AN ANALYSIS OF THE COST OF DISPENSING PRESCRIPTIONS IN A SAMPLE OF COMMUNITY PHARMACIES

by

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(Under the supervision of Professor Robert W. Hammel)

The study had a threefold purpose: (1) to measure what it cost community pharmacists in Wisconsin to dispense prescriptions in 1968, (2) to find a cost of dispensing formula which separated prescription department costs from other pharmacy costs, and (3) to find a model for measuring the costs of prescription services over and above routine dispensing costs.

Pharmacy operations data were collected by personal interviews with 30 community pharmacy owners or managers in Wisconsin, after first surveying those same respondents plus 45 others by mail questionnaire. Four major cost elements within total prescription department costs were defined, and best allocation formulae were hypothesized for separating these four costs from total pharmacy costs during the personal interviews. The closest mail-collectable cost elements to these "best" personal interview cost element allocations then were combined to form the Wisconsin cost of dispensing formula, COD(WIS). For a given pharmacy, COD(WIS) is (1) the salary of the proprietor(s) or manager allocated to the prescription department based upon his time spent in "prescription department duties," plus (2) pharmacist salaries allocated

by time, plus (3) nonpharmacist wages and salaries allocated by the ratio of prescription sales to total pharmacy sales, plus (4) nonlabor costs allocated by the same ratio. COD(WIS) is the total of these four prescription department costs divided by the total number of original plus renewed prescriptions dispensed in the pharmacy.

In this study, the unweighted mean COD(WIS) was $\$1.77 \pm \$0.10$, at a 95% level of confidence, measured from mail submitted pharmacy operations data for 1968 supplied for 75 of the 952 community pharmacies in Wisconsin. The weighted mean COD(WIS) was $1.69 per prescription. Costs of dispensing generally were higher in community pharmacies (1) which were located either in Milwaukee or Madison, (2) which had less than $40,000 in prescription sales, (3) from which less than 40 prescriptions were dispensed daily, and (4) which had less than a ratio of 30% prescription sales to total pharmacy sales. Also, higher COD(WIS)s were found for pharmacists offering prescription delivery services (those pharmacists who delivered 5% or more of their prescriptions) and who provided patient record services. COD(WIS) generally increased with increases in the proportion of third party payer prescriptions to total prescriptions dispensed in the pharmacy.

Costs of additional prescription services for the 30 personal interview respondents also were measured.

Prescription delivery costs per delivered prescription were an unweighted mean of $0.68 for 27 pharmacies, patient record service costs per dispensed prescription were $0.14 for 24 pharmacies, and third party payer prescription service costs per third party payer prescription were $0.62 in 30 pharmacies. Among the 30 personal interview respondents plus the 45 mail surveyed respondents, about 84% routinely delivered prescriptions, about 76% maintained patient record systems, and all 75 dispensed third party payer prescriptions.

Recommendations were made that individual pharmacy owners use the Wisconsin cost of dispensing formula annually to help in their pricing strategies and in setting their professional fees. Recommendations to the pharmacy profession included that it conduct recurring cost of dispensing mail surveys among a sample of community pharmacies in Wisconsin and that it use an unweighted mean COD(WIS) to express the "average" cost of dispensing for these pharmacies. Recommendations to third party payers of prescription services are that they reimburse pharmacies on a per prescription basis, and the reimbursement amount should be based upon a prescription's cost of ingredients plus an unweighted COD(WIS) plus a pre-tax profit component of 10% of the weighted mean prescription price to patrons. Use of one or several per prescription reimbursement amounts for all pharmacies is preferred

over a different reimbursement amount for each pharmacy in the state.

APPROVED _____

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Finally, thanks are given to those colleagues at G. D. Searle & Co. who helped with computer programs for the project, and with typing and preparation of this report. Special thanks to Miss Dolores Nemec for

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--K. W. L.

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CHAPTER ONE

INTRODUCTION

A mail survey plus a follow-up personal interview study was done among a sample of community pharmacists in Wisconsin to determine costs associated with dispensing prescriptions and with additional prescription services.

A. Purpose of the Study

The purpose of this study is threefold: (1) to measure what it cost community pharmacists in Wisconsin to dispense prescriptions in the year 1968, (2) to find a "good" allocative model or formula (a "cost of dispensing" formula) for separating prescription dispensing costs from nondispensing costs, and (3) to find a model for measuring what it cost community pharmacists to provide such prescription services as delivery, patient record systems, charge account services, and third party payer prescription services.

Hopefully, a by-product of this study will be that pharmacists will be able to determine their own prescription department costs more accurately. This will allow them to price their prescription services more equitably for their patrons, for themselves, and for third party payers.

Also, it is hoped that another by-product of this study will be that pharmacy will have better tools to

measure expenses involved in supplying prescription services from community pharmacies. Armed with a better insight into expense measurement and the limitations of such measurements, it is hoped the profession will perform these measurements in order to deal more effectively with third party payers for prescription services.

Third party payers can benefit also by a comparative study of prescription service measurement. Such cost studies have been done previously by or for third parties such as federal government agencies. Missing from most of these studies are alternative measurement comparisons, or, if done, appropriate alternative methods often are not chosen.

