent 2002 trend. Ninety percent of the contribution of 2002 new drugs resulted from the utilization of these new drugs, and ten percent was due to added costs per prescription (Teitelbaum et al. 2003). These findings suggested that the shift to new drugs might not occur immediately, but gradually.

Fairman (2000) used 1996 and 1997 claims data from Express Scripts, Inc to examine the effect of new and continuing prescription drug use on cost. The measure used to assess

the product mix change was cost per dispensed day, where the calculation of costs was based on AWP information in December 1998. The results suggested an increasing trend in the use of newer, more expensive antipsychotic drugs, both over time and for new users versus common users in 1997. Comparison of 1996 and 1997 antidiabetic product mix also indicated that the increased costs over time were due to the shift from low-cost sulfonylureas to newer, more expensive oral antidiabetic products.

Express Scripts, Inc. published a series of Drug Trend Reports through the 1990s (Teitelbaum et al. 2003). Ingredient cost per prescription was one of the factors examined. The calculation of ingredient costs was based on the AWP that First DataBank reported for each unit of a given drug. The trend in the cost per prescription for "common drugs", which were available medications for use between 2001 and 2002, were analyzed in terms of four components, inflation, brand/generic mix, therapeutic mix, and units. Overall, the results indicated that inflation had the greatest impact on the average ingredient cost per prescription for common drugs between 2001 and 2002. The use of relatively more expensive drugs also contributed to the increase in the average cost per prescription. For example, Topamax, used to prevent migraines, gained 2.4 market points. At $162.22 per prescription, the cost of Topamax was almost twice the therapy class average price of $82.73. The introduction of new generics and the greater market share penetration by generic drugs offset the degree of the increase in the average cost per prescription, but the overall financial impact was much smaller than inflation and therapeutic mix. The change in the number of units per prescription only explained 0.1 percent of the difference in the cost per prescription. However, these results varied widely by therapeutic class.

In addition to the general trend toward use of newer, more expensive products, insurance status has been shown to be related to costs of dispensed drugs. Medicaid recipients were found to incur higher prescription costs than private-pay patients because larger quantities and more expensive drugs were prescribed (Kotzan and Carroll 1991). The type of insurance coverage also was associated with costs of dispensed drugs. Private third-party and indemnity prescriptions were more likely to be dispensed with brand name drugs. Also, indemnity patients and the uninsured were dispensed brand name and generic drugs with lower unit costs (Mott and Kreling 1998). These findings suggested that benefit design would influence the mix of products.

Research Objectives

Although the price and the cost are two basic factors to determine the gross margin for a prescription, the overall gross margin per prescription also depends on the mix of products, either the shift from less expensive to more expensive drugs or the change in the market share between brand-name and generic drugs, or both. The first objective of this study is to examine the trend in the gross margin per prescription from 1998 to 2003. Second, the impact of product mix on the change in the gross margin per prescription will be analyzed, with the focus on the mix of different types of drugs and the switch between different costs of brand name drugs.

CHAPTER 3

METHODS

This study is a simulation analysis using Medicaid claims data from 1998 to 2003 to estimate the gross margin earned on Medicaid prescriptions by retail pharmacies during that period. This chapter includes three main sections: data source, gross margin per prescription, and statistical analysis. First, two data sources used in this study are discussed. Second, the process of simulating gross margin per prescription is described. The final section includes the analysis framework used to examine the research questions.

Data Source

Medicaid Claims Data

A summary of the claims activity of Medicaid prescription drugs from 1998 to 2003 was obtained from the State of Wisconsin Department of Health and Family Services (DHFS). Because of availability, only data for six-month (January to June) of each fiscal year were analyzed. The data included all claims from the ambulant patients in Wisconsin. The variables in the claims data used for analysis included the generic name of active ingredient, the strength, the dosage form, the number of prescriptions dispensed, and the quantity dispensed. Several variables were created for analysis purposes. A brand name was assigned to each product in a particular strength and dosage form. The prescription size, which represents the average quantity per prescription, was calculated by dividing total quantity dispensed by the total number of prescriptions dispensed. The Maximum Allowable Cost (MAC) unit price was obtained from the Wisconsin Medicaid Pharmacy Handbook. The

Average Wholesale Price (AWP) unit price and the Wholesaler Acquisition Cost (WAC) unit price were obtained from the ReadyPrice System, a price reference database.

ReadyPrice System

ReadyPrice System, a database product of Thomson Micromedex, provides current and historical drug pricing data, product descriptions, and complete manufacturer information. The information is available for all package sizes for a given product, and is updated monthly to ensure access to current price changes and new product information. Up to 10 previous AWP prices and a most recently updated WAC are provided for a given product. The AWP information is either reported by the manufacturer or calculated based on a markup specified by the manufacturer. This markup is typically based on the WAC or Direct Price (DIRP), as provided by the manufacturer, but may be based on other pricing data provided by the manufacturer. When the manufacturer does not provide an AWP or a markup formula from which AWP can be calculated, the AWP is calculated by applying a standard 20% markup over the manufacturer supplied WAC. If a WAC is not provided, the standard markup will be applied to DIRP. The AWP and WAC information used in this study was obtained from this database.

Gross Margin Per Prescription (GM/Rx)

The main purpose of this study was to examine the trend in gross margin dollars on a third-party prescription basis. Thus, the gross margin per prescription was the key element required for this study. Instead of using primary data from retail pharmacies to calculate actual gross margin dollars, this study used prescription claims data to simulate the gross

margin per prescription based on Wisconsin Medicaid reimbursement rates and pricing information for manufacturers and wholesalers. Three groups were created based on the payment formula and the source of drugs. A single source group included the brand-name drugs which were under patent, a MAC group included the multiple source drugs on the MAC list, and a non-MAC group included the multiple source drugs not on the MAC list. A multiple source drug is defined as a drug sold by two or more manufacturers or labelers. The status of each prescription product was confirmed by approved dates and equivalence rating information listed in the electronic Orange Book, which provides a list of approved drugs.

The gross margin per prescription was defined as the difference between the price and the ingredient cost of the drug dispensed in the prescription. Since the data used in this study were a summary of claims activity, an average prescription size, which was calculated by dividing total quantity dispensed by the total number of prescriptions dispensed, was assigned to each prescription product in the market basket. The average prescription size was used in the process of simulating the price and the cost of each product. Therefore, the simulated gross margin per prescription was determined on an average basis. Conservative estimation was an underlying assumption applied to all processes. The process of simulating the price and the cost for three groups (single source, MAC, and non-MAC) is presented below.

Simulated Prices

The Wisconsin Medicaid reimbursement policy was considered as the price for all prescription products in the three groups. Basically, for multiple source drugs with at least three equivalent generic versions, the reimbursement payment during the study period was

MAC plus a dispensing fee of $4.88 less $0.50; for single source drugs and multiple source drugs not on the MAC list, the reimbursement payment was AWP minus 10 percent plus a dispensing fee of $4.88 less $0.50. The following sections describe the process of simulating the price for each group based on Medicaid reimbursement policy.

Single Source Group

For the single source group, the formula used to simulate the price of a prescription was denoted as,

$$\text{Price/Rx} = (0.9 * \text{AWP Unit Price} * \text{Prescription Size}) + \$4.38$$

The AWP information was obtained from the ReadyPrice System. The brand name of prescription drugs in this group was used to search the AWP information for each product. The AWP unit price was based on the 100's package size or the one closest to the 100's package size. The effective AWP unit price between January and June of each year was chosen. If there was more than one AWP unit price within the same time frame, the average AWP unit price was weighted by months. The rules of weighting are described below.

a. If the effective date was between the 1st and the 15th, that month was considered to have the new price.
b. If the effective date was between the 16th and the 31st, that month was considered to have the old price.

MAC Group

For the MAC group, the formula used to simulate the price of a prescription was denoted as,

$$\text{Price/Rx} = (\text{MAC Unit Price} * \text{Prescription Size}) + \$4.38$$

The MAC unit price was obtained from the Wisconsin Medicaid Pharmacy Handbook. The MAC information is updated quarterly. Since the online Wisconsin Medicaid Pharmacy Handbook only has the most current MAC list available, historical MAC lists from January 1998 to April 2003 were obtained from the Wisconsin Department of Health and Family Services (DHFS). The MAC unit price was assigned to each prescription product in this group. If the MAC unit price changed during the January-June period, the average price was used.

Non-MAC Group

For the non-MAC group, the formula used to simulate the price of a prescription was denoted as,

$$\text{Price/Rx} = (0.9 * \text{AWP Unit Price} * \text{Prescription Size}) + \$4.38$$

This group included the multiple source drugs which didn't meet the three-supplier requirement for setting a MAC price. Usually, these drugs demonstrate some bioequivalence problems. The Food and Drug Administration (FDA) assigns A codes to the drug products that are considered to be therapeutically equivalent to other pharmaceutically equivalent products. As of March 2002, of 7,602 multiple source drugs listed in the Orange Book, the FDA rated 7,309 (96%) as bioequivalent and therapeutically equivalent and 293 (4%) as non-therapeutically equivalent. Of that 4%, the majority were older drugs on which modern tests have not been conducted. A handful is drugs whose level in the body is very sensitive, and therefore the FDA put them in the non-equivalent category (NIHCM 2002). Therefore, most prescription products in the non-MAC group only had one or two A-rated generic versions available in the market.

The AWP from the innovator manufacturer was chosen to simulate the price for the non-MAC group. The AWP information also was obtained from the ReadyPrice System, and historical AWP prices were assigned by the same rule described above. The first reason of choosing the innovator's AWP instead of the generic manufacturer's AWP was consistency. Not every prescription drug in the non-MAC group had A-rated generic equivalents across all the study years (Table 3.1). Second, using the innovator's AWP to simulate the price and the ingredient cost results in a more conservative estimation of gross margin dollars, which will be discussed in detail in the following section. For a few products, equivalence issues continued to be controversial, such as Clozapine and Levothyroxine (NIHCM 2002). Brand Synthroid also was the dominant product for levothyroxine with over 60 percent of market share in 2002 (Teitelbaum et al. 2003).

Simulated Costs

Two approaches could be considered to estimate the acquisition cost of a drug when primary data from retail pharmacies are not available. The first approach is based on the AWP, which is the suggested price for wholesalers to sell prescription drugs to pharmacies. Although the AWP is not the actual transaction price in the market, the percentage discount relationship between AWP and AAC has been demonstrated by a series of reports from the Office of Inspector General (OIG 2002). Therefore, the AWP minus a defined percentage (AWP less approach) could be used to simulate the acquisition cost of a drug. The second approach to estimate acquisition costs would be based on the WAC, which is the list cost for wholesalers to buy prescription drugs from manufacturers. Considering that the WAC reflects the cost of good sold in the financial report of a wholesaler, the price of a wholesaler

Table 3.1 Summary of Approved Date of 1st A-Rated Generic Product for the Drugs in the Non-MAC Group

Brand Name	Generic Name	Approved Date of 1st A-Rated Generic Product [a]	Year with MAC Available	Number of A-Rated Generic Manufacturers before MAC Available or Before July 2003
CLOZARIL[b]	Clozapine	Nov 26, 1997	2001	2
LANOXIN[b]	Digoxin	Dec 23, 1999	2002	1
DILANTIN	Phenytoin Sodium Extended	Dec 28, 1998	Not on the MAC list	2
K-DUR 20	Potassium Chloride	Nov 20, 1998	2002	1
K-DUR 10	Potassium Chloride	Aug 09, 2000	2003	2
MICRO-K 10	Potassium Chloride	Apr 26, 1996	2001	2
DYAZIDE	Triamterene/HCTZ	Jun 07, 1996	2003	4
COUMADIN[c]	Warfarin Sodium	Mar 27, 1997	2001	3
SYNTHROID[d]	Levothyroxine[b]	Aug 21, 2000	Not on the MAC list	2

a. Source: Electronic Orange Book.
b. Approved Date of 1st A-rated generic product was the same for different strengths.
c. Approved Date of 1st A-rated generic product was the same for different strengths except 3mg, which had 1st A-rated generic product on Nov 05, 1998.
d. Levothyroxine has had A-rated products since 2000, but Synthroid remains B-rated.

selling prescription drugs to a pharmacy should be represented by the WAC plus the gross margin percentage wholesalers earns (WAC plus approach). The decision of choosing the AWP less approach or the WAC plus approach to estimate the acquisition cost was based on different considerations for drugs in each group.

Single Source Group

Since drugs in this group are reimbursed based on AWP, using the AWP less approach to estimate the ingredient cost can have the gross margin presented in a mathematical function with AWP. In other words, the relationship between the ingredient cost and the gross margin is connected by AWP; thereby, the role of AWP in this reimbursement method can be examined. In 2002, the OIG performed an audit to examine the size of the difference between AWP and actual invoice prices paid by retail pharmacies to purchase drugs. The results indicated that the estimated discount of single source drugs was 17.13 percent in Wisconsin. The relationship between the AWP and the AAC for single source drugs has been relatively consistent across the study years (OIG 1997; OIG 2002). The formula used to simulate the ingredient cost of a prescription in the single source group was denoted as,

$$\text{Ingredient Cost/Rx} = 0.8287 * \text{AWP Unit Price} * \text{Prescription Size}$$

Here, the AWP unit price used to estimate the ingredient cost was the same as the one used to simulate the price for a given drug.

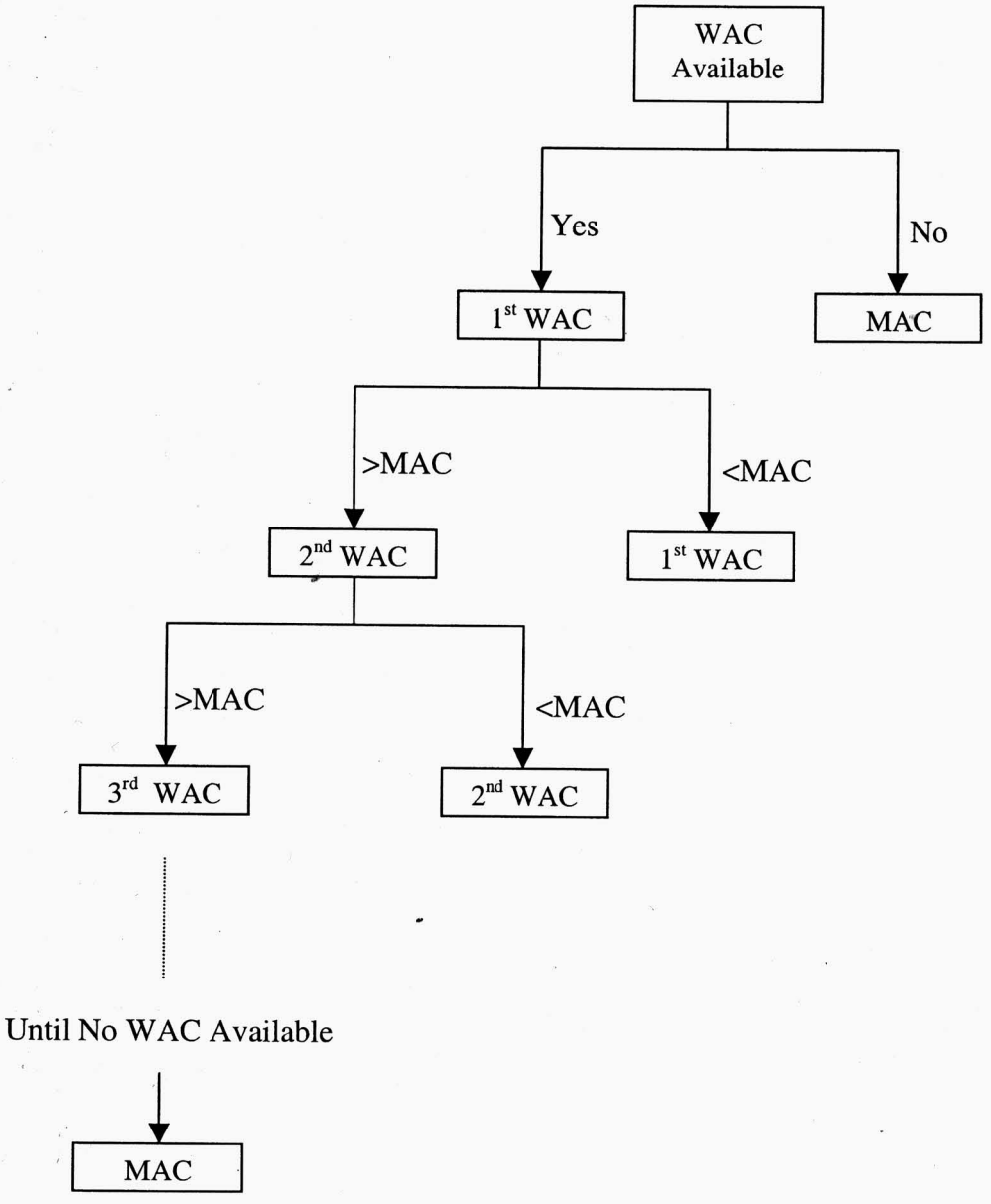
MAC Group

The WAC plus approach was used to estimate ingredient costs for multiple source drugs with MAC prices. This group represented typical generic drugs in the prescription market. The reason for choosing the WAC plus approach instead of the AWP less approach

was based mainly on the concern of a wide variation of AWP prices in the generic market. WAC information also was obtained from the ReadyPrice System. Only the manufacturers with WAC information for the 100's package size were chosen. The ReadyPrice System only provided the most currently updated WAC price. Before the updated date, the historical WAC price was estimated by the proportional relationship of the WAC to the corresponding AWP. For every prescription product in the MAC group, one generic manufacturer was chosen as the proxy for WAC price in the market. There were two reasons for using one WAC price from one manufacturer instead of using the mean of all manufacturers. First, a small number of generic manufacturers, usually less than ten, provided WAC information in the ReadyPrice System. Therefore, the mean of these selected generic manufacturers didn't represent the overall mean of the generic market. Second, generic products can be viewed as homogenous goods based on stringent FDA requirements for bioequivalence (NIHCM 2002). Theoretically, prices from different firms should be close for homogenous goods. Reekie (1978) also demonstrated that non-innovative products were introduced at the prices of competing products. Therefore, one WAC price was chosen to represent the overall price in the market.

Two assumptions were made for the criteria of choosing the WAC price. Since the generic product is a homogenous good and production technology yields economies of scale, the firms with bigger output enjoy higher competitive advantage. Therefore, the generic manufacturers with more product items were assumed to provide more competitive prices in the market. Second, retail pharmacies are able to purchase generic drugs at or below the MAC price. Based on these two assumptions, the process of choosing the generic manufacturer is presented by the flow chart in Figure 3.1. First, the manufacturers were

Figure 3.1 Flow Chart for Choosing WAC of MAC Group Drugs



limited to those having WAC information for prescription products in the market basket, and they were ranked by the scale of firms, which was based on the number of product items produced. For example, Watson, which provided WAC prices for 32 generic products in the market basket, was the company with the largest scale. Therefore, its WAC price was the first candidate if it was available for a given product. The ranking of generic manufacturers is listed in Appendix A. Second, the amount of the first WAC unit price plus a GM percent (4.51%) of wholesalers, which will be discussed in the following section, was compared with the MAC unit price of the same drug. The WAC unit price would be chosen if the amount was smaller than the MAC unit price. If the amount of the first WAC unit price plus 4.51% was larger than the MAC unit price, the second WAC unit price would be compared with the MAC unit price again. This process was repeated until there was no WAC unit price available. Then, the MAC unit price was used to estimate the acquisition cost of the drug.

The gross margin percentage of wholesalers was one component of simulating ingredient costs for the MAC group. Information from three sources was compared with each other to determine the GM% that would be used in the formula. The first two sources were the financial reports of the top two drug wholesalers in the United States, McKesson and AmerisourceBergen, and the third source was the 2000 National Wholesale Druggist's Association (NWDA) Industry Profile. McKesson conducts business through three segments, Pharmaceutical Solutions, Medical-Surgical Solutions, and Information Solutions. The Pharmaceutical Solutions segment, which accounts for 93% of net revenues in 2003, manages the distribution of ethical and proprietary drugs, and health and beauty care products throughout North America. AmerisourceBergen has two operating segments: Pharmaceutical Distribution and PharMerica. The Pharmaceutical Distribution segment

includes the full-service pharmaceutical distribution facilities, the distribution of pharmaceuticals, over-the-counter medicines, health and beauty aids, and other health-related business. A comparison of three sources is described below and shown in Table 3.2.

Each source had some advantages and disadvantages. Both AmerisourceBergen and McKesson have shown a declining trend in gross margin percentage since 1998, which was consistent with the overall trend in the wholesaler industry. However, AmerisourceBergan didn't provide the gross margin percentage in 2003. Providing gross margin percentage, which focused on the pharmaceutical distribution segment, was one of the advantages for both AmerisourceBergen and McKesson; however, again, the complete information across the study years was not available. Also, the financial reports from these two wholesalers only reflect the operation of a single firm. Although gross margin percentages from NWDA Industry Profile represented the overall performance in the wholesaler industry, only two-year consolidated information (1998 and 1999) was available.