Cries for uniform cost accounting among community pharmacies often are recommended to these latter studies. Since even public utilities are unable to agree on uniform accounting methods, the author hopes to present a reasonable alternative to the development of exact, complex, and lengthy cost accounting procedures in community pharmacies.

It seems more sensible for cost of dispensing investigators to develop a measuring method that can use a pharmacy's current records, rather than try to force pharmacists to conform to new, more extensive and costly record keeping systems.

B. Twelve Desirable Criteria for Measuring Prescription Service Expenses[1]

Twelve possible criteria can be itemized for a cost of dispensing formula which can be used to separate prescription service expenses from the total pharmacy expenses, both for an individual pharmacy and for groups of community pharmacies. These twelve criteria will be defined in measurable, quantitative terms, and nine will be tested as hypotheses in this study. The first five criteria should be applied sequentially to any proposed cost of dispensing formula; the last seven criteria can be applied in any order after the first five. The twelve criteria are not meant to be all inclusive. Other tests could be applied against any proposed cost of dispensing formula.

Without trying to enumerate all possible criteria, twelve desirable criteria about cost of dispensing formulae which could be used to measure prescription service expenses are:

1. Material Criteria

Both a cost of dispensing (COD) formula and each cost element allocation within that formula should be

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1. Ten of these twelve criteria, although redefined in some cases, were mentioned by T. D. Rucker in his discussion about a pharmacy reimbursement formula in "Drug Insurance and Vendor Compensation," California Pharmacist (18:4) October 1970, pp. 20ff.

material from both a logical and a statistical point of view.

(1) Each cost element allocation in a COD formula should be capable of being quantified in dollars and should be obtainable from each pharmacy in the sample. Use of cost elements which are "averages" from a sample of pharmacies, for example, may help "smooth" out a pharmacy's cost of dispensing, but it also may give pharmacies "average" COD's which are misleading. For example, use of 60¢ or 70¢ per prescription for the proprietor's salary instead of the proprietor's salary in each pharmacy divided by the total number of prescriptions dispensed, may give a very misleading COD for a given pharmacy. This proprietor's salary per prescription mean cost also unrealistically narrows the variability of CODs normally found among a group of community pharmacies.

(2) Each cost element allocation in a COD should be calculated independently of its cost subelements. An example of misuse here would be to use the ratio professional salaries to total salaries times, for example, pharmacist salaries for a given pharmacy's allocation of these salaries to the prescription department. An allocation ratio applied against pharmacist salaries should not contain the variable, pharmacist salaries, in the allocation ratio itself.

(3) Each cost element allocation in a COD formula should "work" in all attempts to apply that allocation. An example of misuse here would be Paul's formula where he uses both the ratios (a) prescription sales to total sales times a cost element plus (b) prescription department area to total pharmacy area times the same cost element.[2] In a pharmacy where the majority of sales are prescription sales, therefore, you may be allocating more than 100% of that cost element to the prescription department. To be material statistically, a cost element allocation should never be less than 0% or greater than 100% of that cost element in dollars.

(4) Only "sensible" cost element allocations should be used. Using, for example, the ratio of prescription department area to total pharmacy area times a cost element such as employee pharmacists' salaries may significantly understate prescription department salary costs. Normally, employee pharmacists are hired specifically to spend the major portion of their expensive time in prescription department duties, whereas prescription department areas typically occupy only a minor portion of the total pharmacy area. As a general rule,

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2. Stephen H. Paul, "The Pricing of Prescriptions With Particular Emphasis Devoted to the Fee for Pharmaceutical Service," unpublished Doctoral Dissertation, University of Pittsburgh, Pittsburgh, Pennsylvania, 1967.

the cost allocation ratio should be positively associated with the cost element being allocated.

2. Substitutable Criteria

The "best" cost of dispensing formula is one which most accurately separates true prescription department operating costs from total pharmacy operating costs. Cost elements within this "best" COD formula are most accurately measured by having the investigator observe the operation of each pharmacy in the universe over the desired period of measurement time to see how much time each employee spends in "prescription department duties." Second "best" might be for the investigator personally to ask detailed questions about the operation of each pharmacy in a sample of the universe of pharmacies being measured. Third "best" might be for the investigator, by mail, to ask about less detailed cost elements which could be substituted for the "best" cost elements, which could only be measured or asked about in detail by a personal interview.

In this study, a second "best" cost of dispensing formula will be proposed consisting of the four "best" cost elements which were found in a personal interview survey in 30 community pharmacies in Wisconsin. A "test of substitutability" then will be done comparing this "second best" formula to alternative COD formulae which could be applied to data obtained by mail. It is assumed

that mail collected data from a sample of pharmacies is preferred over personal interview collected data due to the efficiencies that result in both time and money for both the investigator and the pharmacist respondents.

The hypothesis to be tested for substitutability is:

HYPOTHESIS I--Test of Substitutability

> An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin surveyed by mail will equal a mean calculated by summing the best estimators of the four cost elements of prescription department expenses for those same pharmacies surveyed by personal interview.

3. Valid Criteria

Given that a legal, substitutable, and mail applied cost of dispensing formula is found that gives results which approximate results from a personal interview applied COD formula, the prescription expense data submitted by mail first must be checked for validity. This can be done by (1) internal checks built into any mail survey sent to pharmacy respondents, or (2) personal interviews with a sample of mail respondents to check on incorrect data. The former can be done through improved mail questionnaire; the latter can be done or even just implied in the cover letter to mail respondents.

In this study, both validity procedures were done. The mail questionnaire was rewritten to include some internal data checks following several pretests.

Personal interviews were held with a sample of mail respondents and "tests of validity" were done between the mail and the personal interview results.

The hypothesis to be tested for validity in this study is:

HYPOTHESIS II--Test of Validity

An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin surveyed by mail will equal a mean calculated for those same pharmacies surveyed by personal interview.

4. Practical Criteria

After checking the validity of a cost of dispensing formula between cost data submitted by mail and during a personal interview of respondents, it still seems necessary to show that the COD formula produces results which would be statistically similar from one sample of pharmacies to another sample of pharmacies for the same time period. This similarity of results between two pharmacy samples surveyed by mail would then be evidence that accurate measurements could result from the "practical" mail survey method versus the less practical personal interview or personal observation methods.

The test of practicality, then, is:

HYPOTHESIS III--Test of Practicality

An unweighted mean cost of dispensing per prescription calculated for one sample of community pharmacies in Wisconsin surveyed by mail will equal a mean calculated for another sample of pharmacies surveyed by mail.

5. Responsive Criteria

This last sequential criteria, and one of the most important, involves how frequently costs of dispensing should be measured for any given pharmacy, a sample of pharmacies, or all pharmacies. Annual measurement would appear to be the most frequent way that we want to consider; otherwise seasonality factors may affect our computations. Longer than annual periods may be unfair to pharmacy owners in light of inflationary trends.

Unfortunately, no hypothesis testing about frequency of surveying costs of dispensing will be discussed in this study, since only 1968 data were collected.

6. Precise Criteria

A measurement for a given pharmacy should be precise enough to measure a true cost of dispensing. An unweighted mean cost of dispensing calculated for a representative group of pharmacies should be precise enough to be within 10¢ per prescription of the true mean cost of dispensing at a 95% level of confidence, for example. This study will show how many pharmacies' cost data are needed to compute such a level of precision using alternative cost of dispensing formulae.

The hypothesis to be tested here is:

HYPOTHESIS IV--Test of Precision

Mail questionnaire returns from at least 75 representative community pharmacies in

Wisconsin are needed to compute an unweighted mean cost of dispensing per prescription within 10¢ of the true mean for all community pharmacies in Wisconsin at a 95% level of confidence.

7. Adequate Criteria

A prescription price should "cover" the cost of ingredients in a prescription, plus provide a profit to the entrepreneuring pharmacist. While a profit on each prescription dispensed may not be realistic for competitive reasons, a profitable pharmacy usually depends upon its prescription services to provide an overall fair return on a pharmacy owner's investment. Judgements will have to be made by both pharmacy owners as well as the pharmacy profession and third party payers of prescription services as to what profit amount should be attached to their prescription services. This study will examine adequate reimbursement for community pharmacy prescription services in Wisconsin.

An hypothesis to be tested here is:

HYPOTHESIS V--Test of Adequacy

Costs of dispensing per prescription, plus a 10% profit before taxes on total prescription sales per prescription, are equal to gross margins per prescription for community pharmacies in Wisconsin.

8. Discriminate Criteria

Given that a precise measurement of pharmacy prescription department costs can be made, should there be any fundamental ways that costs per prescription dispensed can vary? Does it cost more to dispense in one geographical area or in one city size versus another? Do total pharmacy sales, total prescription sales, or the number of prescriptions dispensed daily affect these costs in a predictable manner? Does the number of years of the same ownership of pharmacies make a difference? Does the average prescription charge relate to costs of dispensing? Correlation techniques will be used in this study to answer these questions which may tend to discriminate costs of dispensing among groups of pharmacies having different demographic or size variables.

The hypothesis to be tested here is:

HYPOTHESIS VI--Test of Discrimination

> Costs of dispensing per prescription are equal for pharmacies which otherwise differ by geographical location, by city size, by the numbers of prescriptions dispensed daily, by total pharmacy sales, by total prescription sales, by the number of years the pharmacy has been under the same ownership, and by the "average" (weighted mean) prescription prices charged to patrons.

9. Inclusive Criteria

Do computed costs of dispensing include expenses of such measurable costs as prescription delivery services, patient record services, charge account services, and

third party payer administration time and payment delays? This study attempts to quantify service expenses such as these; quality of these services plus patient consultation time should show up in the percent of pharmacists' time, and therefore salaries, to be allocated to prescription departments.

The hypothesis to be tested here is:

HYPOTHESIS VII--Test of Inclusion

> Costs of dispensing per prescription for community pharmacies in Wisconsin are the same whether or not they include expenses incurred for such prescription department services as prescription delivery, patient records, prescription charge accounts, third party payer prescriptions, or continuing education costs.

10. Neutral Criteria

Two major expense allocations must be made in a pharmacy's prescription department whenever a pharmacy's prescription sales do not equal total pharmacy sales: those of labor and those of nonlabor. Since labor traditionally is about 70% of a pharmacy's total expenses, an unbiased means of allocating labor expense is most important. This study will consider at least 18 different ways of allocating labor expenses to a prescription department. Most important, which employees' time should be allocated 100% to a prescription department, which only a percent of their time, and which only an amount equal to a ratio such as prescription sales to total sales? The

allocative methods used should be neutral so as to avoid over or under stating of these prescription department expenses.