The gross margin percentage of the wholesaler industry in 1998 was selected to estimate acquisition costs for drugs in the MAC group across these years. The decision of using the 1998 industry's gross margin percentage was based on the following reasons. First, using the same gross margin percentage could affirm that the change in simulated acquisition costs of generic drugs across the study years was due to the change in WAC prices. Second, the pharmaceutical distribution segment gross margin percentage excluding sales to warehouses, which was only available in McKesson's financial report, should be the most ideal candidate; however, the consolidated gross margin percentages of McKesson were not consistent with those of the wholesaler industry. This lack of consistency made the information of McKesson more questionable. Third, the 1998 gross margin percentage would

Table 3.2 Summary of Wholesaler Gross Margin Percent Information Considered for Estimating Acquisition Costs via a WAC Plus Approach

	1998	1999	2000	2001	2002	2003
AmerisourceBergen						
Consolidated	4.86%	4.82%	4.46%	4.32%	4.48%	N/A
Pharmaceutical Distribution	N/A	N/A	N/A	4.19%	3.87%	N/A
McKesson						
Consolidated	9.5%	7.71%	6.03%	5.75%	5.58%	5.43%
Pharmaceutical Solutions	N/A	N/A	N/A	3.92%	3.87%	3.85%
Pharmaceutical Solutions, excluding sales to warehouses	N/A	N/A	N/A	5.44%	5.41%	5.33%
Industry						
Consolidated	4.51%	4.20%	N/A	N/A	N/A	N/A

be the highest one among these study years due to the declining trend in the gross margin percentage of the wholesaler industry. Therefore, using 1998 gross margin percentage would result in more conservative results. One of the reasons using consolidated gross margin percentage of the wholesaler industry instead of AmerisouceBergen was the representativeness. The other reason was the chargeback payment between manufacturers and wholesalers. Although chargeback was not part of the formula of simulating ingredient costs in this study, it was a common phenomenon in the real world. Therefore, the gross margin percentage of the wholesaler industry, which was smaller than that of AmerisourceBergen, was preferred because simulated ingredient costs would have been lower if chargeback payments had been considered. Overall, the formula used to simulate the ingredient cost for the MAC group drug prescriptions was denoted as,

Ingredient Cost/Rx = 1.0451 * WAC Unit Price * Prescription Size

Or

Ingredient Cost/Rx = MAC Unit Price * Prescription Size

Non-MAC Group

The non-MAC group products were reimbursed on an AWP basis. In order to examine the role of AWP in this reimbursement method, the AWP plus approach was used to simulate ingredient costs for non-MAC group drug prescriptions. Unlike the variety of AWP in the MAC group due to the large number of generic manufacturers, there were only few A-rated generic manufacturers available for the non-MAC group. Basically, the choice of AWP was between innovator manufacturers and non-innovator manufacturers. In addition to the consideration regarding consistency described earlier, using innovators' AWPs results in a more conservative estimation of gross margin dollars, which would meet the underlying

assumption described at the beginning of this section. According to the 2002 OIG report, for multiple source drugs without a Federal Upper Limit (FUL), innovator manufacturers had a smaller percentage discount (24.4%) off AWP than non-innovator manufacturers (54.2%) (OIG 2002). Given the fact that AWP differences between innovator multiple source drugs and non-innovator multiple source drugs were much smaller than differences in the percentage discount between these two types of drugs in the non-MAC group, using innovators' AWPs to simulate ingredient costs provided a smaller AWP-AAC differential than using generic counterparts' AWPs. As a result, the estimation of gross margin dollars based on innovators' AWPs was more conservative. A mathematical explanation based on the sizes of percentage discount in 2002 OIG report is given in Appendix B.

AWP information was obtained from the ReadyPrice System, and the discount percentage of 24.4% was from the 2002 OIG report. The formula to simulate ingredient costs for the non-MAC group drug prescriptions was denoted as,

Ingredient cost/Rx = 0.756 * AWP Unit Price * Prescription Size

A summary of the formulas of simulated prices and simulated ingredient costs by product group is presented in Table 3.3.

Statistical Analysis

Market Basket

A sample of 100 items was selected to represent a market basket sample for each year. Only oral solid dosage forms (capsules and tables) were included in the study. Unlike intravenous fluids, liquid orals, ointments, etc., these dosage forms are widely distributed and more popular. Each item represents a drug product in a particular strength and form. The

Table 3.3 Summary of the Formulas of Simulated Price and Simulated Ingredient Cost by Product Group

	Single Source Group	MAC group	Non-MAC group
Definition	Single source drugs	Multiple source drugs on the MAC list	Multiple source drugs not on the MAC list
Price/Rx	0.9 * AWP Unit Price * Rx Size + 4.38	MAC Unit Price * Rx Size + 4.38	0.9 * AWP Unit Price[a] * Rx Size + 4.38
Ingredient Cost/Rx	0.8273 * AWP Unit Price * Rx Size	WAC Unit Price * (1 + GM%) * Rx Size or MAC Unit Price * Rx Size	0.756 *AWP Unit Price[a] * Rx Size

a. Innovator's AWP was used.

sample of products was the Top 100 prescription drugs based on the number of prescriptions dispensed from January to June for Wisconsin Medicaid ambulant patients. The market basket of each year is listed in Appendix C.

Descriptive Statistics

Descriptive statistics were conducted, including the expenditures and the volume for the Top 100 prescription products from 1998 to 2003. In addition to the original three groups, two other dichotomies were created based on reimbursement payment formulas and drug sources, respectively. The single source group and the non-MAC group were combined to represent the group of AWP based reimbursement formula (AWP group) for comparison with the MAC group, and the MAC group and the non-MAC group were combined to represent the group of multiple source drugs (multiple source group) for comparison with the single source group. A few drugs were categorized into two different groups in given years (2002 and 2003). Digoxin and Metformin have had MAC prices published since April 2002; therefore, they were defined as the non-MAC group and the MAC group in 2002. Also, Claritin and Prilosec have had MAC prices available since April 2003 because of the expiration of patent. They were defined as the single source group and the MAC group in 2003. For purposes of analysis, a half of the prescription volume of these drugs with two-group status was allocated into each group.

The Change in Gross Margin per Prescription (GM / Rx)

The statistical analysis was based on two research questions of interest. The first part of the analysis was to study the change in gross margin per prescription. In order to test equal

means for the multiple-group situation, One-way analysis of variance (ANOVA) was chosen to examine the difference in unweighted means of the gross margin per prescription from 1998 to 2003 for each product group. All pairwise comparisons were tested by the Bonferroni method at the significance level of 0.05 due to unequal sample size. In addition to the comparisons between years, the comparisons among three groups (single source group, MAC group, and non-MAC group) within each year also were examined by One-way ANOVA. Fisher's Least Significant Difference (LSD) procedure was chosen to test the significance of pairwise contrasts since the omnibus test has 2 numerator degrees of freedom whereby greater statistical power could be achieved. Two sample t-tests were used to compare the means of the gross margin per AWP based prescription and MAC list prescription for each study year. Also, the mean differences between single source drugs and multiple source drugs were tested by two sample t-tests.

The gross margin per prescription weighted by prescription volume also was calculated for each group. Since the data were a summary format, it was difficult to examine the difference between weighted gross margins per prescription by SPSS, where the raw data were required to perform the analysis. Paired t-tests were performed to examine the potential differences between unweighted and weighted means. For each prescription product, a weighted factor based on the prescription volume was assigned. A weighted mean of a certain prescription product was calculated by multiplying an unweighted mean of that product by the corresponding weighted factor, and then times the number of prescription products in that group.

The average amount per prescription paid by the Medicaid program was available from the claims data, which was calculated by dividing the total paid amount by the total

number of prescriptions dispensed. This measure represented the actual amount received by retail pharmacies on a prescription basis. Therefore, the actual gross margin per prescription, which was defined as the difference between the paid amount and the simulated ingredient cost, also was examined by study year and product group.

Product Mix

The second part of analysis was to test the impact of product mix on the change in the gross margin per prescription. Two kinds of product mix were of interest, the distribution of product groups and the product mix within single source drugs. For a third-party prescription, as discussed in the previous chapter, gross margin dollars depend on the product group. Therefore, the overall gross margin per prescription results from the joint effect of average gross margin dollars for each group and the distribution of product groups. Chi-square test was used to examine whether the proportions of product groups differed by study year. Both the distribution of product groups within the market basket and the distribution of product groups within total prescriptions dispensed were tested at a significance level of 0.05.

In regard to drugs in the AWP group, gross margin dollars of a prescription will increase as the ingredient cost of drugs dispensed increases because both the price and the ingredient cost are a function of AWP. Although the non-MAC group also is reimbursed on an AWP basis, the percentage discount between AWP and AAC depends on the type of manufacturer, innovator or non-innovator. Therefore, to purify the mathematical relationship between the gross margin and the ingredient cost, only single source drugs were analyzed. The simulated ingredient cost per prescription was used as the measure of product mix because it reflected the change in the combination of single source drugs across the study

years. One-way ANOVA was performed to examine the difference in the means of simulated ingredient costs of drugs in the single source group between years. Next, simulated ingredient cost was decomposed into AWP unit price and prescription size to examine which factor contributed to the change.

CHAPTER 4

RESULTS

Results will be presented in three main sections. The first section will present the general description of the market basket across the study years. The second section will describe the change in gross margin per prescription. Both the comparisons across product groups within the year and the comparisons between years will be presented. The third section will report the impact of product mix on the change in average gross margin per prescription.

Descriptive Statistics

Table 4.1 reports a general description of the market basket examined in this study across the study years. It includes the total number of prescriptions and the total paid amount of prescriptions within the Top 100 prescription products dispensed for Medicaid ambulant patients from January to June. The percentages of the total volume and the total paid amount also are presented. The total prescription volume for the Top 100 prescription products increased by 492,172 from 1998 to 2003, with an average annual growth rate of 6.19%. The volume increased sharply during the 1999-2000 period. Similarly, the total amount paid by the Medicaid program for the Top 100 prescription products has showed an upward trend. The total paid amount for the half-year period in 2003 was slightly over twice that for 1998. Also, the 1999-2000 period showed the greatest increase in total paid amount across the study years.

Table 4.1 General Description of Top 100 Prescription Drugs for 6-Month Medicaid Claims Data from 1998 to 2003

	1998	%△	1999	%△	2000	%△	2001	%△	2002	%△	2003	%△
Total Numbers of Prescriptions (% of total volume)	1,405,016 (43.02)	-	1,456,707 (42.57)	3.68%	1,631,385 (42.22)	11.99%	1,701,991 (41.82)	4.33%	1,797,338 (40.90)	5.60%	1,897,188 (40.14)	5.56%
Total Paid of Prescriptions (% of total amount)	$46,329,130 (40.10)	-	$55,373,749 (40.30)	19.52%	$67,669,741 (39.47)	22.21%	$75,629,761 (38.91)	11.76%	$84,756,774 (37.15)	12.07%	$95,161,412 (35.65)	12.28%

The Change in Gross Margin per Prescription

The gross margin percentage has decreased (Figure 4.1), while the overall gross margin per prescription showed an increasing trend during the 1998-2000 period, followed by a drop in 2001, and then increased again in 2002 and 2003. Table 4.2 summarizes the average gross margin per prescription by product group and study year. The average gross margin was the difference between the price and the simulated ingredient cost on a prescription basis, so the utilization effect is eliminated in this measure. As described in the methods chapter, there were some prescription products categorized into two groups in 2002 and 2003. For those prescription products, each of them had two gross margins based on the group type. For example, Omeprazole 20mg was in the single source group with a gross margin of $16.33 from January to March in 2003, and was in the MAC group with a gross margin of $17.49 from April to June in 2003. Each gross margin was included in the corresponding group when calculating the group means.

Each year, the ranking based on the amount of the gross margin from high to low was single source drugs, multiple source drugs without MAC prices (non-MAC group), and multiple source drugs with MAC prices (MAC group), respectively. Across years, different trends appeared for the various product groups. The gross margin consistently increased for single source drugs on a prescription basis from 1998 to 2003 to a total change of $2.97. The gross margins per prescription for both the MAC group and the non-MAC group followed similar patterns, remaining steady from 1998 to 2000, followed by a sizeable fall in 2001, and then increasing in 2002, and holding relatively steady in 2003. When the MAC group and the non-MAC group were combined to represent all multiple source drugs, a similar steady, drop, steady pattern resulted. The gross margin per prescription of the multiple source

Figure 4.1 Summary of Gross Margin Percentages and Gross Margin Dollars for Top 100 Medicaid Prescription Drugs from 1998 to 2003

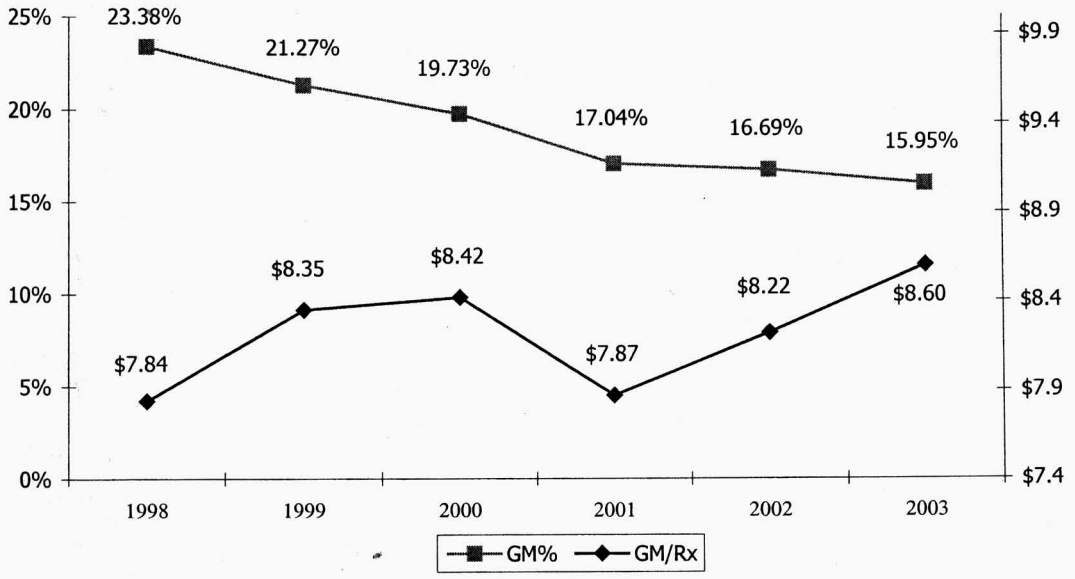


Table 4.2 Summary of Average Gross Margin per Prescription by Product Group and Study Year

	1998 Mean (SD) (N)	1999 Mean (SD) (N)	2000 Mean (SD) (N)	2001 Mean (SD) (N)	2002 Mean (SD) (N)	2003 Mean (SD) (N)	Average	ANOVA (Year) p-value	$\chi 2$ (Critical Value)
verall GM / Rx	$7.84 (4.91) (100)	$8.35 (4.78) (100)	$8.42 (4.82) (100)	$7.87 (4.28) (100)	$8.22 (5.01) (103)	$8.60 (5.25) (102)	$8.22 (4.86)	0.853	
Single Source Group	$9.86 (4.23)[a] (34)	$10.64 (4.50)[a,b] (39)	$10.87 (4.34)[a,b] (40)	$11.22 (4.39)[a,b] (44)	$11.50 (4.33)[a,b] (46)	$12.83 (5.00)[a,b] (44)	$11.22 (4.53)	0.082	16.67 (18.31)
MAC Group	$6.62 (5.39)[a] (48)	$6.58 (4.45)[a] (43)	$6.35 (4.44)[a] (41)	$4.96 (1.30)[a] (46)	$5.25 (4.27)[a] (47)	$5.25 (2.43)[a] (53)	$5.81 (3.96)	0.130	
Non-MAC Group	$7.31 (3.54) (18)	$7.65 (4.30)[b] (18)	$7.73 (4.43)[b] (19)	$6.55 (1.12)[b] (10)	$7.05 (2.18)[b] (10)	$6.81 (1.10)[b] (5)	$7.33 (3.47)	0.959	
ANOVA (Group) p-value	0.010	<0.001	<0.001	<0.001	<0.001	<0.001			
AWP Group[c]	$8.98 (4.15) (52)	$9.69 (4.62) (57)	$9.86 (4.58) (59)	$10.35 (4.38) (54)	$10.71 (4.36) (56)	$12.21 (5.09) (49)	$10.27 (4.60)	0.011	2.99 (11.07)
MAC Group[c]	$6.62 (5.39) (48)	$6.58 (4.45) (43)	$6.35 (4.44) (41)	$4.96 (1.30) (46)	$5.25 (4.27) (47)	$5.25 (2.43) (53)	$5.81 (3.96)	0.130	
T-test (Group) p-value	0.016	0.001	<0.001	<0.001	<0.001	<0.001			
Single Source Group[d]	$9.86 (4.23) (34)	$10.64 (4.50) (39)	$10.87 (4.34) (40)	$11.22 (4.39) (44)	$11.50 (4.33) (46)	$12.83 (5.00) (44)	$11.22 (4.53)	0.082	3.26 (11.07)
Multiple Source Group[d]	$6.81 (4.94) (66)	$6.89 (4.40) (61)	$6.79 (4.44) (60)	$5.24 (1.40) (56)	$5.57 (4.03) (57)	$5.39 (2.38) (58)	$6.15 (3.90)	0.031	
T-test (Group) p-value	0.003	<0.001	<0.001	<0.001	<0.001	<0.001			

a,b Significant difference via LSD post-hoc comparison, p= 0.05
c,d Significant difference via t-test for all years

group was closer to the MAC group than the non-MAC group since the MAC group was larger than the non-MAC group in terms of the number of prescription products in the market basket. When the single source group and the non-MAC group were combined into the AWP based prescriptions, the gross margin showed an upward trend. Although the gross margin per AWP based prescription was lower than for the single source group drugs alone, the change in the gross margin per prescription between 1998 and 2003 was larger in this group ($3.23).

The drop in overall average gross margin in 2001 was attributed to the decrease in margin dollars of multiple source drugs. Both the MAC group and the non-MAC group had decreased gross margin dollars in 2001. For the MAC group, the lowest gross margin results from using the MAC price as a proxy of the acquisition cost of a drug. In this case, the gross margin per prescription would be equal to the dispensing fee of $4.38. Table 4.3 shows that the proportion of simulated prescriptions using MAC as the acquisition cost has been over 50% since 2001, and this increase was the first reason for the declined gross margin in the MAC group in 2001. This increase in the proportion implied that more and more reported WAC prices were larger than the corresponding MAC prices. Thirty-two multiple source drugs in the MAC group, which were in the market basket across all the study years, were chosen to examine the 1998-2003 trend in MAC price. Only 13 out of 32 multiple source drugs showed a continuous increase in MAC price from 1998 to 2003. The MAC price of other multiple source drugs remained the same, fluctuated up and down, or even decreased during the study period. MAC change trends for thirty-two drugs that appeared in the MAC group for all study years are listed in Appendix D.

Table 4.3 Summary of the Source for Estimating the Acquisition Cost of a Drug for the MAC Group Drugs

	1998 N= 48	1999 N= 43	2000 N= 41	2001 N= 46	2002 N= 47	2003 N= 53
MAC N (%)	17 (35.4%)	20 (46.5%)	19 (46.3%)	24 (52.2%)	30 (63.8%)	31 (58.5%)
WAC+GM% N (%)	31 (64.6%)	23 (53.5%)	22 (53.7%)	22 (47.8%)	17 (36.2%)	22 (41.5%)

A second reason that contributed to the overall change of gross margin dollars in 2001 was a change in MAC policy of two drugs, Clonazepam and Lorazepam. Figure 4.2 shows the change in overall gross margin of the MAC group and the gross margin for Clonazepam and Lorazepam across the study years. Clonazepam and Lorazepam had relatively high gross margin dollars per prescription compared to the overall means of the MAC group during the 1998-2000 period. As revealed by Figure 4.3, these two drugs also had relatively high MAC unit prices compared to other multiple source drugs from 1998 to 2000. Given the fact that their WAC unit prices didn't change a lot as the years changed, the gross margins of these drugs were mainly determined by their MAC prices. Therefore, the steep fall of MAC prices for Clonazepam and Lorazepam was the second contributor to the overall drop in the gross margin of the MAC group in 2001.

For the non-MAC group, the decreased gross margin per prescription in 2001 was mainly due to the change in the group status of Clozapine. Clozapine 25mg and 100mg did not have the MAC prices until 2001; therefore, they were reimbursed based on their AWP prices from 1998 to 2000. The high AWP prices of Clozaril 25mg and 100mg (brand-name drug of Clozapine) resulted in the relatively high gross margin dollars of these two drugs compared to other drugs in the non-MAC group. When they were out of the non-MAC group after 2000, the average gross margin per prescription dropped as a result. A comparison of average gross margins of the non-MAC group with and without Clozaril from 1998 to 2000 is shown in Table 4.4.

Figure 4.2 Gross Margin per Prescription for MAC Group, Clonazepam, and Lorazepam from 1998 to 2003

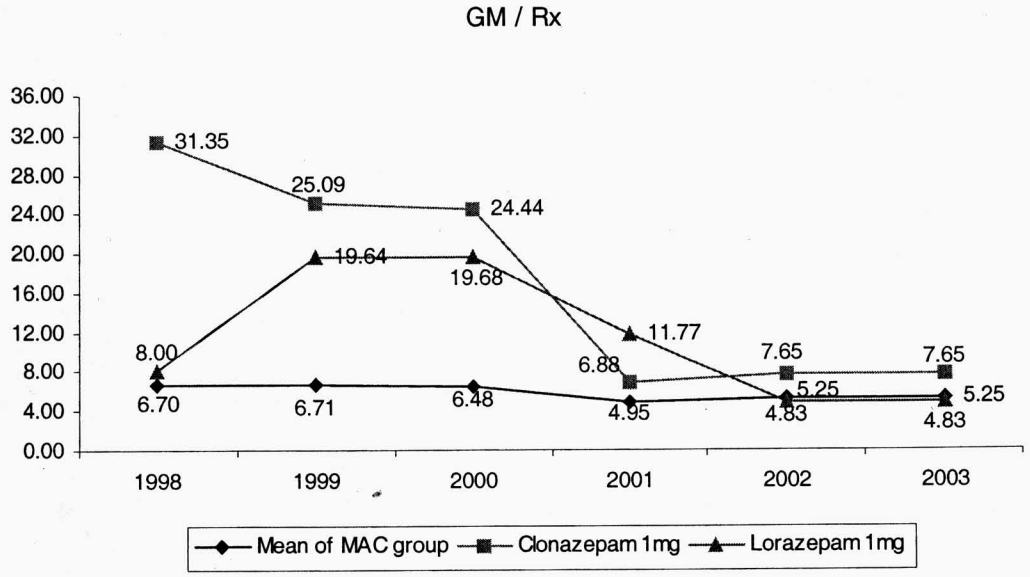


Figure 4.3 MAC Unit Price for MAC Group, Clonazepam, and Lorazepam from 1998 to 2003

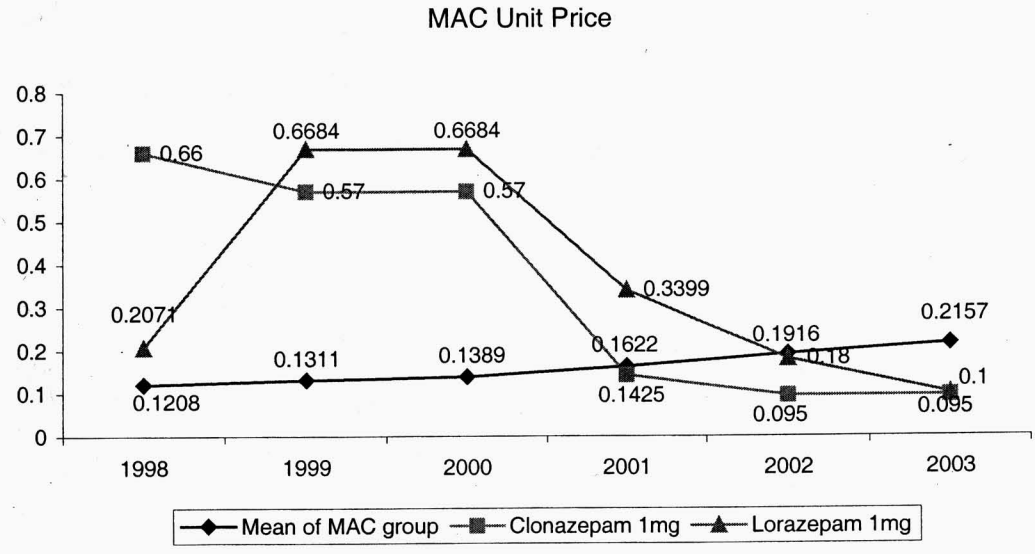


Table 4.4 Comparison of Average Gross Margin for the Non-MAC Group with and without Clozaril from 1998 to 2000

	1998	1999	2000
w Clozaril	$7.31	$7.65	$7.73
w/o Clozaril	$6.37	$6.49	$6.57

Within Year Comparisons

The results of One-way ANOVA showed that there was a significant difference in average gross margins per prescription among the three product groups (single source group, MAC group, and non-MAC group) for each study year (Table 4.2). LSD procedure demonstrated that the average gross margin of the single source group was significantly different from that of the MAC group for each study year, and significantly different from that of the non-MAC group since 1999. No significant differences in average gross margins per prescription between the MAC group and the non-MAC group were found during the study period. When the single source group and the non-MAC group were combined into the AWP group, the results of t-tests showed that average gross margins of the AWP group drugs and average gross margins of the MAC group drugs were significantly different for each study year (Table 4.2). The AWP group drugs had higher average gross margins than the MAC group drugs, with a mean difference of $2.36 in 1998 and $6.96 in 2003. Significant differences in average gross margins per prescription between the single source group and the multiple source group also were found for each study year by t-tests (Table 4.2). In addition, the single source group had higher gross margin dollars than the multiple source group. The mean difference has increased from $3.05 to $7.44 during the 1998-2003 period.

Between Year Comparisons

As revealed in Table 4.2, the overall gross margin per prescription from 1998 to 2003 was $8.22, with no significant differences between years. Although there was a continuous increase in average gross margin per prescription for the single source group, no significant differences between years were found by One-way ANOVA. Also, no significant differences

in average gross margins per prescription between years were found for the MAC group or the non-MAC group. However, when these two groups combined to represent all multiple source drugs, the means of the gross margins per prescription of each study year were significantly different, while no significant differences were found for any pairwise comparison by Bonferroni post hoc tests. However, two pairwise comparisons, 1998 vs. 2001 and 1998 vs. 2003, were found significantly different under the LSD procedure. An overall difference in the means of average gross margin across the study years was found for the AWP group. A Bonferroni post hoc test indicated a significant difference in average gross margin per AWP based prescription between 1998 and 2003.

Weighted Gross Margin per Prescription

The gross margin per prescription weighted by prescription volume is presented in Figure 4.4. The trend in the weighted gross margin per prescription was similar to the unweighted gross margin per prescription in an overall picture. However, the dollar amounts were slightly different due to changes in the proportions of each group when considering total prescription volume instead of the number of prescription products in the market basket. No significant differences between weighted means and unweighted means were found by paired t-tests (Appendix E).

Actual Gross Margin per Prescription

Table 4.5 summarizes the gross margin per prescription based on actual paid amounts and simulated ingredient costs. Overall, the actual gross margins were lower than the simulated gross margins for each group. The largest amount of difference between actual and

Figure 4.4 Summary of Weighted Gross Margin per Prescription by Product Group from 1998 to 2003

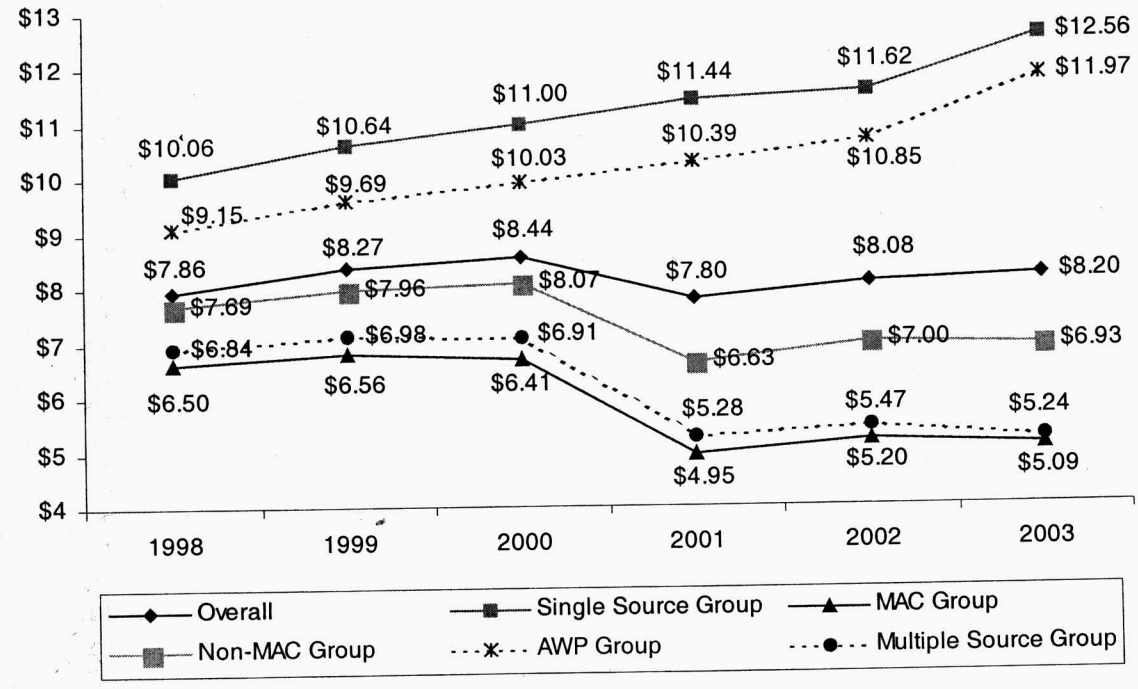


Table 4.5 Summary of Actual Gross Margin per Prescription by Study Year and Product Group

	1998	1999	2000	2001	2002	2003
Overall						
Unweighted	$6.66	$6.71	$6.51	$6.43	$6.87	$7.01
Weighted	$6.73	$6.72	$6.65	$6.47	$6.87	$6.93
Single Source Group						
Unweighted	$7.54	$7.62	$7.63	$7.58	$8.02	$8.17
Weighted	$7.48	$7.43	$7.78	$7.79	$8.28	$8.41
MAC Group						
Unweighted	$6.48	$6.43	$6.01	$5.98	$6.23	$6.31
Weighted	$6.57	$6.55	$6.13	$5.97	$6.19	$6.08
Non-MAC Group						
Unweighted	$5.51	$5.43	$5.24	$3.48	$3.85	$3.96
Weighted	$5.95	$5.82	$5.57	$3.84	$3.68	$4.08

simulated gross margins (unweighted), $4.67, occurred in the single source group in 2003. The rankings based on the actual gross margins were different from the simulated gross margins. Drugs in the single source group still had the highest margins across the study years, but gross margin dollars per prescription for drugs in the non-MAC group were lower than those for drugs in the MAC group based on actual paid amounts. In addition to the difference in the dollar amount between the actual gross margin and the simulated gross margin, the actual gross margin for drugs in the single source group didn't show a clear increasing trend between 1998 and 2001. Similar to the simulated gross margin, the MAC group and the non-MAC group also experienced a drop in the actual gross margin in 2001.

Product Mix

Distribution of Product Group

Table 4.2 includes the distributions of market basket drugs within the product groups from 1998 to 2003. The prescription drugs with two-group status accounted for one product in each group. In 2002, Digoxin 125 mcg, Digoxin 250 mcg, and Metformin 500mg were categorized into both the MAC group and the non-MAC group, which resulted in a total number of prescription products of 103. In 2003, Loratadine 10mg and Omeprazole 20mg were categorized into both the single source group and the MAC group, which resulted in a total number of prescription products of 102. The proportion of the market basket represented by drugs in the single source group increased from 34% to 45% between 1998 and 2002, and then slightly declined to 43% in 2003. In contrast, the proportion of multiple source drugs in the market basket decreased from 66% to 55% between 1998 and 2002, and then rose to 57% in 2003. When the multiple source drugs were decomposed into the MAC group and the non-

MAC group, the decline in the proportion of the multiple source group was attributed mainly to the drop in the non-MAC group, which accounted for 18% of the Top 100 prescription products in 1998 but only 5% in 2003. The sharp decline in the proportion of drugs in the non-MAC group also contributed to the decrease in the proportion of drugs in the AWP group from 2000 to 2003. Chi-square tests revealed no significant differences in the proportions of the three product groups across the study years. There also were no significant results found when the groups were combined (AWP group vs. MAC group, single source group vs. multiple source group).

Table 4.6 presents the distribution of drugs in the product groups based on total prescription volume from 1998 to 2003. The prescription volume of two-group products was distributed into each group equally. In 2002, a half of the prescription volumes for Digoxin 125 mcg, Digoxin 250 mcg, and Metformin 500mg were allocated to the MAC group and the other halves were allocated to the non-MAC group. In 2003, half of the prescription volumes of Loratadine 10mg and Omeprazole 20mg were assigned to the single source group and the MAC group evenly. Similar to the distributions based on the number of prescription products in the market basket, there has been an increase in proportions for single source drugs and a decrease in proportions for multiple source drugs during the study period except 2003. Unlike non-significant results found in the distributions based on the number of prescription products in the market basket, when the distributions were based on total prescription volume, Chi-square tests showed an overall significant difference in the proportions of three group products across the study years. Significant results also were found for the combined groups (AWP group vs. MAC group, single source group vs. multiple source group).

Table 4.6 The Distribution of Drugs in the Product Groups Based on Total Prescription Volume[a]

		1998 N=1,405,941	1999 N=1,457,585	2000 N=1,631,385	2001 N=1,701,991	2002 N=1,797,338	2003 N=1,897,188
1.	Single Source Group N (%)	442,427 (31.49%)	512,150 (35.16%)	611,906 (37.51%)	697,217 (40.96%)	763,993 (42.51%)	768,370 (40.50%)
	MAC Group N (%)	685,127 (48.76%)	660,735 (45.36%)	715,107 (43.83%)	810,321 (47.61%)	879,138 (48.91%)	1,039,873 (54.81%)
	Non-MAC Group N (%)	277,462 (19.75%)	283,822 (19.48%)	304,372 (18.66%)	194,453 (11.43%)	154,208 (8.58%)	88,945 (4.69%)
2.	AWP Group N (%)	719,889 (51.24%)	795,972 (54.64%)	916,278 (56.17%)	891,670 (52.39%)	918,201 (51.09%)	857,315 (45.19%)
	MAC Group N (%)	685,127 (48.76%)	660,735 (45.36%)	715,107 (43.83%)	810,321 (47.61%)	879,138 (48.91%)	1,039,873 (54.81%)
3.	Single Source Group N (%)	442,427 (31.49%)	512,150 (35.16%)	611,906 (37.51%)	697,217 (40.96%)	763,993 (42.51%)	768,370 (40.50%)
	Multiple Source Group N (%)	962,589 (68.51%)	944,557 (64.84%)	1,019,479 (62.49%)	1,004,774 (59.04%)	1,033,345 (57.49%)	1,128,818 (59.50%)

a. There were significant differences in the distributions of drugs in the product groups over the study period. $\chi 2$ for single source group vs. MAC group vs. non-MAC group, AWP group vs. MAC group, and single source group vs. multiple source group were 324770.8, 50919.6, and 56484.6, respectively. The large chi-square values were due to the large number of observations.

Product Mix within Single Source Drugs

As revealed in Figure 4.5, the simulated ingredient cost for drugs in the single source group was $63.64 in 1998 and $98.19 in 2003, an increase of $34.55 within the six years. There was a wide variation of simulated ingredient costs of drugs in the single source group for each study year, and no significant differences between years were found by One-way ANOVA (p-value= 0.082). As shown in Table 4.7, the difference between the minimum and the maximum ingredient cost per prescription has been over $230 since 1998. The simulated ingredient cost per prescription reflected the combination of AWP unit price and prescription size. As revealed in Figure 4.6 and 4.7, the average AWP unit price has increased by $1.61 from 1998 to 2003. The greatest increase of $0.55 occurred during the 2001-2002 period. One-way ANOVA indicated an overall significant difference in the means of AWP unit price across the study years (p-value= 0.007). On the other hand, the prescription size increased from 1998 to 1999, followed by a declining trend until 2002, and slightly rose in 2003. No significant differences in the means of prescription size between years were found by One-way ANOVA (p-value= 0.58). As shown in Table 4.8 and Table 4.9, the decrease in average prescription size between 1999 and 2002 was due to the change in the proportion of prescriptions with smaller size and the continuous decrease in both minimum and maximum prescription sizes. Overall, the increase in AWP unit price was the major contributor to the overall rise of simulated ingredient costs of single source drugs during the study period even though part of the effect of increasing AWP unit price between 1999 and 2002 was offset by the decreasing prescription size.

Sixteen single source drugs in the market basket appearing in all study years were selected to examine the effect of general inflation on changes in AWP unit price. As revealed

Figure 4.5 Simulated Ingredient Cost per Prescription for Single Source Group from 1998 to 2003

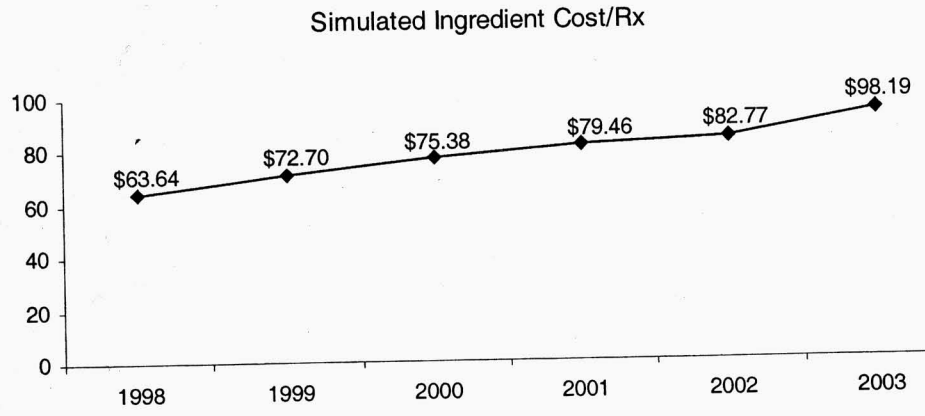


Figure 4.6 Average AWP Unit Price for Single Source Drugs from 1998 to 2003

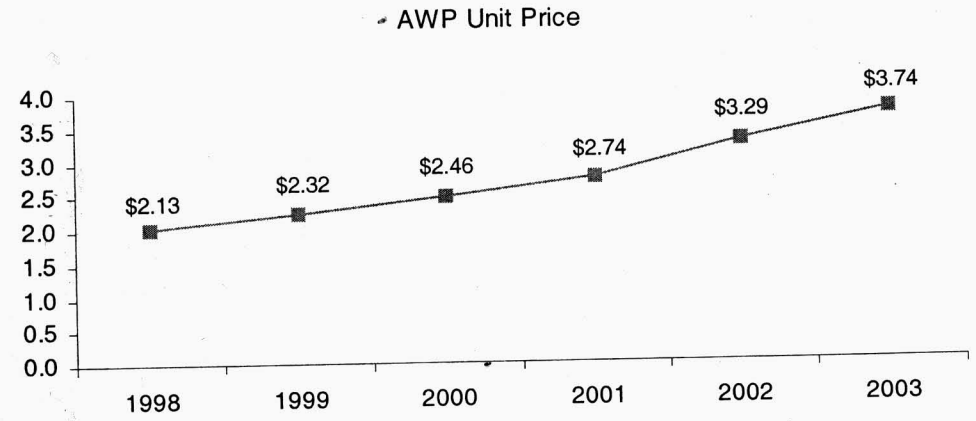


Figure 4.7 Average Prescription Size for Single Source Drugs from 1998 to 2003

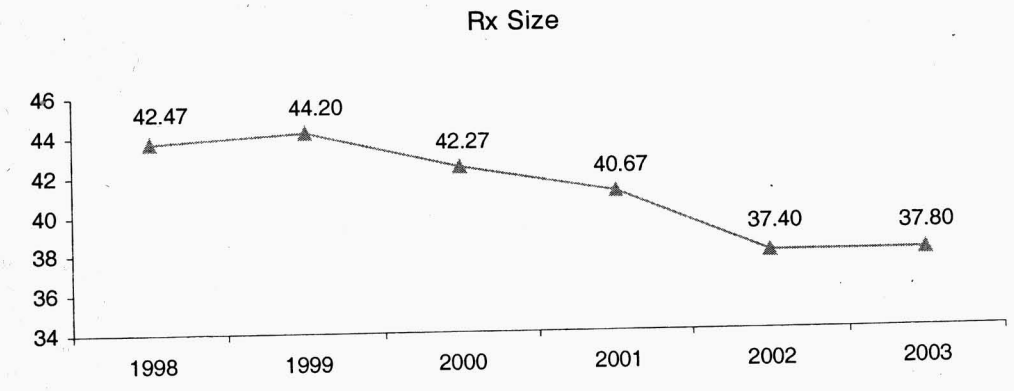


Table 4.7 Summary of Minimum and Maximum Simulated Ingredient Cost in Single Source Group

	Minimum	Maximum	Difference
1998	$11.87	$249.96	$238.09
1999	$12.85	$278.48	$265.63
2000	$14.59	$295.84	$281.25
2001	$16.72	$314.67	$297.95
2002	$17.32	$316.14	$298.82
2003	$20.35	$317.80	$297.45

Table 4.8 Summary of the Number of Single Source Drugs by Prescription Size and Study Year

	<30	30-60	60-90	>=90	Total
1998 N (%)	8 (23.5%)	20 (58.8%)	5 (14.7%)	1 (2.9%)	34
1999 N (%)	8 (20.5%)	24 (61.5%)	5 (12.8%)	2 (5.1%)	39
2000 N (%)	11 (27.5%)	22 (55.0%)	6 (15.0%)	1 (2.5%)	40
2001 N (%)	12 (27.3%)	24 (54.5%)	7 (15.9%)	1 (2.3%)	44
2002 N (%)	13 (28.3%)	27 (58.7%)	5 (10.9%)	1 (2.2%)	46
2003 N (%)	12 (27.3%)	27 (61.4%)	4 (9.1%)	1 (2.3%)	44

Table 4.9 Summary of Prescription Drugs with Minimum and Maximum Prescription Size in Single Source Group by Study Year

	Minimum Rx Size	Brand Name	Maximum Rx Size	Brand Name
1998	6.43	Zithromax 250mg	93.85	Propulsid 10mg
1999	6.26	Zithromax 250mg	116.84	Neurontin 300mg
2000	6.25	Zithromax 250mg	110.82	Neurontin 300mg
2001	6.20	Zithromax 250mg	103.72	Neurontin 300mg
2002	4.06	Fosamax 70mg	99.96	Neurontin 300mg
2003	4.02	Fosamax 70mg	97.77	Neurontin 300mg

in Table 4.10, the annual rates of changes in AWP unit price from drugs in the single source group have been higher than those from these sixteen drugs. This result indicated that the increase in AWP unit price was mainly due to changes in the combinations of single source drugs in the market basket from 1998 to 2003. The AWP unit prices of these sixteen single source drugs also were weighted by the prescription volume. The annual rate of changes in weighted AWP unit price for these 16 drugs was the joint effect of general inflation and redistribution of prescription volume. Therefore, the higher annual rates of changes in weighted AWP unit price than unweighted AWP unit price pointed out the shift to more expensive products within these 16 single source drugs except for 2002.