No specific hypotheses will be tested about the neutrality of cost of dispensing formulae.

11. Simple Criteria

Any allocative method used should be simple to use and to understand. It is difficult to allocate varying proportions of nonlabor expenses to the prescription department. This study will show that confusion about these allocations exist, and will test alternative ways of allocating such expenses. Many solutions have been offered such as applying combinations of floor space and sales ratios to individual nonlabor expense categories such as rent, utilities, and telephone expenses. Can total nonlabor expenses be allocated as a group, or is it necessary to allocate the individual nonlabor expense items? Certainly a questionnaire could be simplified and the number of editing assumptions reduced if all nonlabor expenses could be considered as a group without loss of precision.

The hypothesis to be tested here is:

HYPOTHESIS VIII--Test of Simplicity

An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin by allocating prescription department nonlabor expenses

by the ratio of prescription sales to total sales times total pharmacy nonlabor expenses will equal a mean calculated by allocating individual pharmacy nonlabor expense items by the following formulae:

Pharmacy Nonlabor Expense Item	Allocation Ratio Used
Rent Heat, light, and power	Rx department area to total pharmacy area
Taxes Insurance Advertising Depreciation Delivery Telephone Accounting, legal, and other professional fees Miscellaneous expenses	Rx sales to total pharmacy sales
Licenses, dues, and subscriptions	100% direct allocation

12. Effective Criteria

Cost of dispensing efficiencies must be encouraged by any allocative formulae used; effectiveness of these formulae are better insured if allocation bias can be minimized, either by the pharmacy owner, the pharmacy profession, or third party payers of prescription services. One expense element often the source of much confusion by all these groups is allocation of nonpharmacists labor expenses to the prescription department. Pharmacy owners tend to minimize the involvement of nonpharmacist time spent in prescription department duties because of possible legal problems involved; the pharmacy profession

tends to overestimate time spent in providing services to patrons over and above just dispensing prescriptions, and third party payers tend to forget that nonpharmacists are even employed in a pharmacy to aid pharmacists in providing prescription services.

This study will examine alternative allocative methods for nonpharmacist wage expenses, both before and after personal interviews with pharmacy owners and managers. Also an attempt will be made to examine by comparison whether (1) a percent of total nonpharmacist time, and therefore wages, should be allocated to the prescription department, (2) whether a summed wage should be calculated for helping to provide less direct prescription services such as delivery, charge account services, patient record services, and third party prescription payer administration, or (3) whether a ratio such as prescription sales to total sales times total nonpharmacists' wages should be used.

The hypothesis to be tested here is:

HYPOTHESIS IX--Test of Effectiveness

An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin by allocating nonpharmacist prescription department labor expenses by the ratio of prescription sales to total sales times total pharmacy nonpharmacist labor expenses will equal a mean calculated by allocating nonpharmacist labor expenses by the percentage of time spent in prescription department duties.

C. Comparison of Cost of Dispensing Formulae

Part of any testing of a specific cost of dispensing formula should include a comparison of it with other proposed cost of dispensing formulae. In this study a new "Wisconsin" cost of dispensing formula will be proposed which then will be compared to seven other formulae found either in cost of dispensing literature or in unpublished studies done by the author. Conceivably all seven of these alternative cost of dispensing formulae could produce results which could pass many of the previous twelve criteria for an acceptable cost of dispensing formula. However, only a "test of comparability" will be performed using these formulae in this study.

The hypothesis to be tested for comparability is:

HYPOTHESIS X--Test of Comparability

> An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin surveyed by mail using the Wisconsin cost of dispensing formula is "as good as or is better" than seven alternative cost of dispensing formulae.

The findings of this study will include all ten of the proposed hypotheses.

CHAPTER TWO

DEFINITIONS

Standardization and precision of terminology are important for a study like this, so mathematical symbols will be used throughout. Hopefully, the symbols used will bear some resemblance to the data being discussed. Since this study's results are intended more for the non-mathematician than the mathematician, some mathematical liberties have been taken. Also, the author assumes that usual pharmaceutical terms and accounting terms are understood by the reader.

A. Prescription Price Components for a Pharmacy

A prescription price can be thought of as consisting of three cost elements, namely, (1) the cost of ingredients (goods) for that prescription, (2) the cost of dispensing the prescription, and (3) the "cost" of a profit for that prescription. In this study Rx will refer to the word "prescription," $COG will mean "cost of ingredients" or "cost of goods", $COD will mean "cost of dispensing", and $Pr will signify "profit." $Rx will refer to the prescription price to a patron.

$$\text{Prescription price} = \$Rx = \$COG + \$COD + \$Pr$$

Summing $Rx for all prescriptions dispensed in a pharmacy for a given time period gives us total prescription sales, or Rx sales $= \Sigma\$RX = \Sigma\$COG + \Sigma\$COD + \Sigma\$Pr$.[1] Dividing Rx sales by the total number of prescriptions dispensed (Rxs), to include both new (original) Rxs plus refill (renewal) Rxs, gives us these data on a per prescription basis.

$$\text{Thus } \frac{\text{Rx sales}}{\text{Total Rxs}} = \frac{\Sigma\$Rx}{Rxs} = \frac{\Sigma\$COG}{Rxs} + \frac{\Sigma\$COD}{Rxs} + \frac{\Sigma\$Pr}{Rxs}$$

The term, ($\Sigma\$Rx/Rxs$), really is the "<u>average" (mean) prescription price</u> which we will designate as $\$\overline{Rx}$. The term, ($\Sigma\$COD/Rxs$), we will call a <u>mean cost of dispensing</u> per prescription, or just COD.

This study concerns itself with measuring the cost of dispensing per prescription (COD). Total costs of dispensing, $\Sigma\$COD$, can be defined as the total operating costs of the prescription department for a given pharmacy. They include the "normal" cost components[2] of an income

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1. The symbol, Σ, is used for the summation, $\sum_{i=1}^{n}$, where $i = 1,2,\ldots,n$. In this example, n is the total number of prescriptions dispensed in the given time period.

2. "Normal" cost components usually include proprietor(s)' or manager's salary; employee wages and salaries; rent; taxes; advertising; depreciation; heat, light, and power; delivery; telephone; licenses, dues, and subscriptions; accounting, legal and other professional fees; and "miscellaneous" expenses.

statement for a pharmacy which have been allocated to the operation of that pharmacy's prescription department. More important perhaps, is what $\leq$\$COD do not include. For this study, $\leq$\$COD will not include any profit or return on investment component, any cost of capital or cost of inventory component, or any other implicit costs. All explicit costs, both labor and nonlabor costs, are included.

In the professional fee method of pricing, a prescription price can be thought of as a function of the previous year's COD, plus a profit per prescription, plus the cost of goods for the prescription being dispensed. For one pharmacy for example, if $\leq$\$COD = \$18,000 the past year for 10,000 prescriptions dispensed, the pharmacy's COD = \$1.80. If Rx sales the past year were \$40,000 and the desired profit on Rx sales was 15%, then the profit per prescription = (\$40,000 x 0.15)/10,000 = (\$6,000/10,000) = \$0.60. Thus for the current year, the COD + desired profit per prescription, assuming another 10,000 prescriptions are dispensed, will be \$1.80 + \$0.60 = \$2.40. This \$2.40 is called the professional fee and will be added to the cost of goods for each prescription dispensed. Thus, a given prescription price for the current year will be \$Rx = \$COG + \$2.40.

Notice that with this definition of a professional fee that the desired profit per prescription is not a set percent of the final prescription price; the profit

percent varies as the $COG varies. An example of this is:

$COG	+	COD	+	Desired profit per prescription	=	$Rx	Professional fee = (COD+profit)
$2.00 (45%)	+	$1.80 (41%)	+	$0.60 (14%)	=	$4.40 (100%)	$2.40
$8.00 (77%)	+	$1.80 (17%)	+	$0.60 (6%)	=	$10.40 (100%)	$2.40

That these percents vary as $COG varies is important as a frequent error made when discussing the use of a "professional fee" is that a set percent profit per prescription is used. If a set percent profit per prescription is used, you then have a "sliding" or "modified" professional fee.[3] For example, suppose a 15% profit per prescription is desired:

$COG	+	COD	+	Desired profit per prescription	=	$Rx	Professional fee = (COD+profit)
$2.00	+	$1.80	+	15%($Rx)	=	$Rx	$1.80+15%($Rx)
$8.00	+	$1.80	+	15%($Rx)	=	$Rx	$1.80+15%($Rx)

$$\$Rx = \$3.80 + 0.15(\$Rx)$$

$$\$Rx - 0.15(\$Rx) = \$3.80$$

$$(1.00 - 0.15)(\$Rx) = \$3.80$$

$$0.85(\$Rx) = \$3.80$$

$$\$Rx = \$3.80/0.85 = \$4.47$$

Likewise, $\$Rx = \$9.80/0.85 = \$11.53$

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3. Hugh A. Cotton and F. C. Hammerness, "Prescription Pricing: The Cost Factors Involved," PM-Pharmacist's Management Journal (3:8) August 1969, p. 35.

Therefore,

$COG	+	COD	+	Realized profit per prescription	=	$Rx	Professional fee = (COD+profit)
$2.00 (45%)	+	$1.80 (40%)	+	$0.67 (15%)	=	$4.47 (100%)	$2.47
$8.00 (69%)	+	$1.80 (16%)	+	$1.73 (15%)	=	$11.53 (100%)	$3.53

The "sliding" professional fee now varies from prescription to prescription, while the profit <u>percent</u> for each prescription remains the same. The "regular" professional fee has the profit <u>amount</u> remain the same from prescription to prescription. An advantage of the regular professional fee method is that high cost of goods prescriptions are lower in price to the consumer than when the sliding professional fee is used as shown on the previous page. A disadvantage is that the regular professional fee is based upon the previous year's prescription experience.

Another term we will use is <u>gross margin</u>. This is defined as Rx sales $-\Sigma\$COG$ = total gross margin, or since Rx sales $=\Sigma\$COG+\Sigma\$COD+\Sigma\$Pr$, therefore Rx sales $-\Sigma\$COG=\Sigma\$COD+\Sigma\$Pr$ = total gross margin. Notice, in the aggregate, that total gross margin $=\Sigma\$COD+\Sigma\$Pr=\Sigma(\$COD+\$Pr)$ = the total professional fees. Therefore, the gross margin per prescription equals the professional fee per prescription.