Table 4.10 Average AWP Unit Prices for Single Source Drugs and 16 Single Source Drugs Appearing in All Years

	1998	1999	2000	2001	2002	2003
All Single Source Drugs						
Unweighted AWP Unit Price	2.13	2.32	2.46	2.74	3.29	3.74
Annual Rate (%)	-	8.91%	6.15%	11.38%	19.82%	13.80%
Sixteen Drugs Appearing in All Years						
Unweighted AWP Unit Price	2.86	2.97	3.09	3.24	3.43	3.59
Annual Rate (%)	-	4.00%	3.97%	4.65%	5.78%	4.85%
Weighted AWP Unit Price	2.67	2.82	3.02	3.19	3.37	3.53
Annual Rate (%)	-	5.87%	6.90%	5.70%	5.33%	4.92%

CHAPTER 5

DISCUSSION

This chapter is composed of four sections. Explanations of findings are discussed first, including the change in gross margin per prescription and product mix effect. The second section provides a discussion regarding the WAC plus approach. The third section discusses the impacts of Medicaid reimbursement policy on the gross margin of prescriptions. Finally, a summary of limitations is provided.

The Trend in Gross Margins and Product Mix Effect

The objectives of this study were to examine the trend in gross margin dollars per prescription and how product mix affected the change. The overall gross margin dollar per prescription experienced two increasing trends during the 1998-2000 and the 2001-2003 periods even though the gross margin percentage has decreased consistently from 23.05% to 15.95%. The overall trend resulted from the joint effect of the change in average gross margin for each group and the change in the distribution of products used. Table 5.1 summarizes the change in average gross margins and the change in proportions by the source of drugs, the single source group and the multiple source group. The increase in overall gross margin per prescription from 1998 to 2000 was due to the increase in gross margin dollars for both single source drugs and multiple source drugs and the shift from multiple source drugs to single source drugs. Although both the average gross margin and the proportion of single source drugs increased in 2001, the drop in the overall gross margin reflected the effect of the decrease in gross margin dollars of multiple source drugs. Both the MAC group and the non-MAC group had a decline in gross margin dollars in 2001. There was only a slight increase in

Table 5.1 Summary of Changes in Gross Margin per Prescription and Proportions by the Source of Drugs

		1998	1999	2000	2001	2002	2003
Overall Trend		-	↑	↑	↓	↑	↑
GM/Rx	Single Source Group	-	↑	↑	↑	↑	↑
	Multiple Source Group	-	↑	↑	↓	↑	↑
Proportion[a]	Single Source Group	-	↑	↑	↑	↑	↓
	Multiple Source Group	-	↓	↓	↓	↓	↑

a. Change in proportion is the change of the percent of drugs categorized in each group, year to year.

the overall gross margin from 2002 to 2003. Although both gross margin dollars for single source drugs and multiple source drugs increased, the shift from single source drugs to multiple source drugs partially offset the impact.

The average gross margin for single source drugs has shown an increasing trend, and has been the highest one among the three product groups across the study years. Since the dispensing fee has not been changed, the increase in gross margin dollars was mainly due to an increasing difference between the simulated ingredient cost (ICs) and the Medicaid estimated acquisition cost reimbursement (EACm), which accounted for 55.58% of gross margin dollars in 1998 and 65.86% of gross margin dollars in 2003 (Table 5.2). Based on the formulas given in the methods chapter, this difference can be presented by a mathematical equation,

EACm-ICs differential= 0.0713 * AWP Unit Price * Prescription Size

Although both AWP unit price and prescription size had impacts on the EACm-ICs differential, Figure 4.6 and 4.7 point out that the increase in AWP unit price was the contributor to the increase in the EACm-ICs differential. Under the reimbursement formula for single source drugs, as long as the EACm-ICs differential is positive, the more expensive single source drug a pharmacy dispenses, the higher gross margin dollars a pharmacy will earn since this formula includes the AWP as a variable. In contrast, the more expensive single source drug results in a lower gross margin percentage due to a flat fee component.

As discussed above, the increase in average AWP unit price for single source drugs resulted in the increase in average gross margin dollars for this group. Table 4.10 shows that the inflation effect, which was examined by the annual rates from the sixteen single source

Table 5.2 Contribution by Ingredient Cost Component[a] to Gross Margin per Prescription

	1998	1999	2000	2001	2002	2003
GM/Rx[b]	$9.86	$10.64	$10.87	$11.22	$11.50	$12.83
Contribution						
$	$5.48	$6.26	$6.49	$6.84	$7.12	$8.45
(%)	(55.58%)	(58.83%)	(59.71%)	(60.96%)	(61.91%)	(65.86%)

a. Contribution by ingredient cost component= Estimated Acquisition Cost Reimbursement Payment in Medicaid, less simulated ingredient cost.
b. The effective dispensing fee was constant at $4.38 each year

drugs available in all years, could only explain part of the increase in average AWP unit price for the single source group overall. The overall increase was attributed mainly to having newer and more expensive drugs included in the single source group as years changed. In addition to the change in the combinations of drugs in the single source group, different annual rates between weighted and unweighted AWP unit prices for the sixteen single source drugs available in all years reflected the shift from less expensive drugs to more expensive drugs except for 2002. Overall, not only general inflation but also product mix effect, including the mix of prescription products in the list and the shift to more expensive drugs, influenced the average AWP unit price for the single source group.

Unlike the increasing trend in the gross margin for the single source group, the MAC group showed a steady-drop-steady pattern during the study period. The decrease in 2001 was due mainly to the steep fall of the MAC prices for a few drugs, such as Clonazepam and Lorazepam. Although the goal of MAC limits essentially was to yield payment amounts that were set at or near the prices of multiple source products from generic manufacturers, it would seem that MAC prices were not updated timely enough to reflect the actual market prices for some multiple source drugs.

The drugs in the non-MAC group also experienced a steady-drop-steady trend in gross margin dollars per prescription. Similar to the MAC group, the drop in the gross margin for the non-MAC group was only attributed to two products, Clozaril 25mg and 100mg. Table 4.4 and Table 4.2 showed a slightly increasing trend in gross margin dollars for the non-MAC group from 1998 to 2002 when Clozaril 25mg and 100mg were excluded from analysis. The relatively high gross margins for these two products, coupled with the

number of prescriptions dispensed, demonstrated an important impact of the window period of setting a MAC price for a multiple source drug on pharmacies' finances.

Although some multiple source drugs were reimbursed based on AWP, on average, their gross margin dollars were closer to other multiple source drugs reimbursed based on MAC than single source drugs. This result suggested that even if the drugs in the non-MAC group have a larger AWP percentage discount than the single source group (OIG 2002), AWP prices in the non-MAC group might be much smaller than the single source group due to a generational price effect. Innovator multiple source drugs generally are older than innovator single source drugs. Therefore, the EACm-ICs differential in the non-MAC group should be smaller than the single source group. This relationship was confirmed by the smaller gross margins found for the non-MAC group. Unlike the single source group, where the product mix effect resulted from the competition among brand name manufacturers, the change in prescribing behaviors or the new drug development, the mix effect in the non-MAC group depended a lot on the FDA regulation regarding bioequivalence issues.

WAC Plus Approach

Unlike the consistent relationship between the AWP and the acquisition cost in the brand name market, there is more uncertainty in the generic market. The WAC plus approach was based on the financial relationship between wholesalers and retail pharmacies in the distribution channel. However, Table 4.3 shows that more and more acquisition costs of multiple source drugs estimated by this method were higher than their MAC prices. This result implied that the WAC plus approach might overestimate acquisition costs of generic drugs. This method was composed of two parts, the gross margin percentage of the

wholesaler industry and the WAC price obtained from the ReadyPrice System. Two explanations are related to the gross margin percentage used in this study. First, the highest gross margin percentage of the wholesale industry across the study years was chosen based on the assumption of conservative estimation. Second, this gross margin percentage was a consolidated number. Since the pharmaceutical distribution segment usually had lower margins relative to other business segments in the wholesaler industry, using a consolidated percentage might overestimate ingredient costs of generic drugs.

The WAC price, the second component of this method, also plays an important role in determining the accuracy of estimation. Since only one most currently updated WAC price for a given drug was available in the ReadyPrice system, the comparison between MAC prices and WAC prices effectively was based on 2003 information. Table 4.3 shows that more than half of multiple source drugs had higher reported WAC prices compared to their MAC prices in 2003. Furthermore, the price information from a purchasing organization, IPC/ServAll, was obtained online. With over 1,000 affiliated and 4,000 members, IPC/ServAll is the largest purchasing organization owned by independent pharmacies. Since 1984, IPC/ServAll has evolved into an organization that negotiates over $2 billion annually of contracted services for it members. Therefore, the prices provided by IPC/ServAll (IPC prices) could be considered as acquisition costs of prescription drugs for retail pharmacies. Overall, the IPC price was lower than the WAC price for a given drug, which did not match the logical order of the prices that should have occurred in the channel of distribution levels for pharmaceuticals.

The comparison between IPC prices and WAC prices indicated that listed WAC amounts might not reflect all available discounts. Some purchasers, like health maintenance

organizations (HMOs), hospital buying groups, and retail pharmacies, can negotiate a discounted price with pharmaceutical manufacturers. Manufacturers sell prescription products to wholesalers at WAC prices, and wholesalers sell products to these purchasers at the discounted price, and then wholesalers request chargeback credit from manufacturers for the difference between the WAC price and the discounted price. Consequently, the actual acquisition cost of prescription products for wholesalers should be the WAC minus the chargeback payment. Instead of updating WAC prices, manufacturers might adjust them based on the negotiation with each prime vendor through the chargeback system. Therefore, simulated ingredient costs could have been closer to actual acquisition costs if chargeback payments had been included in the calculations or determinations. In reality, however, it is difficult to measure the effect of chargebacks because pharmaceutical manufacturers usually do not make their discounts public.

In addition to the relatively high prices, WAC prices didn't follow the same trend with their MAC prices. Out of 32 multiple source drugs which were in the market basket across all the study years, only 13 showed a continuous increase in MAC price from 1998 to 2003. The MAC price of the other multiple sources drugs remained the same, fluctuated up and down, or even decreased during the study years. However, when browsing the corresponding WAC prices, many of them didn't follow the same direction. This inconsistency might be attributed to the way of estimating the historical WAC prices. In this study, the historical WAC prices were estimated by the proportional relationship to the counterpart AWP prices. Within these 32 multiple source drugs, the majority of their AWP prices either stayed the same or had an increasing trend. Given the proportional relationship between AWP prices and WAC prices assumed in this study, the inconsistency between

MAC prices and WAC prices actually was due to the inconsistency between MAC prices and AWP prices. If MAC prices were supposed to capture the prices of multiple source drugs in the market, the findings in this study implied that AWP prices of multiple source drugs did not reflect the change in actual transaction prices in the generic market.

Medicaid Reimbursement Policy

AWP Based Reimbursement

Table 4.5 showed that the single source group and the non-MAC group had lower gross margins based on actual amounts paid by the Medicaid program than those based on reimbursement formulas (Table 4.2). This difference actually reflected the difference between the simulated price and the actual amount received by pharmacies based on the same ingredient cost. Since the Medicaid reimbursement policy specifies that the payment has to be the lower of estimated acquisition costs, plus dispensing fees or the provider's usual and customary (U&C) prices to the general public, the overall lower paid amount reflected the variation of U&C prices among retail pharmacies. The larger difference between the paid amount and the simulated price, the more pharmacies offered a U&C price lower than the reimbursement payment. Table 5.3 shows that the difference between the paid amount and the simulated price per prescription is larger for the drugs with ingredient costs higher than $100. In other words, pharmacies provided lower U&C prices on high-cost products. This finding suggested that private-pay customers might have higher price sensitivities on high-cost products. Two reasons might contribute to the overall lower gross margins based on actual paid amounts than reimbursement payments for single source drugs. First, some pharmacies might offer a U&C price lower than a reimbursement payment due to price

Table 5.3 Comparison of Difference[a] between Medicaid Paid Amount and Simulated Price per Prescription by Ingredient Cost of Single Source Drug

	1998	1999	2000	2001	2002	2003
Single Source Drugs with Ingredient Costs Higher than $100	-$3.40	-$4.38	-$5.49	-$6.08	-$6.55	-$8.49
Single Source Drugs with Ingredient Costs Lower than $100	-$1.99	-$2.72	-$2.44	-$2.72	-$2.09	-$2.25

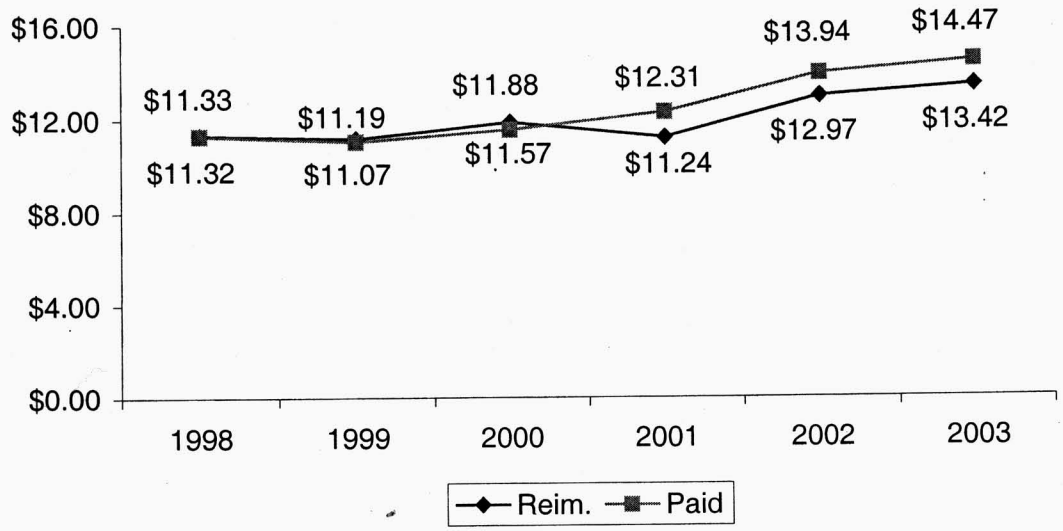
a. Amount shown is actual paid amount less simulated price on a prescription basis

competition. Also, the AWP reimbursement method results in high reimbursement payments for high-cost prescriptions. However, the sliding scale method, the most common pricing method in retail pharmacies, tends to offer reasonable prices on very expensive drugs (Carroll 1998). In this pricing method, the size of the percentage markup decreases as drug cost increases, which might result in some U&C prices lower than reimbursement payments, especially for high-cost drugs. For the non-MAC group, in addition to the effect from low U&C prices, the mix of innovators' AWP prices and non-innovators' AWP prices also contributed to the lower paid amount per prescription. Simulated amounts were based on innovators' AWPs, yet paid amounts might have been based on non-innovators' products dispensed.

MAC Based Reimbursement

Table 4.5 showed the gross margin based on the actual paid amount was higher than the gross margin based on the MAC payment from 2001 to 2003. As discussed above, the WAC plus approach presented some challenges in predicting actual acquisition costs for multiple source drugs. Therefore, instead of using gross margins, the following discussions are based on the comparison between simulated prices and actual paid amounts for drugs in the MAC group (Figure 5.1). The higher paid amount during the 2001-2003 period might result from the impact of the payment policy regarding "Brand Medically Necessary" designation possible for prescriptions. MAC prices were set to encourage the use of generic drugs; however, these limits did not apply if a physician certified that a specific brand was medically necessary for a particular recipient. For a given multiple source drug, the higher amount paid by Medicaid suggested that more prescriptions were specified as brand

Figure 5.1 Comparisons of Simulated Prices Based on MAC Reimbursement Payment and Actual Amount Paid by Medicaid Program



medically necessary. This relationship was confirmed by the large number of prescriptions written "no substitute" in the claims data for three multiple source drugs with unusually high paid amounts, Tegretol (200mg), Clozaril (100mg), and Prozac (20mg). There have been more than one-third of prescriptions written as brand medically necessary for Clozaril. The high proportion of brand medically necessary might be due to the bioequivalence issue for generic clozapine. The higher amount from payments based on innovators' AWP prices, combined with the lower acquisition cost due to competition in the generic market, resulted in the higher margin dollars for the prescriptions written as brand medically necessary than they would have not been otherwise.

The brand medically necessary policy permits an innovator multiple source drug to be reimbursed on an AWP basis. As discussed above, innovator multiple source drugs should have higher margin dollars based on AWP payment than MAC payment. Even more, the gross margin of innovator multiple source drugs is expected to be higher than that of these drugs still under patent protection. Prices of brand-name drugs continue to increase after patent expiration, and discounts on brand-name drugs also increase once generic alternatives are available (CBO 2002). Therefore, the AWP-AAC differential for brand-name drugs should be larger after they go off patent. This relationship also was confirmed by an OIG report (OIG 2002).

High MAC prices for the drugs at the beginning of patent expiration also had an impact on pharmacies' gross margins. This phenomenon might be related to the 180-day market exclusivity for the first generic manufacturer, which limits price competition in the first six months after brand-name drugs are off patent. Table 5.4 depicts the comparisons of simulated gross margins per prescription under patent and off patent for Prozac, Claritin, and

Table 5.4 Comparisons of Gross Margin per Prescription Under Patent and Off Patent for Prozac, Claritin, and Prilosec

	Under Patent	Off Patent
PROZAC 20mg	$13.59	$33.68
CLARITIN 10mg	$10.85	$14.96
PRILOSEC 20mg	$16.01	$17.49

Prilosec. These drugs had even higher gross margin dollars after they lost patent protection under the Medicaid reimbursement policy. However, high MAC prices only explained half of the story. Lower acquisition costs for generic drugs also contributed to high gross margins. For example, all the various dosage forms of fluoxetine with 180 days of market exclusivity were priced at a discount of 25% to 40% off Prozac's price (NIHCM 2002).

In addition to high MAC prices within the 180-day market exclusivity, the change in MAC prices after the 180-day market exclusivity also plays an important role in gross margins for generic copies of off-patent brand-name drugs. Figure 5.2 and Figure 5.3 show comparisons of MAC unit prices and simulated unit costs for Ranitidine (the generic version of Zantac) and Fluoxetine (the generic version of Prozac), respectively. Zantac went off patent in July 1997, and Prozac went of patent in July 2001. Therefore, the 180-day market exclusivity was still effective at the beginning of 1998 for Ranitidine and the beginning of 2002 for Fluoxetine. Ranitidine's MAC price took three years to reach the simulated cost in the market, while Fluoxetine's MAC price dropped sharply to the level lower than the simulated cost right after the 180-day market exclusivity. The change in MAC prices might be related to the rate of generic substitution. Prozac was one of the quickest uptakes of a generic drug. Merck-Medco claimed to have achieved an 80% generic substitution for Prozac within one week of the generic's launch. By comparison, most brand-name drugs that go off patent experience a 40% to 75% erosion in their market share over nine months to a year (NIHCM 2002). Based on the examples of Ranitidine and Fluoxetine in this study, the impact of MAC policy on gross margins for off patent drugs resulted from the 180-day market exclusivity and the length to match the pharmacy's actual purchase costs.

Figure 5.2 Comparison of MAC Unit Price and Simulated Unit Cost for Ranitidine 150mg

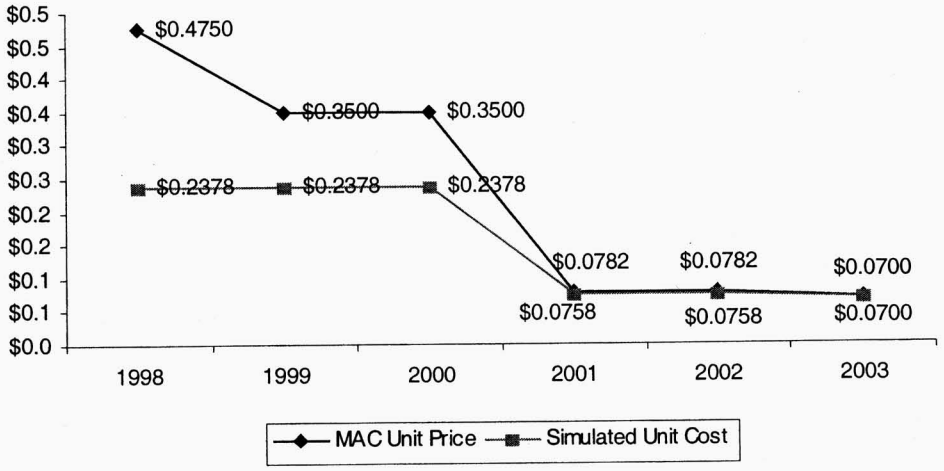
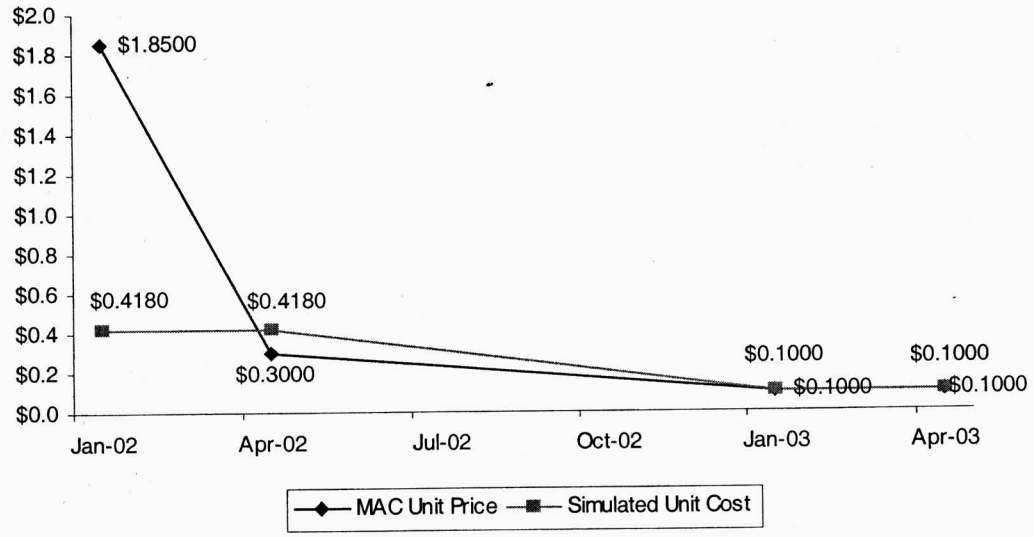


Figure 5.3 Comparison of MAC Unit Price and Simulated Unit Cost for Fluoxetine 20mg



Limitations

The results must be considered in light of the data constraints and assumptions made in deriving estimates. First, the data only represented the claims activity for the first six months for each study year. The list of Top 100 prescription drugs in the market basket might be changed due to different seasonal utilization. Second, the estimation of historical WAC prices was based on the corresponding AWP prices. This assumption could introduce some bias into the results if the relationship between WAC and AWP was not proportional, but the available data were not sufficient to verify this assumption. Third, the figures in this study could be considered a minimum estimate of gross margin dollars per prescription due to a conservative assumption.

This study used the gross margin percentage of the wholesaler industry as a proxy of the markup percentage in wholesalers' pricing systems. However, the denominator of gross margin percent is the sales rather than the costs. Fail to convert the gross margin percentage to the markup-on-cost percentage resulted in a lower percentage used in this study. However, only a tiny difference of 0.21 percent resulted due to the small number of the gross margin percentage (4.51%).

Finally, the eligibility of Medicaid recipients and some unique characteristics related to the Medicaid program might result in different mix of prescription drugs from other third-party programs. This limits the generalizability of the findings in this study.

CHAPTER 6

CONCLUSION

While the gross margin percentage has consistently decreased from 23.05% in 1998 to 15.95% in 2003, average gross margin dollars per prescription experienced two increasing trends during the 1998-2000 and the 2001-2003 periods, with an average of $8.22. The average gross margin per prescription for single source drugs has been higher than that for multiple source drugs, and has shown a continuous increase since 1998. Unlike the increasing trend in gross margin dollars for single source drugs, multiple source drugs had a steady-drop-steady pattern in gross margin dollars across the study years. Few multiple source drugs contributed to the decrease in overall gross margin dollars in 2001. The change of MAC prices for Clonazepam and Lorazepam lowered the average gross margin dollars per prescription for drugs in the MAC group, and the change from AWP based reimbursement to MAC based reimbursement for Clozapine decreased the average gross margin dollars per prescription for drugs in the non-MAC group.

The increase in average AWP unit price for single source drugs indicated more expensive products were included in the market basket. In addition to having newer, more expensive drugs in the market, there has been a tendency of shifting to more expensive products among the existing drugs. Although the increase in simulated ingredient costs was partly offset by the decrease in prescription size from 1999 to 2002 and the increase in average AWP unit price could somewhat be attributed to general inflation, the mix of products still dominated the change in gross margin dollars per prescription for single source drugs across the study years.

Different ingredient cost reimbursement methods have different impacts on gross margin dollars per prescription. AWP based reimbursement is usually used to estimate the acquisition cost (EAC) of single source drugs. Since a percentage discount relationship exists between the AWP and the actual acquisition cost (AAC) of a given drug, the AWP reimbursement method actually makes the EAC-AAC differential proportional to AWP. On a product basis, the more expensive drug a pharmacy dispenses, the higher gross margin dollars a pharmacy will earn for a prescription. In an overall picture, the trend in shifting to more expensive drugs has resulted in the increase in gross margin dollars per prescription for single source drugs over these years. However, price competition and the sliding scale method in the private-pay prescription market limits the effect of product mix on overall gross margin dollars per prescription for single source drugs in the Medicaid program due to using usual and customary prices as payment limits.

Ingredient costs of multiple source drugs are reimbursed at MAC prices. More challenges are presented in estimating acquisition costs for multiple source drugs. In addition to a variation of AWP prices in the generic market, the inconsistent trend between AWP prices of multiple source drugs and their MAC lists implied that the AWP price might be an inflated number for multiple source drugs. The WAC price might be a better parameter to estimate the AAC of multiple source drugs in this regard. However, the chargeback system between wholesalers and manufacturers imposed uncertainty in the WAC plus approach.

Although it presented some challenges in explaining the change in gross margin dollars per prescription for multiple source drugs based on simulated ingredient costs, MAC based reimbursement, which was considered as the price of a prescription, could partly account for this change. The major impact of MAC policy on gross margin dollars per

prescription resulted from whether or not MAC prices were updated promptly. As described earlier, Clonazepam and Lorazepam presented examples regarding how high MAC prices influenced average gross margin dollars. Also, a large MAC-AAC differential occurred for generic drugs when counterpart brand-name drugs just went off patent. High gross margin dollars might occur for prescriptions specified as brand medically necessary due to higher payment amounts based on innovators' AWPs and lower acquisition costs in the generic market.

Future Research

This study was a simulation analysis based on secondary data. Therefore, the results were limited by the assumptions and availability of data. The estimation of gross margin dollars through primary data collection is suggested for future research.

Medicaid claims data were used as an example to examine the gross margin per prescription due to availability. Private third-party programs could be considered in future research. Although the basic format of reimbursement method is similar among third-party programs, they usually have different benefit designs and patient bases; as a result, different third-party programs represent different product mixes. For a given pharmacy, the mix of third-party programs would influence overall gross margins per prescription. In addition to examine how one specific third-party program affects prescriptions' gross margins, the scope can be extended to the overall impact from all third-party programs in future research.

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APPENDIX A

The Ranking of Generic Manufacturers Based on the Number of Product Items

Rank	Generic Manufacturers	# of Product Items Available
1	Watson	32
2	Geneva	30
3	Major	23
4	Ivax Pharm	20
5	URL	17
5	Purepac	17
6	Mutual	15
7	Barr	13
8	Ranbaxy Pharm	12
9	Apotex Corp.	10
10	Sidmak	9
11	Par	8
11	Taro	8
12	Greenstone	7
12	West-Ward	7
13	Caraco	5
13	Mallinckrodt Pharm	5
14	Upsher-Smith	4
15	Amide	3
16	Stada Pharm	2
16	Lannett	2
16	Celltech	2
16	Superior	2
16	Trigen Labs	2
17	Inwood	1
17	Endo Generics	1
17	Upsher-Smith Labs	1

APPENDIX B

Mathematic Explanation for a More Conservative Estimation of Gross Margin from Using Innovators' AWPs Based on the 2002 OIG Report

Let innovators' AWP = AWP_B and non-innovators' AWP = AWP_G

$$\frac{AWP_B\text{-}AAC}{AWP_G\text{-}AAC} = \frac{0.244*AWP_B}{0.542*AWP_G} = \frac{0.45*AWP_B}{AWP_G}$$

If $AWP_G = 0.45*AWP_B$;

then $AWP_B\text{-}AAC = AWP_G\text{-}AAC$

If $AWP_G < 0.45*AWP_B$;

then $AWP_B\text{-}AAC > AWP_G\text{-}AAC$

If $AWP_G > 0.45*AWP_B$;

then $AWP_B\text{-}AAC < AWP_G\text{-}AAC$

Therefore, innovators' drugs results in a larger AWP-AAC differential than their generic counterparts only when the AWP of non-innovators is more than 55 percent off the AWP of innovators. Based on AWP information in the ReadyPrice System, generally, percentage differences between innovators' AWPs and non-innovators' AWPs have been smaller than 35 percent for the non-MAC drugs examined in this study, which made AWP-AAC differentials smaller when using innovators' AWPs.

APPENDIX C

Market Basket from 1998 to 2003

1998 Market Basket

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
1	LASIX	FUROSEMIDE	40MG	TABLET	55,480	MAC
2	DARVOCET N 100	PROPOXYPHENE/ACETAMINOPHEN	100-650MG	TABLET	41,002	MAC
3	LASIX	FUROSEMIDE	20MG	TABLET	37,773	MAC
4	LANOXIN	DIGOXIN	125MCG	TABLET	33,968	Non-MAC
Not Oral Solid Form		ALBUTEROL	90MCG	AEROSOL	33,341	
5	PRILOSEC	OMEPRAZOLE	20MG	CAPSULE DR	31,229	SS
6	ZANTAC	RANITIDINE HCL	150MG	TABLET	29,597	MAC
7	K-DUR 20	POTASSIUM CHLORIDE	20MEQ	TAB PRT SR	27,353	Non-MAC
8	PROZAC	FLUOXETINE HCL	20MG	CAPSULE	25,068	SS
9	DILANTIN	PHENYTOIN SODIUM EXTENDED	100MG	CAPSULE	24,868	Non-MAC
10	ZOLOFT	SERTRALINE HCL	50MG	TABLET	24,543	SS
11	ATIVAN	LORAZEPAM	0.5MG	TABLET	24,063	MAC
12	TYLENOL No.3	CODEINE PHOSPHATE/APAP	30-300MG	TABLET	23,778	MAC
13	CLOZARIL	CLOZAPINE	100MG	TABLET	23,257	Non-MAC
14	PAXIL	PAROXETINE HCL	20MG	TABLET	22,079	SS
15	VICODIN	HYDROCODONE BIT/ACETAMINOPHEN	5-500MG	TABLET	21795	MAC
16	TEGRETOL	CARBAMAZEPINE	200MG	TABLET	20,262	MAC
Not Oral Solid Form		INSULIN NPH HUMAN RECOM	100 U/ML	VIAL	20,127	
17	LANOXIN	DIGOXIN	250MCG	TABLET	19,928	Non-MAC
18	PREMARIN[a]	ESTROGENS,CONJUGATED	0.625MG	TABLET	19,694	SS
19	RISPERIDAL	RISPERIDONE	1MG	TABLET	19,566	SS
20	DESYREL	TRAZODONE HCL	50MG	TABLET	18,998	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
21	HYDRODIURIL	HYDROCHLOROTHIAZIDE	25MG	TABLET	18,406	MAC
22	K-DUR 10	POTASSIUM CHLORIDE	10MEQ	TABLET SA	18,218	Non-MAC
23	SYNTHROID	LEVOTHYROXINE SODIUM	100MCG	TABLET	18,174	Non-MAC
24	DEPAKOTE	DIVALPROEX SODIUM	500MG	TABLET DR	17,685	SS
Not Oral Solid Form		HUM INSULIN NPH/REG INSULIN HM	70-30 U/ML	VIAL	17,133	
25	LASIX	FUROSEMIDE	80MG	TABLET	17,034	MAC
26	BACTRIM DS	SULFAMETHOXAZOLE/TRIMETHOPRIM	800-160MG	TABLET	16,993	MAC
27	ATIVAN	LORAZEPAM	1MG	TABLET	16,724	MAC
28	MICRO K	POTASSIUM CHLORIDE	10MEQ	CAPSULE SA	16,299	Non-MAC
29	ZOLOFT	SERTRALINE HCL	100MG	TABLET	15,747	SS
30	PEPCID	FAMOTIDINE	20MG	TABLET	15,536	SS
31	DEPAKOTE	DIVALPROEX SODIUM	250MG	TABLET DR	15,196	SS
32	ULTRAM	TRAMADOL HCL	50MG	TABLET	14,631	SS
33	TENORMIN	ATENOLOL	50MG	TABLET	14,408	MAC
34	PERCOCET	OXYCODONE HCL/ACETAMINOPHEN	5-325MG	TABLET	14,334	MAC
35	KLONOPIN	CLONAZEPAM	0.5MG	TABLET	14,270	MAC
36	DITROPAN	OXYBUTYNIN CHLORIDE	5MG	TABLET	14,236	MAC
37	MICRONASE	GLYBURIDE	5MG	TABLET	14,088	MAC
38	ZYPREXA	OLANZAPINE	10MG	TABLET	14,002	SS
39	AMOXIL	AMOXICILLIN TRIHYDRATE	500MG	CAPSULE	13,725	MAC
40	GLUCOPHAGE	METFORMIN HCL	500MG	TABLET	13,541	SS
41	NORVASC	AMLODIPINE BESYLATE	5MG	TABLET	13,345	SS
42	COGENTIN	BENZTROPINE MESYLATE	1MG	TABLET	13,226	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
43	XANAX	ALPRAZOLAM	0.25MG	TABLET	13,141	MAC
44	SYNTHROID	LEVOTHYROXINE SODIUM	50MCG	TABLET	12,696	Non-MAC
45	CLOZARIL	CLOZAPINE	25MG	TABLET	12,389	Non-MAC
46	PROPULSID	CISAPRIDE MONOHYDRATE	10MG	TABLET	12,212	SS
47	PRINIVIL	LISINOPRIL	10MG	TABLET	12,177	SS
48	LOPRESSOR	METOPROLOL TARTRATE	50MG	TABLET	11705	MAC
49	BUSPAR	BUSPIRONE HCL	10MG	TABLET	11,044	SS
50	COUMADIN	WARFARIN SODIUM	5MG	TABLET	10,999	Non-MAC
51	TENORMIN	ATENOLOL	25MG	TABLET	10,919	MAC
52	CLARITIN	LORATADINE	10MG	TABLET	10,855	SS
Not Oral Solid Form		IPRATROPIUM BROMIDE	18MCG	AER W/ADAP	10,853	
53	MOTRIN	IBUPROFEN	600MG	TABLET	10,704	MAC
54	VASOTEC	ENALAPRIL MALEATE	5MG	TABLET	10,701	SS
55	COGENTIN	BENZTROPINE MESYLATE	2MG	TABLET	10,408	MAC
56	SYNTHROID	LEVOTHYROXINE SODIUM	75MCG	TABLET	10,347	Non-MAC
57	KLONOPIN	CLONAZEPAM	1MG	TABLET	10,063	MAC
58	CIPRO	CIPROFLOXACIN HCL	500MG	TABLET	9,986	SS
59	FOLVITE	FOLIC ACID	1MG	TABLET	9,879	MAC
Not Oral Solid Form		INSULIN REGULAR HUMAN REC	100 U/ML	VIAL	9,680	
60	COUMADIN	WARFARIN SODIUM	2MG	TABLET	9,615	Non-MAC
61	LITHOBID	LITHIUM CARBONATE	300MG	CAPSULE	9,583	MAC
62	ELAVIL	AMITRIPTYLINE HCL	25MG	TABLET	9,485	MAC
63	VALIUM	DIAZEPAM	5MG	TABLET	9,476	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
64	RITALIN	METHYLPHENIDATE HCL	10MG	TABLET	9,471	MAC
Not Oral Solid Form		TRIAMCINOLONE ACETONIDE	100MCG	AER W/ADAP	9,461	
65	RELAFEN	NABUMETONE	500MG	TABLET	9,458	SS
66	LIPITOR	ATORVASTATIN CALCIUM	10MG	TABLET	9,345	SS
67	XANAX	ALPRAZOLAM	0.5MG	TABLET	9,284	MAC
68	DYAZIDE	TRIAMTERENE/HCTZ	37.5-25MG	CAPSULE	9184	Non-MAC
69	ZYPREXA	OLANZAPINE	5MG	TABLET	8,977	SS
Not Oral Solid Form		ALBUTEROL SULFATE	0.83MG/ML	SOLUTION	8,661	
Not Oral Solid Form		CLOTRIMAZOLE/BETAMET DIPROP	1-0.05%	CREAM(GM)	8,622	
70	VASOTEC	ENALAPRIL MALEATE	10MG	TABLET	8,618	SS
71	CATAPRES	CLONIDINE HCL	0.1MG	TABLET	8,597	MAC
72	PRINIVIL	LISINOPRIL	20MG	TABLET	8,468	SS
73	DESYREL	TRAZODONE HCL	100MG	TABLET	8,452	MAC
Not Oral Solid Form		NITROGLYCERIN	0.2MG/HR	PATCH TD24	8,247	
74	PRINIVIL	LISINOPRIL	5MG	TABLET	8,240	SS
75	ADALAT CC	NIFEDIPINE	30MG	TAB SA OSM	8,206	SS
76	DELTASONE	PREDNISONE	5MG	TABLET	8,198	MAC
77	AMBIEN	ZOLPIDEM TARTRATE	10MG	TABLET	8,177	SS
78	ZITHROMAX	AZITHROMYCIN	250MG	TABLET	8,171	SS
OTC		ASPIRIN	325MG	TABLET DR	8,108	
79	FLEXERIL	CYCLOBENZAPRINE HCL	10MG	TABLET	8,105	MAC
80	MOTRIN	IBUPROFEN	800MG	TABLET	8,035	MAC
81	SYNTHROID	LEVOTHYROXINE SODIUM	125MCG	TABLET	8,007	Non-MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
82	RITALIN	METHYLPHENIDATE HCL	5MG	TABLET	7,974	MAC
83	COUMADIN	WARFARIN SODIUM	2.5MG	TABLET	7,925	Non-MAC
Not Oral Solid Form		NITROGLYCERIN	0.4MG/HR	PATCH TD24	7,899	
84	ISOPTIN SR	VERAPAMIL HCL	240MG	TABLET SA	7,792	MAC
85	KEFLEX	CEPHALEXIN MONOHYDRATE	500MG	CAPSULE	7695	MAC
86	PAXIL	PAROXETINE HCL	10MG	TABLET	7,689	SS
87	DELTASONE	PREDNISONE	10MG	TABLET	7,664	MAC
Not Oral Solid Form		CYANOCOBALAMIN	1000MCG/ML	VIAL	7,554	
Not Oral Solid Form		AMOXICILLIN TRIHYDRATE	250MG/5ML	SUSP RECON	7,531	
Prevention Use		NITROGLYCERIN	0.4MG	TAB SUBL	7,521	
88	SYNTHROID	LEVOTHYROXINE SODIUM	150MCG	TABLET	7,460	Non-MAC
89	AXID	NIZATIDINE	150MG	CAPSULE	7,329	SS
90	PREMPRO	ESTROGEN,CON/M-PROGEST ACET	0.625-2.5	TABLET	7,256	SS
91	GLUCOTROL	GLIPIZIDE	5MG	TABLET	7,148	MAC
92	MAXZIDE	TRIAMTERENE/HCTZ	37.5-25MG	TABLET	7026	MAC
Not Oral Solid Form		TRIAMCINOLONE ACETONIDE	0.10%	CREAM(GM)	7,008	
93	TEGRETOL	CARBAMAZEPINE	100MG	TAB CHEW	7,006	MAC
94	RISPERIDAL	RISPERIDONE	3MG	TABLET	6,965	SS
95	LIORESAL	BACLOFEN	10MG	TABLET	6,881	MAC
96	ZYLOPRIM	ALLOPURINOL	300MG	TABLET	6,814	MAC
97	MOTRIN	IBUPROFEN	400MG	TABLET	6,799	MAC
98	COUMADIN	WARFARIN SODIUM	1MG	TABLET	6,759	Non-MAC
99	TRENTAL	PENTOXIFYLLINE	400MG	TABLET SA	6,630	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
100	PREVACID	LANSOPRAZOLE	30MG	CAPSULE DR	6,596	SS

a. Although estrogen 0.625mg already went off patent, brand Premarin was categorized into the single source group due to the lack of generic equivalents.