Summarizing:

1) For a given prescription:

	Example
Prescription price = $Rx	$10.40
Cost of goods = $COG	$ 8.00
Gross margin or professional fee	$ 2.40
Cost of dispensing = $COD	$ 1.80
Profit = $Pr	$ 0.60
Number of prescriptions = Rx	one

2) For all prescriptions for a given pharmacy in a given time period:

	Example
Total prescription sales = $\Sigma$$Rx	$40,000
Total costs of goods = $\Sigma$$COG	$16,000
Total gross margin or total professional fees	$24,000
Total costs of dispensing = $\Sigma$$COD	$18,000
Total profits = $\Sigma$$Pr	$ 6,000
Total number of prescriptions = Rxs	10,000

3) For the "average" (mean) prescription for the pharmacy above:

	Example
Mean prescription price = $\overline{\$Rx}$	$ 4.00
Mean costs of goods = COG	$ 1.60
Gross margin per Rx or professional fee per Rx	$ 2.40
Mean cost of dispensing = COD	$ 1.80
Mean profit = $\overline{\$Pr}$	$ 0.60

The mean cost of dispensing, COD, often is called the "break-even" point, since unless the gross margin per Rx is equal to the COD or greater, the pharmacy will be operating their prescription department at a loss.

The importance of cost dispensing determination can best be shown by an example. Assume that Rx sales, cost of goods, and the number of Rxs stay the same for three years in a row for a given pharmacy, in the face of rising costs.

	Year 1	% of Rx sales	Year 2	% of Rx sales	Year 3	% of Rx sales
Rx sales	$40,000		$40,000		$40,000	
≤$COG	$16,000	(40%)	$16,000	(40%)	$16,000	(40%)
Total gross margin or total professional fees	$24,000	(60%)	$24,000	(60%)	$24,000	(60%)
≤$COD	$18,000	(45%)	$23,000	(57.5%)	$28,000	(70%)
≤$Pr	$ 6,000	(15%)	$ 1,000	(2.5%)	$-4,000	(-10%)

From this example we can see it is possible then for costs of dispensing actually to be higher than gross margin or professional fees. However, this would mean the prescription department is operating at a loss. Frequent measurement of costs of dispensing therefore are important; measuring only gross margins for prescription sales, as many pharmacists do, merely masks potential profit problems.

B. Cost of Dispensing Components

In general, there are two major operating cost components in a pharmacy: labor and nonlabor expenses. Comparing methods of allocation of both these expense categories to the prescription department is a major

purpose of this study. A cost of dispensing for a pharmacy refers only to those labor and nonlabor costs allocated to the prescription department. Again, only explicit, not implicit, prescription department operating costs are defined as being costs of dispensing for this study. Explicit costs are "real" costs in that they appear in an income (profit and loss) statement.

Labor expenses, for this study, are divided threefold among a proprietor(s) or a manager salary (PS), employee pharmacist salaries (RPhs), and nonpharmacist wages and salaries (nonRPhs). Included in the "pharmacists" category are both full-time and part-time pharmacists as well as pharmacy interns and externs. "Nonpharmacists" include all employed personnel other than the proprietor(s), manager, or pharmacists. These categories include only those personnel for whom social security taxes are paid by the pharmacy, and do not include such people as consulting attorneys, accountants, refuse collectors, and so forth. One implicit personnel cost which could be included would be a "normal" salary for a relative or friend who is working for the pharmacy for little or no salary or wages.

Nonlabor expenses include all pharmacy operating costs other than employed labor wages and salaries. Generally these costs appear in expense categories such as: rent; heat, light and power; accounting, legal, and other professional fees; taxes and licenses; insurance; interest paid; repairs; delivery; advertising; depreciation; bad

debts; telephone; and miscellaneous expenses.[4] For this study, interest paid, repairs, and bad debts were grouped together with miscellaneous expenses because of their minor cost significance; licenses, dues, and subscriptions were put in a separate expense category; and "other employee benefits" was added as a separate expense item. Frequently this latter expense category appears outside the total expense itemization in a pharmacy's income statement such as employees' bonuses, for example, which may be calculated as a set percent of net profit before taxes. In any case, it represents an explicit cost to a pharmacy's operation.

C. Operating Cost Allocations to the Prescription Department

Prescription department operating costs are equal to the total pharmacy operating costs only if 100% of pharmacy sales are for prescription services. Normally prescription department costs are less than pharmacy operating costs.

Pharmacy labor expenses can be allocated to the prescription department several ways; three common methods are (1) 100% allocation; (2) percent time spent in

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4. These categories are used in the Lilly Digest, published annually by Eli Lilly and Company, Indianapolis, Indiana.

prescription department duties times salaries and wages, and (3) the ratio Rx sales to total sales times salaries and wages. Different allocations can be applied to the salary or wage of each employee, or to groups of employees.