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Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
1	LASIX	FUROSEMIDE	40MG	TABLET	56,848	MAC
2	DARVOCET N 100	PROPOXYPHENE/ACETAMINOPHEN	100-650MG	TABLET	38,546	MAC
3	LASIX	FUROSEMIDE	20MG	TABLET	38,036	MAC
4	LANOXIN	DIGOXIN	125MCG	TABLET	35,218	Non-MAC
Not Oral Solid Form		ALBUTEROL	90MCG	AEROSOL	33,010	
5	ZANTAC	RANITIDINE HCL	150MG	TABLET	30,541	MAC
6	K-DUR	POTASSIUM CHLORIDE	20MEQ	TAB PRT SR	28,215	Non-MAC
7	VICODIN	HYDROCODONE BIT/ACETAMINOPHEN	5-500MG	TABLET	26,615	MAC
8	PRILOSEC	OMEPRAZOLE	20MG	CAPSULE DR	25,873	SS
9	DILANTIN	PHENYTOIN SODIUM EXTENDED	100MG	CAPSULE	25,119	Non-MAC
10	ZOLOFT	SERTRALINE HCL	50MG	TABLET	24,656	SS
11	PROZAC	FLUOXETINE HCL	20MG	CAPSULE	24,400	SS
12	TYLENOL No.3	CODEINE PHOS/ACETAMINOPHEN	30-300MG	TABLET	23,473	MAC
13	ATIVAN	LORAZEPAM	0.5MG	TABLET	23,344	MAC
14	RISPERIDAL	RISPERIDONE	1MG	TABLET	23,247	SS
15	PAXIL	PAROXETINE HCL	20MG	TABLET	21,823	SS
16	CLOZARIL	CLOZAPINE	100MG	TABLET	21,623	Non-MAC
17	HYDRODIURIL	HYDROCHLOROTHIAZIDE	25MG	TABLET	21,431	MAC
18	PREMARIN[a]	ESTROGENS,CONJUGATED	0.625MG	TABLET	20,702	SS
Not Oral Solid Form		INSULIN NPH HUMAN RECOM	100 U/ML	VIAL	20,592	
19	DESYREL	TRAZODONE HCL	50MG	TABLET	20,590	MAC
20	TEGRETOL	CARBAMAZEPINE	200MG	TABLET	19,836	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
21	LANOXIN	DIGOXIN	250MCG	TABLET	19,566	Non-MAC
22	DEPAKOTE	DIVALPROEX SODIUM	500MG	TABLET DR	19,168	SS
23	K-DUR	POTASSIUM CHLORIDE	10MEQ	TABLET SA	19,037	Non-MAC
24	SYNTHROID	LEVOTHYROXINE SODIUM	100MCG	TABLET	18,261	Non-MAC
25	LASIX	FUROSEMIDE	80MG	TABLET	18,053	MAC
26	ZOLOFT	SERTRALINE HCL	100MG	TABLET	17,923	SS
27	MICRO K	POTASSIUM CHLORIDE	10MEQ	CAPSULE SA	17,828	Non-MAC
Not Oral Solid Form		HUM INSULIN NPH/REG INSULIN HM	70-30 U/ML	VIAL	17,613	
28	GLUCOPHAGE	METFORMIN HCL	500MG	TABLET	17,319	SS
29	ATIVAN	LORAZEPAM	1MG	TABLET	16,445	MAC
30	DEPAKOTE	DIVALPROEX SODIUM	250MG	TABLET DR	16,142	SS
31	ZYPREXA	OLANZAPINE	10MG	TABLET	16,094	SS
32	BACTRIM DS	SULFAMETHOXAZOLE/TRIMETHOPRIM	800-160MG	TABLET	15,999	MAC
33	TENORMIN	ATENOLOL	50MG	TABLET	15,727	MAC
34	PEPCID	FAMOTIDINE	20MG	TABLET	15,581	SS
35	PERCOCET	OXYCODONE HCL/ACETAMINOPHEN	5-325MG	TABLET	15,458	MAC
36	ULTRAM	TRAMADOL HCL	50MG	TABLET	15,292	SS
37	NORVASC	AMLODIPINE BESYLATE	5MG	TABLET	15,144	SS
38	KLONOPIN	CLONAZEPAM	0.5MG	TABLET	14,878	MAC
39	PRINIVIL	LISINOPRIL	10MG	TABLET	14,119	SS
40	MICRONASE	GLYBURIDE	5MG	TABLET	14,043	MAC
41	LIPITOR	ATORVASTATIN CALCIUM	10MG	TABLET	13,840	SS
42	AMOXIL	AMOXICILLIN TRIHYDRATE	500MG	CAPSULE	13,837	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
43	SYNTHROID	LEVOTHYROXINE SODIUM	50MCG	TABLET	13,644	Non-MAC
44	DITROPAN	OXYBUTYNIN CHLORIDE	5MG	TABLET	13,367	MAC
45	PREVACID	LANSOPRAZOLE	30MG	CAPSULE DR	13,359	SS
46	LOPRESSOR	METOPROLOL TARTRATE	50MG	TABLET	13,047	MAC
47	CLARITIN	LORATADINE	10MG	TABLET	13,015	SS
48	COGENTIN	BENZTROPINE MESYLATE	1MG	TABLET	12,944	MAC
49	TENORMIN	ATENOLOL	25MG	TABLET	12,746	MAC
50	XANAX	ALPRAZOLAM	0.25MG	TABLET	12,442	MAC
51	COUMADIN	WARFARIN SODIUM	5MG	TABLET	11,928	Non-MAC
52	ZITHROMAX	AZITHROMYCIN	250MG	TABLET	11,764	SS
53	SYNTHROID	LEVOTHYROXINE SODIUM	75MCG	TABLET	11,363	Non-MAC
54	CLOZARIL	CLOZAPINE	25MG	TABLET	11,054	Non-MAC
55	KLONOPIN	CLONAZEPAM	1MG	TABLET	10,787	MAC
56	PRINIVIL	LISINOPRIL	20MG	TABLET	10,670	SS
57	FOLVITE	FOLIC ACID	1MG	TABLET	10,503	MAC
58	ZYPREXA	OLANZAPINE	5MG	TABLET	10,439	SS
Not Oral Solid Form		INSULIN REGULAR HUMAN REC	100 U/ML	VIAL	10,290	
59	MOTRIN	IBUPROFEN	600MG	TABLET	10,240	MAC
60	PRINIVIL	LISINOPRIL	5MG	TABLET	10,194	SS
61	COUMADIN	WARFARIN SODIUM	2MG	TABLET	10,121	Non-MAC
62	BUSPAR	BUSPIRONE HCL	10MG	TABLET	10,069	SS
63	PROPULSID	CISAPRIDE MONOHYDRATE	10MG	TABLET	9,872	SS
64	COGENTIN	BENZTROPINE MESYLATE	2MG	TABLET	9,577	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
65	DYAZIDE	TRIAMTERENE/HCTZ	37.5-25MG	CAPSULE	9,520	Non-MAC
66	CIPRO	CIPROFLOXACIN HCL	500MG	TABLET	9,489	SS
67	XANAX	ALPRAZOLAM	0.5MG	TABLET	9,391	MAC
Not Oral Solid Form		ALBUTEROL SULFATE	0.83MG/ML	SOLUTION	9,381	
68	VASOTEC	ENALAPRIL MALEATE	5MG	TABLET	9,349	SS
69	ELAVIL	AMITRIPTYLINE HCL	25MG	TABLET	9,235	MAC
70	VALIUM	DIAZEPAM	5MG	TABLET	9,189	MAC
71	AMBIEN	ZOLPIDEM TARTRATE	10MG	TABLET	9,160	SS
Not Oral Solid Form		IPRATROPIUM BROMIDE	18MCG	AER W/ADAP	8,808	
72	CATAPRES	CLONIDINE HCL	0.1MG	TABLET	8,755	MAC
73	DESYREL	TRAZODONE HCL	100MG	TABLET	8,747	MAC
74	PREMPRO	ESTROGEN,CON/M-PROGEST ACET	0.625-2.5	TABLET	8,718	SS
Not Oral Solid Form		CALCITONIN,SALMON,SYNTHETIC	200 U/DOSE	SPRAY/PUMP	8,707	
75	FLEXERIL	CYCLOBENZAPRINE HCL	10MG	TABLET	8,645	MAC
76	PAXIL	PAROXETINE HCL	10MG	TABLET	8,578	SS
77	LITHOBID	LITHIUM CARBONATE	300MG	CAPSULE	8,554	MAC
78	SYNTHROID	LEVOTHYROXINE SODIUM	125MCG	TABLET	8,499	Non-MAC
79	DELTASONE	PREDNISONE	5MG	TABLET	8,465	MAC
Not Oral Solid Form		CLOTRIMAZOLE/BETAMET DIPROP	1-0.05%	CREAM(GM)	8,461	
80	NEURONTIN	GABAPENTIN	300MG	CAPSULE	8,425	SS
OTC		ASPIRIN	325MG	TABLET DR	8,387	
81	WELLBUTRIN SR	BUPROPION HCL	150MG	TABLET SA	8,342	SS
82	RITALIN	METHYLPHENIDATE HCL	10MG	TABLET	8,272	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
Not Oral Solid Form		TRIAMCINOLONE ACETONIDE	100MCG	AER W/ADAP	8,244	
83	NORVASC	AMLODIPINE BESYLATE	10MG	TABLET	8,192	SS
84	COUMADIN	WARFARIN SODIUM	2.5MG	TABLET	8,153	Non-MAC
85	MOTRIN	IBUPROFEN	800MG	TABLET	8,096	MAC
86	VASOTEC	ENALAPRIL MALEATE	10MG	TABLET	8,028	SS
Not Oral Solid Form		LATANOPROST	0.01%	DROPS	7,851	
Not Oral Solid Form		ALBUTEROL SULFATE/IPRATROPIUM	103-18MCG	AER W/ADAP	7,844	
87	DELTASONE	PREDNISONE	10MG	TABLET	7,812	MAC
88	RELAFEN	NABUMETONE	500MG	TABLET	7,770	SS
Prevention Use		NITROGLYCERIN	0.4MG	TAB SUBL	7,729	
Not Oral Solid Form		NITROGLYCERIN	0.4MG/HR	PATCH TD24	7,583	
89	MAXZIDE	TRIAMTERENE/HCTZ	37.5-25MG	TABLET	7,564	MAC
Not Oral Solid Form		CYANOCOBALAMIN	1000MCG/ML	VIAL	7,556	
90	KEFLEX	CEPHALEXIN MONOHYDRATE	500MG	CAPSULE	7,510	MAC
91	SYNTHROID	LEVOTHYROXINE SODIUM	150MCG	TABLET	7,483	Non-MAC
Not Oral Solid Form		NITROGLYCERIN	0.2MG/HR	PATCH TD24	7,462	
Not Oral Solid Form		AMOXICILLIN TRIHYDRATE	250MG/5ML	SUSP RECON	7,349	
92	LIPITOR	ATORVASTATIN CALCIUM	20MG	TABLET	7,304	SS
93	RISPERIDAL	RISPERIDONE	3MG	TABLET	7,268	SS
Not Oral Solid Form		TRIAMCINOLONE ACETONIDE	0.10%	CREAM(GM)	7,244	
94	COUMADIN	WARFARIN SODIUM	1MG	TABLET	7,190	Non-MAC
95	ISOPTIN SR	VERAPAMIL HCL	240MG	TABLET SA	7,176	MAC
Not Oral Solid Form		IPRATROPIUM BROMIDE	0.2MG/ML	SOLUTION	7,110	

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
96	REMERON	MIRTAZAPINE	15MG	TABLET	7,060	SS
97	GLUCOTROL	GLIPIZIDE	5MG	TABLET	7,006	MAC
98	LIORESAL	BACLOFEN	10MG	TABLET	6,965	MAC
99	RISPERIDAL	RISPERIDONE	2MG	TABLET	6,911	SS
Not Oral Solid Form		SALMETEROL XINAFOATE	21MCG	AER W/ADAP	6,870	
100	PREVACID	LANSOPRAZOLE	15MG	CAPSULE DR	6,851	SS

a. Although estrogen 0.625mg already went off patent, brand Premarin was categorized into the single source group due to the lack of generic equivalents.

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Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
1	LASIX	FUROSEMIDE	40MG	TABLET	59,726	MAC
2	ZANTAC	RANITIDINE HCL	150MG	TABLET	53,112	MAC
3	LASIX	FUROSEMIDE	20MG	TABLET	39,908	MAC
Not Oral Solid Form		ALBUTEROL	90MCG	AEROSOL	37,087	
4	VICODIN	HYDROCODONE BIT/ACETAMINOPHEN	5-500MG	TABLET	37,216	MAC
5	LANOXIN	DIGOXIN	125MCG	TABLET	36,859	Non-MAC
6	DARVOCET N 100	PROPOXYPHENE/ACETAMINOPHEN	100-650MG	TABLET	35,460	MAC
7	PRILOSEC	OMEPRAZOLE	20MG	CAPSULE DR	33,294	SS
8	K-DUR 20	POTASSIUM CHLORIDE	20MEQ	TAB PRT SR	29,060	Non-MAC
9	TYLENOL No.3	CODEINE PHOS/ACETAMINOPHEN	30-300MG	TABLET	25,647	MAC
10	DILANTIN	PHENYTOIN SODIUM EXTENDED	100MG	CAPSULE	25,333	Non-MAC
11	PROZAC	FLUOXETINE HCL	20MG	CAPSULE	25,296	SS
12	ZOLOFT	SERTRALINE HCL	50MG	TABLET	24,739	SS
13	HYDRODIURIL	HYDROCHLOROTHIAZIDE	25MG	TABLET	24,533	MAC
14	PAXIL	PAROXETINE HCL	20MG	TABLET	23,730	SS
15	PREVACID	LANSOPRAZOLE	30MG	CAPSULE DR	23,576	SS
16	ATIVAN	LORAZEPAM	0.5MG	TABLET	23,555	MAC
17	CLOZARIL	CLOZAPINE	100MG	TABLET	22,342	Non-MAC
18	DEPAKOTE	DIVALPROEX SODIUM	500MG	TABLET DR	21,953	SS
Not Oral Solid Form		INSULIN NPH HUMAN RECOM	100 U/ML	VIAL	21,934	
19	PREMARIN[a]	ESTROGENS,CONJUGATED	0.625MG	TABLET	21,717	SS
20	DESYREL	TRAZODONE HCL	50MG	TABLET	21,013	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
21	ZOLOFT	SERTRALINE HCL	100MG	TABLET	20,863	SS
22	GLUCOPHAGE	METFORMIN HCL	500MG	TABLET	20,814	SS
23	K-DUR 10	POTASSIUM CHLORIDE	10MEQ	TABLET SA	20,607	Non-MAC
24	TEGRETOL	CARBAMAZEPINE	200MG	TABLET	19,688	MAC
25	RISPERIDAL	RISPERIDONE	1MG	TABLET	19,416	SS
26	ZYPREXA	OLANZAPINE	10MG	TABLET	19,177	SS
27	SYNTHROID	LEVOTHYROXINE SODIUM	100MCG	TABLET	19,074	Non-MAC
28	LANOXIN	DIGOXIN	250MCG	TABLET	18,943	Non-MAC
29	LASIX	FUROSEMIDE	80MG	TABLET	18,749	MAC
30	DEPAKOTE	DIVALPROEX SODIUM	250MG	TABLET DR	18,228	SS
31	LIPITOR	ATORVASTATIN CALCIUM	10MG	TABLET	18,174	SS
32	TENORMIN	ATENOLOL	50MG	TABLET	18,095	MAC
Not Oral Solid Form		HUM INSULIN NPH/REG INSULIN HM	70-30 U/ML	VIAL	17,954	
33	MICRO K	POTASSIUM CHLORIDE	10MEQ	CAPSULE SA	17,917	Non-MAC
34	PERCOCET	OXYCODONE HCL/ACETAMINOPHEN	5-325MG	TABLET	17,822	MAC
35	NORVASC	AMLODIPINE BESYLATE	5MG	TABLET	17,640	SS
36	ULTRAM	TRAMADOL HCL	50MG	TABLET	17,266	SS
37	CELEBREX	CELECOXIB	200MG	CAPSULE	17,218	SS
38	ATIVAN	LORAZEPAM	1MG	TABLET	17,076	MAC
39	KLONOPIN	CLONAZEPAM	0.5MG	TABLET	16,942	MAC
40	CLARITIN	LORATADINE	10MG	TABLET	16,933	SS
41	PRINIVIL	LISINOPRIL	10MG	TABLET	16,364	SS
42	BACTRIM DS	SULFAMETHOXAZOLE/TRIMETHOPRIM	800-160MG	TABLET	16,165	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
43	AMOXIL	AMOXICILLIN TRIHYDRATE	500MG	CAPSULE	15,766	MAC
44	LOPRESSOR	METOPROLOL TARTRATE	50MG	TABLET	15,501	MAC
45	SYNTHROID	LEVOTHYROXINE SODIUM	50MCG	TABLET	15,259	Non-MAC
46	TENORMIN	ATENOLOL	25MG	TABLET	15,231	MAC
47	ZITHROMAX	AZITHROMYCIN	250MG	TABLET	14,148	SS
48	VIOXX	ROFECOXIB	25MG	TABLET	13,852	SS
49	MICRONASE	GLYBURIDE	5MG	TABLET	13,525	MAC
50	XANAX	ALPRAZOLAM	0.25MG	TABLET	13,262	MAC
51	NEURONTIN	GABAPENTIN	300MG	CAPSULE	12,782	SS
52	COGENTIN	BENZTROPINE MESYLATE	1MG	TABLET	12,770	MAC
53	PRINIVIL	LISINOPRIL	20MG	TABLET	12,768	SS
54	SYNTHROID	LEVOTHYROXINE SODIUM	75MCG	TABLET	12,634	Non-MAC
Not Oral Solid Form		ALBUTEROL SULFATE	0.83MG/ML	SOLUTION	12,619	
55	COUMADIN	WARFARIN SODIUM	5MG	TABLET	12,612	Non-MAC
56	KLONOPIN	CLONAZEPAM	1MG	TABLET	12,199	MAC
57	ZYPREXA	OLANZAPINE	5MG	TABLET	12,174	SS
Not Oral Solid Form		ALBUTEROL SULFATE/IPRATROPIUM	103-18MCG	AER W/ADAP	11,812	
58	PRINIVIL	LISINOPRIL	5MG	TABLET	11,625	SS
59	WELLBUTRIN SR	BUPROPION HCL	150MG	TABLET SA	11,613	SS
60	DITROPAN	OXYBUTYNIN CHLORIDE	5MG	TABLET	11,588	MAC
61	FOLVITE	FOLIC ACID	1MG	TABLET	11,377	MAC
62	CELEXA	CITALOPRAM HYDROBROMIDE	20MG	TABLET	11,248	SS
Not Oral Solid Form		CALCITONIN,SALMON,SYNTHETIC	200 U/DOSE	SPRAY/PUMP	11,241	

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
63	AMBIEN	ZOLPIDEM TARTRATE	10MG	TABLET	11,186	SS
Not Oral Solid Form		INSULIN REGULAR HUMAN REC	100 U/ML	VIAL	11,124	
64	CLOZARIL	CLOZAPINE	25MG	TABLET	10,994	Non-MAC
65	COUMADIN	WARFARIN SODIUM	2MG	TABLET	10,819	Non-MAC
66	NORVASC	AMLODIPINE BESYLATE	10MG	TABLET	10,558	SS
67	FLEXERIL	CYCLOBENZAPRINE HCL	10MG	TABLET	10,478	MAC
68	CELEBREX	CELECOXIB	100MG	CAPSULE	10,331	SS
69	XANAX	ALPRAZOLAM	0.5MG	TABLET	10,313	MAC
70	REMERON	MIRTAZAPINE	15MG	TABLET	10,258	SS
71	LIPITOR	ATORVASTATIN CALCIUM	20MG	TABLET	10,137	SS
72	ALDALTONE	SPIRONOLACTONE	25MG	TABLET	10,052	MAC
73	DYAZIDE	TRIAMTERENE/HCTZ	37.5-25MG	CAPSULE	10,021	Non-MAC
74	MOTRIN	IBUPROFEN	600MG	TABLET	9,972	MAC
75	VALIUM	DIAZEPAM	5MG	TABLET	9,880	MAC
76	CIPRO	CIPROFLOXACIN HCL	500MG	TABLET	9,813	SS
77	PAXIL	PAROXETINE HCL	10MG	TABLET	9,806	SS
78	PREMPRO	ESTROGEN,CON/M-PROGEST ACET	0.625-2.5	TABLET	9,755	SS
79	DESYREL	TRAZODONE HCL	100MG	TABLET	9,565	MAC
80	PLAVIX	CLOPIDOGREL BISULFATE	75MG	TABLET	9,558	SS
81	DELTASONE	PREDNISONE	5MG	TABLET	9,530	MAC
82	CATAPRES	CLONIDINE HCL	0.1MG	TABLET	9,404	MAC
83	BUSPAR	BUSPIRONE HCL	10MG	TABLET	9,386	SS
84	DELTASONE	PREDNISONE	10MG	TABLET	9,281	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
85	MOTRIN	IBUPROFEN	800MG	TABLET	9,247	MAC
86	DETROL	TOLTERODINE TARTRATE	2MG	TABLET	9,192	SS
Not Oral Solid Form		LATANOPROST	0.01%	DROPS	9,137	
87	SYNTHROID	LEVOTHYROXINE SODIUM	125MCG	TABLET	9,106	Non-MAC
OTC		ASPIRIN	325MG	TABLET DR	9,088	
88	ELAVIL	AMITRIPTYLINE HCL	25MG	TABLET	9,076	MAC
Not Oral Solid Form		CLOTRIMAZOLE/BETAMET DIPROP	1-0.05%	CREAM(GM)	9,072	
89	PREVACID	LANSOPRAZOLE	15MG	CAPSULE DR	9,010	SS
90	COGENTIN	BENZTROPINE MESYLATE	2MG	TABLET	8,955	MAC
91	KEFLEX	CEPHALEXIN MONOHYDRATE	500MG	CAPSULE	8,837	MAC
Not Oral Solid Form		SALMETEROL XINAFOATE	21MCG	AER W/ADAP	8,715	
Not Oral Solid Form		IPRATROPIUM BROMIDE	0.2MG/ML	SOLUTION	8,696	
Not Oral Solid Form		AMOXICILLIN TRIHYDRATE	250MG/5ML	SUSP RECON	8,629	
92	LITHOBID	LITHIUM CARBONATE	300MG	CAPSULE	8,399	MAC
Not Oral Solid Form		TRIAMCINOLONE ACETONIDE	0.10%	CREAM(GM)	8,329	
93	COUMADIN	WARFARIN SODIUM	2.5MG	TABLET	8,286	Non-MAC
94	RITALIN	METHYLPHENIDATE HCL	10MG	TABLET	8,279	MAC
95	COUMADIN	WARFARIN SODIUM	1MG	TABLET	8,265	Non-MAC
96	BUSPAR	BUSPIRONE HCL	15MG	TABLET	8,248	SS
97	SYNTHROID	LEVOTHYROXINE SODIUM	150MCG	TABLET	8,168	Non-MAC
Not Oral Solid Form		TRIAMCINOLONE ACETONIDE	100MCG	AER W/ADAP	8,086	
98	COUMADIN	WARFARIN SODIUM	3MG	TABLET	8,073	Non-MAC
99	RISPERIDAL	RISPERIDONE	2MG	TABLET	8,060	SS

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
Not Oral Solid Form		CYANOCOBALAMIN	1000MCG/ML	VIAL	8,031	
100	MAXZIDE	TRIAMTERENE/HCTZ	37.5-25MG	TABLET	7,913	MAC

a. Although estrogen 0.625mg already went off patent, brand Premarin was categorized into the single source group due to the lack of generic equivalents.

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Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
1	LASIX	FUROSEMIDE	40MG	TABLET	60,888	MAC
2	ZANTAC	RANITIDINE HCL	150MG	TABLET	50,293	MAC
3	VICODIN	HYDROCODONE BIT/ACETAMINOPHEN	5-500MG	TABLET	43,144	MAC
4	LASIX	FUROSEMIDE	20MG	TABLET	41,321	MAC
Not Oral Solid Form		ALBUTEROL	90MCG	AEROSOL	37,123	
5	LANOXIN	DIGOXIN	125MCG	TABLET	35,221	Non-MAC
6	PRILOSEC	OMEPRAZOLE	20MG	CAPSULE DR	34,792	SS
7	PREVACID	LANSOPRAZOLE	30MG	CAPSULE DR	33,514	SS
8	DARVOCET N 100	PROPOXYPHENE/ACETAMINOPHEN	100-650MG	TABLET	33,075	MAC
9	K-DUR 20	POTASSIUM CHLORIDE	20MEQ	TAB PRT SR	27,896	Non-MAC
10	HYDRODIURIL	HYDROCHLOROTHIAZIDE	25MG	TABLET	27,199	MAC
11	ZOLOFT	SERTRALINE HCL	50MG	TABLET	25,011	SS
12	ATIVAN	LORAZEPAM	0.5MG	TABLET	24,688	MAC
13	DILANTIN	PHENYTOIN SODIUM EXTENDED	100MG	CAPSULE	24,533	Non-MAC
14	TYLENOL No.3	SERTRALINE HCL	100MG	TABLET	23,928	MAC
15	ZOLOFT	FLUOXETINE HCL	20MG	CAPSULE	23,838	SS
16	PROZAC	CODEINE PHOS/ACETAMINOPHEN	30-300MG	TABLET	23,557	SS
17	PAXIL	PAROXETINE HCL	20MG	TABLET	22,940	SS
18	LIPITOR	ATORVASTATIN CALCIUM	10MG	TABLET	22,625	SS
19	DEPAKOTE	DIVALPROEX SODIUM	500MG	TABLET DR	22,555	SS
20	K-DUR 10	POTASSIUM CHLORIDE	10MEQ	TABLET SA	21,670	Non-MAC
21	PREMARIN[a]	ESTROGENS,CONJUGATED	0.625MG	TABLET	21,283	SS

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
22	CLOZARIL	CLOZAPINE	100MG	TABLET	21,208	MAC
Not Oral Solid Form		INSULIN NPH HUMAN RECOM	100 U/ML	VIAL	20,998	
23	DESYREL	TRAZODONE HCL	50MG	TABLET	20,655	MAC
24	CELEBREX	CELECOXIB	200MG	CAPSULE	20,357	SS
25	ZYPREXA	OLANZAPINE	10MG	TABLET	20,166	SS
26	TENORMIN	ATENOLOL	50MG	TABLET	20,003	MAC
27	GLUCOPHAGE	METFORMIN HCL	500MG	TABLET	19,542	SS
28	LASIX	FUROSEMIDE	80MG	TABLET	19,401	MAC
29	NORVASC	AMLODIPINE BESYLATE	5MG	TABLET	19,269	SS
30	MICRO K	POTASSIUM CHLORIDE	10MEQ	CAPSULE SA	18,879	MAC
31	SYNTHROID	LEVOTHYROXINE SODIUM	100MCG	TABLET	18,755	Non-MAC
32	TEGRETOL	CARBAMAZEPINE	200MG	TABLET	18,574	MAC
33	CLARITIN	LORATADINE	10MG	TABLET	18,246	SS
34	LOPRESSOR	METOPROLOL TARTRATE	50MG	TABLET	18,225	MAC
35	RISPERIDAL	RISPERIDONE	1MG	TABLET	18,196	SS
36	PERCOCET	OXYCODONE HCL/ACETAMINOPHEN	5-325MG	TABLET	18,172	MAC
37	ULTRAM	TRAMADOL HCL	50MG	TABLET	17,830	SS
38	ATIVAN	LORAZEPAM	1MG	TABLET	17,814	MAC
39	KLONOPIN	CLONAZEPAM	0.5MG	TABLET	17,757	MAC
40	DEPAKOTE	DIVALPROEX SODIUM	250MG	TABLET DR	17,733	SS
41	TENORMIN	ATENOLOL	25MG	TABLET	17,641	MAC
Not Oral Solid Form		HUM INSULIN NPH/REG INSULIN HM	70-30 U/ML	VIAL	17,568	
42	CELEXA	CITALOPRAM HYDROBROMIDE	20MG	TABLET	17,364	SS

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
43	LANOXIN	DIGOXIN	250MCG	TABLET	17,072	Non-MAC
44	VIOXX	ROFECOXIB	25MG	TABLET	16,941	SS
45	SYNTHROID	LEVOTHYROXINE SODIUM	50MCG	TABLET	15,881	Non-MAC
46	NEURONTIN	GABAPENTIN	300MG	CAPSULE	15,343	SS
47	AMOXIL	AMOXICILLIN TRIHYDRATE	500MG	CAPSULE	15,334	MAC
48	ZITHROMAX	AZITHROMYCIN	250MG	TABLET	15,034	SS
Not Oral Solid Form		ALBUTEROL SULFATE/IPRATROPIUM	103-18MCG	AER W/ADAP	14,435	
49	BACTRIM DS	SULFAMETHOXAZOLE/TRIMETHOPRIM	800-160MG	TABLET	13,956	MAC
50	PRINIVIL	LISINOPRIL	10MG	TABLET	13,694	SS
51	SYNTHROID	LEVOTHYROXINE SODIUM	75MCG	TABLET	13,675	Non-MAC
52	WELLBUTRIN SR	BUPROPION HCL	150MG	TABLET SA	13,604	SS
53	ZYPREXA	OLANZAPINE	5MG	TABLET	13,527	SS
Not Oral Solid Form		ALBUTEROL SULFATE	0.83MG/ML	SOLUTION	13,506	
54	PLAVIX	CLOPIDOGREL BISULFATE	75MG	TABLET	13,350	SS
55	XANAX	ALPRAZOLAM	0.25MG	TABLET	13,264	MAC
56	KLONOPIN	CLONAZEPAM	1MG	TABLET	13,252	MAC
57	AMBIEN	ZOLPIDEM TARTRATE	10MG	TABLET	13,178	SS
58	COUMADIN	WARFARIN SODIUM	5MG	TABLET	13,068	MAC
59	NORVASC	AMLODIPINE BESYLATE	10MG	TABLET	13,016	SS
60	LIPITOR	ATORVASTATIN CALCIUM	20MG	TABLET	12,672	SS
61	MICRONASE	GLYBURIDE	5MG	TABLET	12,540	MAC
62	COGENTIN	BENZTROPINE MESYLATE	1MG	TABLET	12,460	MAC
63	FOLVITE	FOLIC ACID	1MG	TABLET	12,379	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
64	REMERON	MIRTAZAPINE	15MG	TABLET	11,948	SS
65	ALDALTONE	SPIRONOLACTONE	25MG	TABLET	11,814	MAC
66	FLEXERIL	CYCLOBENZAPRINE HCL	10MG	TABLET	11,790	MAC
Not Oral Solid Form		CALCITONIN,SALMON,SYNTHETIC	200 U/DOSE	SPRAY/PUMP	11,580	
67	COUMADIN	WARFARIN SODIUM	2MG	TABLET	11,528	MAC
68	CLOZARIL	CLOZAPINE	25MG	TABLET	11,096	MAC
69	RISPERIDAL	RISPERIDONE	0.5MG	TABLET	10,890	SS
70	PRINIVIL	LISINOPRIL	20MG	TABLET	10,846	SS
71	XANAX	ALPRAZOLAM	0.5MG	TABLET	10,738	MAC
Not Oral Solid Form		LATANOPROST†	0.01%	DROPS	10,543	
Not Oral Solid Form		SALMETEROL XINAFOATE	21MCG	AER W/ADAP	10,471	SS
72	PREVACID	LANSOPRAZOLE	15MG	CAPSULE DR	10,386	SS
73	DITROPAN	OXYBUTYNIN CHLORIDE	5MG	TABLET	10,382	MAC
74	DETROL	TOLTERODINE TARTRATE	2MG	TABLET	10,365	SS
75	DESYREL	TRAZODONE HCL	100MG	TABLET	10,336	MAC
Not Oral Solid Form		IPRATROPIUM BROMIDE	0.2MG/ML	SOLUTION	10,277	
Not Oral Solid Form		INSULIN REGULAR HUMAN REC	100 U/ML	VIAL	10,263	
76	VALIUM	DIAZEPAM	5MG	TABLET	10,117	MAC
77	ZYRTEC	CETIRIZINE HCL	10MG	TABLET	10,103	SS
78	SEROQUEL	QUETIAPINE FUMARATE	100MG	TABLET	10,015	SS
79	DYAZIDE	TRIAMTERENE/HCTZ	37.5-25MG	CAPSULE	9,969	Non-MAC
80	VASOTEC	ENALAPRIL MALEATE	10MG	TABLET	9,928	MAC
81	PREMPRO	ESTROGEN,CON/M-PROGEST ACET	0.625-2.5	TABLET	9,834	SS

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
82	SEROQUEL	QUETIAPINE FUMARATE	25MG	TABLET	9,832	SS
83	SYNTHROID	LEVOTHYROXINE SODIUM	125MCG	TABLET	9,781	Non-MAC
84	PRINIVIL	LISINOPRIL	5MG	TABLET	9,762	SS
85	MOTRIN	IBUPROFEN	600MG	TABLET	9,634	MAC
OTC		ASPIRIN	325MG	TABLET DR	9,586	
86	KEFLEX	CEPHALEXIN MONOHYDRATE	500MG	CAPSULE	9,446	MAC
87	CATAPRES	CLONIDINE HCL	0.1MG	TABLET	9,426	MAC
88	DELTASONE	PREDNISONE	5MG	TABLET	9,412	MAC
89	MOTRIN	IBUPROFEN	800MG	TABLET	9,307	MAC
90	DELTASONE	PREDNISONE	10MG	TABLET	9,301	MAC
91	PAXIL	PAROXETINE HCL	10MG	TABLET	9,286	SS
92	COUMADIN	WARFARIN SODIUM	3MG	TABLET	9,256	MAC
93	VASOTEC	ENALAPRIL MALEATE	5MG	TABLET	9,219	MAC
94	ELAVIL	AMITRIPTYLINE HCL	25MG	TABLET	9,165	MAC
95	RISPERIDAL	RISPERIDONE	2MG	TABLET	9,087	SS
96	COUMADIN	WARFARIN SODIUM	1MG	TABLET	8,970	MAC
97	CIPRO	CIPROFLOXACIN HCL	500MG	TABLET	8,915	SS
98	LEVAQUIN	LEVOFLOXACIN	500MG	TABLET	8,854	SS
Not Oral Solid Form		TRIAMCINOLONE ACETONIDE	0.10%	CREAM(GM)	8,792	
99	BUSPAR	BUSPIRONE HCL	15MG	TABLET	8,790	SS
100	SINGULAIR	MONTELUKAST SODIUM	10MG	TABLET	8,756	SS

a. Although estrogen 0.625mg already went off patent, brand Premarin was categorized into the single source group due to the lack of generic equivalents.

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Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
1	LASIX	FUROSEMIDE	40MG	TABLET	62,344	MAC
2	VICODIN	HYDROCODONE BIT/ACETAMINOPHEN	5-500MG	TABLET	50,852	MAC
3	LASIX	FUROSEMIDE	20MG	TABLET	43,207	MAC
4	ZANTAC	RANITIDINE HCL	150MG	TABLET	41,188	MAC
5	PREVACID	LANSOPRAZOLE	30MG	CAPSULE DR	40,774	SS
Not Oral Solid Form		ALBUTEROL	90MCG	AEROSOL	39,713	
6	LANOXIN	DIGOXIN	125MCG	TABLET	33,188	Non-MAC/MAC
7	DARVOCET N 100	PROPOXYPHENE/ACETAMINOPHEN	100-650MG	TABLET	32,308	MAC
8	PRILOSEC	OMEPRAZOLE	20MG	CAPSULE DR	31,169	SS
9	HYDRODIURIL	HYDROCHLOROTHIAZIDE	25MG	TABLET	29,401	MAC
10	LIPITOR	ATORVASTATIN CALCIUM	10MG	TABLET	28,544	SS
11	ZOLOFT	SERTRALINE HCL	100MG	TABLET	27,988	SS
12	ZOLOFT	SERTRALINE HCL	50MG	TABLET	26,391	SS
13	ATIVAN	LORAZEPAM	0.5MG	TABLET	26,353	MAC
14	K-DUR	POTASSIUM CHLORIDE	20MEQ	TAB PRT SR	25,321	MAC
15	CELEBREX	CELECOXIB	200MG	CAPSULE	24,933	SS
16	PAXIL	PAROXETINE HCL	20MG	TABLET	24,343	SS
17	K-DUR 10	POTASSIUM CHLORIDE	10MEQ	TABLET SA	24,195	Non-MAC
18	TYLENOL No.3	CODEINE PHOS/ACETAMINOPHEN	30-300MG	TABLET	24,079	MAC
19	DILANTIN	PHENYTOIN SODIUM EXTENDED	100MG	CAPSULE	23,986	n
20	CELEXA	CITALOPRAM HYDROBROMIDE	20MG	TABLET	22,866	SS
21	MICRO K	POTASSIUM CHLORIDE	10MEQ	CAPSULE SA	22,107	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
22	DEPAKOTE	DIVALPROEX SODIUM	500MG	TABLET DR	21,444	SS
23	PREMARIN[a]	ESTROGENS,CONJUGATED	0.625MG	TABLET	21,312	SS
24	TENORMIN	ATENOLOL	50MG	TABLET	21,186	MAC
25	LOPRESSOR	METOPROLOL TARTRATE	50MG	TABLET	20,856	MAC
26	NORVASC	AMLODIPINE BESYLATE	5MG	TABLET	20,798	SS
27	DESYREL	TRAZODONE HCL	50MG	TABLET	20,655	MAC
28	PERCOCET	OXYCODONE HCL/ACETAMINOPHEN	5-325MG	TABLET	20,384	MAC
29	SYNTHROID	LEVOTHYROXINE SODIUM	100MCG	TABLET	19,911	Non-MAC
30	LASIX	FUROSEMIDE	80MG	TABLET	19,617	MAC
31	CLOZARIL	CLOZAPINE	100MG	TABLET	19,580	MAC
32	TENORMIN	ATENOLOL	25MG	TABLET	19,535	MAC
33	KLONOPIN	CLONAZEPAM	0.5MG	TABLET	19,526	MAC
34	PLAVIX	CLOPIDOGREL BISULFATE	75MG	TABLET	19,003	SS
35	ATIVAN	LORAZEPAM	1MG	TABLET	18,783	MAC
Not Oral Solid Form		INSULIN NPH HUMAN RECOM	100 U/ML	VIAL	18,781	
36	ULTRAM	TRAMADOL HCL	50MG	TABLET	18,695	SS
37	CLARITIN	LORATADINE	10MG	TABLET	18,587	SS
38	GLUCOPHAGE	METFORMIN HCL	500MG	TABLET	18,148	Non-MAC/MAC
39	NEURONTIN	GABAPENTIN	300MG	CAPSULE	17,446	SS
40	ZYPREXA	OLANZAPINE	10MG	TABLET	17,367	SS
41	RISPERIDAL	RISPERIDONE	1MG	TABLET	17,335	SS
42	VIOXX	ROFECOXIB	25MG	TABLET	17,313	SS
43	SYNTHROID	LEVOTHYROXINE SODIUM	50MCG	TABLET	17,190	Non-MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
44	TEGRETOL	CARBAMAZEPINE	200MG	TABLET	17,099	MAC
45	PROZAC	FLUOXETINE HCL	20MG	CAPSULE	16,633	MAC
Not Oral Solid Form		HUM INSULIN NPH/REG INSULIN HM	70-30 U/ML	VIAL	16,576	
46	DEPAKOTE	DIVALPROEX SODIUM	250MG	TABLET DR	16,403	SS
47	LIPITOR	ATORVASTATIN CALCIUM	20MG	TABLET	16,329	SS
48	WELLBUTRIN SR	BUPROPION HCL	150MG	TABLET SA	16,271	SS
49	ZITHROMAX	AZITHROMYCIN	250MG	TABLET	16,241	SS
50	AMBIEN	ZOLPIDEM TARTRATE	10MG	TABLET	16,007	SS
51	NORVASC	AMLODIPINE BESYLATE	10MG	TABLET	15,671	SS
52	LANOXIN	DIGOXIN	250MCG	TABLET	15,601	Non-MAC/MAC
53	AMOXIL	AMOXICILLIN TRIHYDRATE	500MG	CAPSULE	15,504	MAC
54	FOSAMAX	ALENDRONATE SODIUM	70MG	TABLET	15,401	SS
Not Oral Solid Form		ALBUTEROL SULFATE/IPRATROPIUM	103-18MCG	AER W/ADAP	15,335	
Not Oral Solid Form		ALBUTEROL SULFATE	0.83MG/ML	SOLUTION	14,975	
55	KLONOPIN	CLONAZEPAM	1MG	TABLET	14,792	MAC
56	SYNTHROID	LEVOTHYROXINE SODIUM	75MCG	TABLET	14,686	Non-MAC
57	PRINIVIL	LISINOPRIL	10MG	TABLET	14,359	SS
58	BACTRIM DS	SULFAMETHOXAZOLE/TRIMETHOPRIM	800-160MG	TABLET	13,957	MAC
59	COUMADIN	WARFARIN SODIUM	5MG	TABLET	13,956	MAC
60	ZYPREXA	OLANZAPINE	5MG	TABLET	13,848	SS
61	FOLVITE	FOLIC ACID	1MG	TABLET	13,671	MAC
62	XANAX	ALPRAZOLAM	0.25MG	TABLET	13,661	MAC
63	ZYRTEC	CETIRIZINE HCL	10MG	TABLET	13,505	SS