Pharmacy nonlabor expenses also can be allocated several different ways to the prescription department (Rx dept.), either as a group or as individual expense categories. Possible allocation methods include (1) the ratio of Rx sales to total sales times these costs, (2) the ratio of Rx dept. area to total pharmacy area (usually measured in square feet) times these costs, or (3) the ratio of the value of Rx dept. inventory to total pharmacy inventory, usually expressed as a percent of the total expense item under discussion, for example, 45% of total pharmacy insurance costs.

D. Cost of Dispensing per Prescription (COD) Formulae

Total costs of dispensing for a given pharmacy are divided by the number of prescriptions dispensed in that pharmacy to give us a cost of dispensing per prescription (COD). In other words, the sum of a pharmacy's prescription department costs is divided by the total number of original plus renewal prescriptions dispensed, usually for a one-year period.

$$COD = \frac{\leq Rx \text{ dept. costs}}{Rxs} = \frac{\leq \$COD}{Rxs}$$

The critical part of the COD equation is, of course, the numerator, total Rx dept. costs. In looking for an ideal formula for this numerator, let us first consider the total number of different combinations possible just given different possible allocations for three labor expense categories: (1) proprietor(s) or manager salaries (PS), (2) pharmacist employee salaries (RPhs), and (3) nonpharmacist employee salaries and wages (nonRPhs).

Since there are at least three ways to treat both PS and RPhs, and two ways to treat nonRPhs, there are $3 \times 3 \times 2 = 18$ different combinations of allocating these expense categories (see Table I). This study will compare results obtained from six of these combinations, while simultaneously allocating all total nonlabor expenses to the Rx dept. by multiplying them times the ratio Rx sales to total sales, or (RXS/TS) times nonlabor expenses. Three of these combinations have appeared in the COD literature; the other three have not. For example, 60% of total sales may be Rx sales, so nonlabor expenses will be multiplied by 0.60 and added to the numerator of our COD equation.

Two additional CODs will be tested using alternative allocation schemes for nonRPh labor expenses and for nonlabor expenses.

TABLE I

POSSIBLE SALARY AND WAGE ALLOCATIONS TO THE PRESCRIPTION DEPARTMENT

Proprietor(s) or Manager (PS)	Pharmacist Employees (RPhs)	Nonpharmacist Employees (nonRPhs)
1. 100% allocation	1. 100% allocation	
2. Time allocation	2. Time allocation	1. Time allocation
3. $\frac{RXS^*}{TS}$ allocation	3. $\frac{RXS}{TS}$ allocation	2. $\frac{RXS}{TS}$ allocation

The following 18 combinations of labor allocation then are possible:

Rx Dept. Labor Allocations

COD Combination	PS	RPhs	nonRPhs
A	1	1	1
B	1	1	2
C	1	2	1
D	1	2	2
E	1	3	1
F	1	3	2
G	2	1	1
H	2	1	2
I	2	2	1
J	2	2	2
K	2	3	1
L	2	3	2
M	3	1	1
N	3	1	2
O	3	2	1
P	3	2	2
Q	3	3	1
R	3	3	2

*The ratio prescription sales to total pharmacy sales.

E. Summarizing Cost of Dispensing Data

Summarizing CODs among pharmacies should give us a means to test hypotheses about them. In summarizing CODs, the following definitions will be used, remembering that an individual pharmacy COD = $\frac{\Sigma \text{Rx dept. costs}}{\text{Rxs}}$:

unweighted mean COD = COD_u

This term applies whenever we compute CODs from individual pharmacies and then sum these CODs and divide by the number of pharmacies.

$$COD_u = \frac{\Sigma COD_i}{n}, \text{ where } i = 1,2,\ldots,n \text{ pharmacies}$$

weighted mean COD = COD_w

This term applies whenever we compute Rx dept. costs from individual pharmacies and then sum those expenses and divide by the summed number of prescriptions dispensed from these pharmacies.

$$COD_w = \frac{\Sigma \$COD_i}{\text{Rxs}}, \text{ where } i = 1,2,\ldots,n \text{ pharmacies}$$

"average" mean COD = COD_a

This term applies whenever we compute a mean Rx dept. cost from mean cost components and a mean number of prescriptions dispensed from a group of pharmacies and then apply a COD formula against these mean data.

$$COD_a = \frac{\frac{\Sigma \$COD_i}{n}}{\frac{\text{Rxs}}{n}}, \text{where } i = 1,2,\ldots,n \text{ pharmacies}$$

Neither COD_w nor COD_u is a preferred way of expressing a mean COD, except that only with the unweighted mean (COD_u) can any statistical tests be applied. This is because the variability of CODs can be measured, since CODs are computed for all individual pharmacies first before a mean is calculated. When COD_w is used, only the variability of Rx dept. costs or of the number of Rxs dispensed can be expressed, as these data are computed or collected from all individual pharmacies first before they are summed and a mean weighted COD is calculated.

All statistical tests employed in this study involve the use of the unweighted mean cost of dispensing, COD_u, as a per prescription expression of costs. However, both COD_w and COD_u will be shown for most summarized pharmacy operations data.