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
64	SEROQUEL	QUETIAPINE FUMARATE	25MG	TABLET	13,334	SS
65	RISPERIDAL	RISPERIDONE	0.5MG	TABLET	13,052	SS
66	ALDALTONE	SPIRONOLACTONE	25MG	TABLET	12,970	MAC
67	FLEXERIL	CYCLOBENZAPRINE HCL	10MG	TABLET	12,877	MAC
68	ZANTAC	RANITIDINE HCL	150MG	CAPSULE	12,445	MAC
70	SEROQUEL	BENZTROPINE MESYLATE	1MG	TABLET	12,060	SS
69	COGENTIN	QUETIAPINE FUMARATE	100MG	TABLET	12,060	MAC
71	COUMADIN	WARFARIN SODIUM	2MG	TABLET	12,023	MAC
72	MICRONASE	GLYBURIDE	5MG	TABLET	11,935	MAC
73	XANAX	ALPRAZOLAM	0.5MG	TABLET	11,700	MAC
74	PRINIVIL	LISINOPRIL	20MG	TABLET	11,555	SS
75	SIGULAIR	MONTELUKAST SODIUM	10MG	TABLET	11,326	SS
76	DESYREL	TRAZODONE HCL	100MG	TABLET	11,265	MAC
77	VASOTEC	ENALAPRIL MALEATE	10MG	TABLET	11,167	MAC
78	PROTONIX	PANTOPRAZOLE SOD SESQUIHYDRATE	40MG	TABLET DR	10,996	SS
79	CELEXA	CITALOPRAM HYDROBROMIDE	40MG	TABLET	10,933	SS
Not Oral Solid Form		CALCITONIN,SALMON,SYNTHETIC	200 U/DOSE	SPRAY/PUMP	10,908	
Not Oral Solid Form		LATANOPROST	0.01%	DROPS	10,740	
80	ACIPHEX	RABEPRAZOLE SODIUM	20MG	TABLET DR	10,703	SS
81	SYNTHROID	LEVOTHYROXINE SODIUM	125MCG	TABLET	10,664	Non-MAC
82	VALIUM	DIAZEPAM	5MG	TABLET	10,541	MAC
83	EFFEXOR XR	VENLAFAXINE HCL	75MG	CAP.SR 24H	10,536	SS
84	VASOTEC	ENALAPRIL MALEATE	5MG	TABLET	10,502	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
OTC		ASPIRIN	325MG	TABLET DR	10,306	
85	COUMADIN	WARFARIN SODIUM	3MG	TABLET	10,235	MAC
86	PREVACID	LANSOPRAZOLE	15MG	CAPSULE DR	10,208	SS
87	ZOCOR	SIMVASTATIN	20MG	TABLET	10,192	SS
88	PRINIVIL	LISINOPRIL	5MG	TABLET	10,130	SS
89	DYAZIDE	TRIAMTERENE/HCTZ	37.5-25MG	CAPSULE	10,107	Non-MAC
90	CLOZARIL	CLOZAPINE	25MG	TABLET	10,089	MAC
91	ZYPREXA	OLANZAPINE	2.5MG	TABLET	10,045	SS
92	REMERON	MIRTAZAPINE	15MG	TABLET	10,018	SS
93	CATAPRES	CLONIDINE HCL	0.1MG	TABLET	10,006	MAC
94	KEFLEX	CEPHALEXIN MONOHYDRATE	500MG	CAPSULE	9,874	MAC
95	DELTASONE	PREDNISONE	5MG	TABLET	9,827	MAC
Not Oral Solid Form		INSULIN REGULAR HUMAN REC	100 U/ML	VIAL	9,799	
96	TOPROL-XL	METOPROLOL SUCCINATE	50MG	TAB.SR 24H	9,724	SS
97	ARICEPT	DONEPEZIL HCL	10MG	TABLET	9,623	SS
98	LEVAQUIN	LEVOFLOXACIN	500MG	TABLET	9,621	SS
99	MOTRIN	IBUPROFEN	800MG	TABLET	9,598	MAC
100	PREMPRO	ESTROGEN,CON/M-PROGEST ACET	0.625-2.5	TABLET	9,594	SS

a. Although estrogen 0.625mg already went off patent, brand Premarin was categorized into the single source group due to the lack of generic equivalents.

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Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
1	LASIX	FUROSEMIDE	40MG	TABLET	63,450	MAC
2	VICODIN	HYDROCODONE BIT/ACETAMINOPHEN	5-500MG	TABLET	61,775	MAC
3	LASIX	FUROSEMIDE	20MG	TABLET	44,118	MAC
Not Oral Solid Form		ALBUTEROL	90MCG	AEROSOL	43,902	
4	ZANTAC	RANITIDINE HCL	150MG	TABLET	37,374	MAC
5	PREVACID	LANSOPRAZOLE	30MG	CAPSULE DR	36,665	SS
6	PRILOSEC	OMEPRAZOLE	20MG	CAPSULE DR	36,024	SS/MAC
7	HYDRODIURIL	HYDROCHLOROTHIAZIDE	25MG	TABLET	32,958	MAC
8	LIPITOR	ATORVASTATIN CALCIUM	10MG	TABLET	31,424	SS
9	ZOLOFT	SERTRALINE HCL	100MG	TABLET	30,579	SS
10	DARVOCET N 100	PROPOXYPHENE/ACETAMINOPHEN	100-650MG	TABLET	30,259	MAC
11	PROTONIX	PANTOPRAZOLE SOD SESQUIHYDRATE	40MG	TABLET DR	30,136	SS
12	LANOXIN	DIGOXIN	125MCG	TABLET	29,975	MAC
13	CELEBREX	CELECOXIB	200MG	CAPSULE	28,176	SS
14	K-DUR	POTASSIUM CHLORIDE	20MEQ	TAB PRT SR	27,438	MAC
15	ATIVAN	LORAZEPAM	0.5MG	TABLET	26,748	MAC
16	ZOLOFT	SERTRALINE HCL	50MG	TABLET	26,142	SS
17	PLAVIX	CLOPIDOGREL BISULFATE	75MG	TABLET	24,202	SS
18	LOPRESSOR	METOPROLOL TARTRATE	50MG	TABLET	23,550	MAC
19	TYLENOL No.3	CODEINE PHOS/ACETAMINOPHEN	30-300MG	TABLET	23,323	MAC
20	PERCOCET	OXYCODONE HCL/ACETAMINOPHEN	5-325MG	TABLET	23,226	MAC
21	DILANTIN	PHENYTOIN SODIUM EXTENDED	100MG	CAPSULE	23,081	Non-MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
22	TENORMIN	ATENOLOL	50MG	TABLET	22,829	MAC
23	K-DUR	POTASSIUM CHLORIDE	10MEQ	TABLET SA	22,254	MAC
24	NORVASC	AMLODIPINE BESYLATE	5MG	TABLET	21,626	SS
25	MICRO K	POTASSIUM CHLORIDE	10MEQ	CAPSULE SA	21,446	MAC
26	DESYREL	TRAZODONE HCL	50MG	TABLET	21,379	MAC
27	KLONOPIN	CLONAZEPAM	0.5MG	TABLET	20,944	MAC
28	DEPAKOTE	DIVALPROEX SODIUM	500MG	TABLET DR	20,715	SS
29	TENORMIN	ATENOLOL	25MG	TABLET	20,694	MAC
30	CELEXA	CITALOPRAM HYDROBROMIDE	20MG	TABLET	20,471	SS
31	SYNTHROID	LEVOTHYROXINE SODIUM	100MCG	TABLET	20,413	Non-MAC
32	NEURONTIN	GABAPENTIN	300MG	CAPSULE	20,333	SS
33	PAXIL	PAROXETINE HCL	20MG	TABLET	20,204	SS
34	ATIVAN	LORAZEPAM	1MG	TABLET	19,743	MAC
35	LASIX	FUROSEMIDE	80MG	TABLET	19,448	MAC
36	AMBIEN	ZOLPIDEM TARTRATE	10MG	TABLET	19,410	SS
37	LIPITOR	ATORVASTATIN CALCIUM	20MG	TABLET	19,394	SS
38	GLUCOPHAGE	METFORMIN HCL	500MG	TABLET	19,152	MAC
39	ULTRAM	TRAMADOL HCL	50MG	TABLET	18,791	MAC
40	CLOZARIL	CLOZAPINE	100MG	TABLET	18,655	MAC
41	SYNTHROID	LEVOTHYROXINE SODIUM	50MCG	TABLET	18,496	Non-MAC
42	WELLBUTRIN SR	BUPROPION HCL	150MG	TABLET SA	18,081	SS
43	FOSAMAX	ALENDRONATE SODIUM	70MG	TABLET	18,060	SS
44	PROZAC	FLUOXETINE HCL	20MG	CAPSULE	17,868	MAC

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
45	ZYRTEC	CETIRIZINE HCL	10MG	TABLET	17,810	SS
46	ZITHROMAX	AZITHROMYCIN	250MG	TABLET	17,660	SS
47	NORVASC	AMLODIPINE BESYLATE	10MG	TABLET	17,649	SS
48	PRINIVIL	LISINOPRIL	10MG	TABLET	17,337	MAC
49	RISPERIDAL	RISPERIDONE	1MG	TABLET	17,158	SS
Not Oral Solid Form		INSULIN NPH HUMAN RECOM	100 U/ML	VIAL	16,856	
50	SEROQUEL	QUETIAPINE FUMARATE	25MG	TABLET	16,802	SS
Not Oral Solid Form		ALBUTEROL SULFATE/IPRATROPIUM	103-18MCG	AER W/ADAP	16,675	
51	AMOXIL	AMOXICILLIN TRIHYDRATE	500MG	CAPSULE	16,550	MAC
52	KLONOPIN	CLONAZEPAM	1MG	TABLET	16,432	MAC
53	VIOXX	ROFECOXIB	25MG	TABLET	16,092	SS
54	TEGRETOL	CARBAMAZEPINE	200MG	TABLET	15,885	MAC
55	ZYPREXA	OLANZAPINE	10MG	TABLET	15,807	SS
56	DEPAKOTE	DIVALPROEX SODIUM	250MG	TABLET DR	15,587	SS
Not Oral Solid Form		POLYETHYLENE GLYCOL 3350		POWDER	15,563	
57	SYNTHROID	LEVOTHYROXINE SODIUM	75MCG	TABLET	15,537	Non-MAC
Not Oral Solid Form		HUM INSULIN NPH/REG INSULIN HM	70-30 U/ML	VIAL	15,464	
58	FOLVITE	FOLIC ACID	1MG	TABLET	15,457	MAC
Not Oral Solid Form		ALBUTEROL SULFATE	0.83MG/ML	SOLUTION	14,927	
59	NEXIUM	ESOMEPRAZOLE MAG TRIHYDRATE	40MG	CAPSULE DR	14,889	SS
60	FLEXERIL	CYCLOBENZAPRINE HCL	10MG	TABLET	14,865	MAC
61	COUMADIN	WARFARIN SODIUM	5MG	TABLET	14,725	MAC
62	SIGULAIR	MONTELUKAST SODIUM	10MG	TABLET	14,605	SS

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
63	PRINIVIL	LISINOPRIL	20MG	TABLET	14,556	MAC
64	PREMARIN[a]	ESTROGENS,CONJUGATED	0.625MG	TABLET	14,390	SS
65	ZYPREXA	OLANZAPINE	5MG	TABLET	14,344	SS
66	LANOXIN	DIGOXIN	250MCG	TABLET	13,961	MAC
67	ALDALTONE	SPIRONOLACTONE	25MG	TABLET	13,909	MAC
68	SEROQUEL	QUETIAPINE FUMARATE	100MG	TABLET	13,836	SS
69	XANAX	ALPRAZOLAM	0.25MG	TABLET	13,777	MAC
70	BACTRIM DS	SULFAMETHOXAZOLE/TRIMETHOPRIM	800-160MG	TABLET	13,676	MAC
71	RISPERIDAL	RISPERIDONE	0.5MG	TABLET	13,306	SS
72	DETROL	TOLTERODINE TARTRATE	4MG	CAP.SR 24H	12,764	SS
73	EFFEXOR XR	VENLAFAXINE HCL	75MG	CAP.SR 24H	12,673	SS
74	DESYREL	TRAZODONE HCL	100MG	TABLET	12,641	MAC
75	XANAX	ALPRAZOLAM	0.5MG	TABLET	12,543	MAC
76	LEXAPRO	ESCITALOPRAM OXALATE	10MG	TABLET	12,356	SS
77	ARICEPT	DONEPEZIL HCL	10MG	TABLET	12,144	SS
78	CELEXA	CITALOPRAM HYDROBROMIDE	40MG	TABLET	12,137	SS
79	COUMADIN	WARFARIN SODIUM	2MG	TABLET	12,017	MAC
80	COGENTIN	BENZTROPINE MESYLATE	1MG	TABLET	11,911	MAC
81	TOPROL-XL	METOPROLOL SUCCINATE	50MG	TAB.SR 24H	11,860	SS
82	PRINIVIL	LISINOPRIL	5MG	TABLET	11,639	MAC
Not Oral Solid Form		INSULIN GLARGINE,HUM.REC.ANLOG	100 U/ML	VIAL	11,513	
Not Oral Solid Form		LATANOPROST	0.01%	DROPS	11,503	
Not Oral Solid Form		FLUTICASONE PROPIONATE	50MCG	SPRAY	11,483	

Rank	Brand Name	Generic Name	Strength	Form	Rxs	Group
83	SYNTHROID	LEVOTHYROXINE SODIUM	125MCG	TABLET	11,418	Non-MAC
84	ZANTAC	RANITIDINE HCL	150MG	CAPSULE	11,356	MAC
85	ACIPHEX	RABEPRAZOLE SODIUM	20MG	TABLET DR	11,196	SS
86	CATAPRES	CLONIDINE HCL	0.1MG	TABLET	11,089	MAC
OTC		ASPIRIN	81MG	TABLET DR	11,087	
87	LEVAQUIN	LEVOFLOXACIN	500MG	TABLET	11,064	SS
88	EFFEXOR XR	VENLAFAXINE HCL	150MG	CAP.SR 24H	11,063	SS
89	ZYPREXA	OLANZAPINE	2.5MG	TABLET	11,052	SS
90	MICRONASE	GLYBURIDE	5MG	TABLET	10,970	MAC
91	ZOCOR	SIMVASTATIN	20MG	TABLET	10,928	SS
92	DELTASONE	PREDNISONE	5MG	TABLET	10,858	MAC
93	VALIUM	DIAZEPAM	5MG	TABLET	10,730	MAC
94	VASOTEC	ENALAPRIL MALEATE	10MG	TABLET	10,693	MAC
95	COUMADIN	WARFARIN SODIUM	3MG	TABLET	10,542	MAC
96	MOTRIN	IBUPROFEN	800MG	TABLET	10,429	MAC
97	DYAZIDE	TRIAMTERENE/HCTZ	37.5-25MG	CAPSULE	10,422	MAC
98	SEROQUEL	QUETIAPINE FUMARATE	200MG	TABLET	10,404	SS
Not Oral Solid Form		CALCITONIN,SALMON,SYNTHETIC	200 U/DOSE	SPRAY/PUMP	10,378	
99	KEFLEX	CEPHALEXIN MONOHYDRATE	500MG	CAPSULE	10,330	MAC
100	CLARITIN	LORATADINE	10MG	TABLET	10,328	SS/MAC

a. Although estrogen 0.625mg already went off patent, brand Premarin was categorized into the single source group due to the lack of generic equivalents.

APPENDIX D

MAC Change Trends for Drugs Appearing in the MAC Group for All Study Years

	Generic Name	Strength	Dosage Form
Drugs with an Increasing Trend in MAC	ALPRAZOLAM	0.5MG	TABLET
	BENZTROPINE MESYLATE	1MG	TABLET
	CODEINE PHOS/ACETAMINOPHEN	30-300MG	TABLET
	DIAZEPAM	5MG	TABLET
	FUROSEMIDE	20MG	TABLET
	FUROSEMIDE	40MG	TABLET
	FUROSEMIDE	80MG	TABLET
	HYDROCHLOROTHIAZIDE	25MG	TABLET
	HYDROCODONE BIT/ACETAMINOPHEN	5-500MG	TABLET
	IBUPROFEN	800MG	TABLET
	OXYCODONE HCL/ACETAMINOPHEN	5-325MG	TABLET
	PREDNISONE	5MG	TABLET
	TRAZODONE HCL	50MG	TABLET
Drugs with a Decreasing Trend in MAC	ATENOLOL	25MG	TABLET
	CARBAMAZEPINE	200MG	TABLET
	CLONAZEPAM	0.5MG	TABLET
	CLONAZEPAM	1MG	TABLET
	FOLIC ACID	1MG	TABLET
	GLYBURIDE	5MG	TABLET
	METOPROLOL TARTRATE	50MG	TABLET
	RANITIDINE HCL	150MG	TABLET
	TRAZODONE HCL	100MG	TABLET
Drugs with a Constant MAC	ALPRAZOLAM	0.25MG	TABLET
	CYCLOBENZAPRINE HCL	10MG	TABLET
Drugs with a Fluctuated Trend in MAC	AMOXICILLIN TRIHYDRATE	500MG	CAPSULE
	ATENOLOL	50MG	TABLET
	CEPHALEXIN MONOHYDRATE	500MG	CAPSULE
	CLONIDINE HCL	0.1MG	TABLET
	LORAZEPAM	0.5MG	TABLET
	LORAZEPAM	1MG	TABLET
	PROPOXYPHENE/ACETAMINOPHEN	100-650MG	TABLET
	SULFAMETHOXAZOLE/TRIMETHOPRIM	800-160MG	TABLET

APPENDIX E

Paired T-Tests for Weighted Gross Margin and Unweighted Gross Margin

Group	Year	Unweighted GM/Rx	Weighted GM/Rx	t (paired)	p-value
Overall	1998	7.84	7.86	-.028	.978
	1999	8.35	8.27	.192	.848
	2000	8.42	8.44	-.051	.960
	2001	7.87	7.80	.173	.863
	2002	8.21	8.08	.347	.729
	2003	8.60	8.20	1.004	.318
Single Source Group	1998	9.86	10.06	-.231	.818
	1999	10.64	10.64	-.011	.991
	2000	10.87	11.00	-.176	.862
	2001	11.22	11.44	-.287	.775
	2002	11.50	11.62	-.159	.874
	2003	12.83	12.56	.362	.719
MAC Group	1998	6.62	6.50	.191	.849
	1999	6.58	6.56	.023	.982
	2000	6.35	6.41	-.084	.933
	2001	4.96	4.95	.008	.993
	2002	5.25	5.20	.139	.890
	2003	5.25	5.09	.366	.716
Non-MAC Group	1998	7.31	7.69	-.395	.698
	1999	7.65	7.96	-.337	.740
	2000	7.73	8.07	-.370	.716
	2001	6.55	6.63	-.089	.931
	2002	7.05	7.00	.053	.959
	2003	6.81	6.93	-.141	.895
AWP Group	1998	8.98	9.15	-.256	.799
	1999	9.69	9.69	.009	.993
	2000	9.86	10.03	-.287	.775
	2001	10.35	10.39	-.061	.951
	2002	10.71	10.85	-.213	.832
	2003	12.21	11.97	.357	.723
Multiple Source Group	1998	6.81	6.84	-.066	.947
	1999	6.89	6.98	-.189	.851
	2000	6.79	6.91	-.215	.831
	2001	5.24	5.28	-.091	.928
	2002	5.57	5.47	.270	.788
	2003	5.39	5.24	.369	.714