CHAPTER THREE

LITERATURE REVIEW

Cost of dispensing determinations have been done for many years, but the advent of third party payer prescription services seems to have sparked a renewed need for these studies. This especially has been true since the advent of Medicaid (Title XIX of the Social Security Act of 1965) wherein most state governments, with federal sharing of costs, administer the reimbursement of prescription services rendered by vendors, usually community pharmacies, to categorically needy and often to medically needy groups in their states. Usually reimbursement to these pharmacies is on a per prescription basis, and normally payment covers the "acquisition cost" of a prescription's ingredients plus a "dispensing fee." This fee amount to an individual pharmacy ostensibly "covers" a pharmacy's cost of dispensing per prescription plus a profit component. In this sense the "dispensing fee" would be similar to a "professional fee." However, normal use of the latter term connotes it was determined independently by the pharmacist proprietor and includes a profit component, whereas the former term may not.

The Federal Register has given guidance to states in determining what the amount of this fee should include, "The dispensing fee should be ascertained by analysis of

(community) pharmacy operational data which includes components of overhead, professional services, and profit."[1] The federal government's policy has led almost all other third party payers and administrators into first reimbursing community pharmacy vendors on a per prescription basis based on a dispensing fee for service basis, and second into reimbursing at about the same absolute dollar amount for each prescription dispensed for their beneficiaries.[2]

A. Previous Surveys

Examination of the literature about cost of dispensing determinations and past surveys reveals the use of alternative cost of dispensing per prescription (COD) formulae and different ways of expressing the summary results of such surveys. This review will discuss the major formulae which have been proposed, and the relative merits of each, rather than concentrating on the summary findings in surveys which have been done using the formulae. Frequently, results of these surveys present the "average" cost of dispensing found among respondents without revealing to which "average" they are referring, to the unweighted or weighted mean, the median, or the

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1. Federal Register (34:17) January 25, 1969, p. 1244.
2. A recent (as of July 1, 1971) list of major third party payers and the absolute dollar amount of their per prescription dispensing fees appears in Prescription Drug Data Summary, Social Security Administration, U.S. Department of Health, Education and Welfare: Washington, D.C., 1972, pp. 36-37.

mode. Later in the findings of this study, results using these major alternative COD formulae will be presented and compared when applied against the same set of pharmacy operations data. Care will be taken to distinguish which "average" is being discussed.

All COD formulae presented may be shown two ways, first as described in the literature, and second as broken down into the four main categories of prescription department expenses: proprietor(s) or manager salaries (PS), pharmacist employee salaries (RPhs), nonpharmacist employee salaries and wages (nonRPhs), and nonlabor expenses (nonlabor). Each formula is calculated on a prescription basis by dividing by the total number of original and renewed prescriptions (Rxs). None of the COD formulae include any profit component; each represents a cost of dispensing and not a professional fee.

B. The American College of Apothecaries Cost of Dispensing Formulae

One of the first cost of dispensing formulae which was used on recurring pharmacy operations data, was a formula first described by Abrams,[3] which was used in

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3. Robert E. Abrams, "The Professional Fee Concept," Bulletin of the Ontario College of Pharmacy (11:3) May 1962, p. 47.

annual surveys of member pharmacies by the American College of Apothecaries.[4] Origin of the formula is unknown,[5] although Abrams and Howard J. Fuller discussed cost of dispensing formulae as early as 1957.[6]

1. The COD(ACA#1) Formula

As shown in the Definitions section, the ACA formula can be expressed either as:

$$\text{COD(ACA\#1)} = \frac{PS + (RXS/TS)(TE - PS)}{Rxs}$$

or, because total expenses, TE = PS+RPhs+nonRPhs+nonlabor, as:

$$\text{COD(ACA\#1)} = \frac{PS}{Rxs} + \frac{(RXS/TS)RPhs}{Rxs} + \frac{(RXS/TS)nonRPhs}{Rxs} + \frac{(RXS/TS)nonlabor}{Rxs}$$

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4. These surveys were called "Facts on the Operation of Prescription Pharmacies," published by the American College of Apothecaries, Philadelphia, Pennsylvania (headquarters now in Washington, D.C.). The last (undated) survey published which showed cost of dispensing calculations was the "Twelfth Annual Survey" covering 1963 pharmacy operations data from 208 pharmacies.

5. Personal correspondence from Robert E. Abrams, August 20, 1969.

6. Howard J. Fuller, "The Cost of Dispensing," Bulletin of the Ontario College of Pharmacy (11:3) May 1962, p. 51.

A frequent mistake made is attempting to calculate a weighted mean COD(ACA#1) for a group of pharmacies from mean pharmacy operations data such as that which appears annually both in the Lilly Digest and in the Canadian Pharmaceutical Journal. No meaningful weighted mean COD(ACA#1) results as demonstrated in the Definitions section, because the unweighted mean ratio of prescription sales to total pharmacy sales (RXS/TS) is needed rather than what is available in those compendia, namely, a weighted mean RXS figure and a weighted mean TS figure. These two weighted mean variables cannot even be combined into $\overline{X}_w(RXS)/\overline{X}_w(TS)$ to form a true weighted mean RXS/TS variable, because $\overline{X}_w(RXS)/\overline{X}_w(TS)$ does not equal $\overline{X}_w(RXS/TS)$. Proof of this is shown in Appendix H.

Proprietor(s) and manager salaries are allocated 100% to the prescription department in the COD(ACA#1) formula. This may be appropriate in pharmacies having only one pharmacist, the owner, but may not be appropriate in pharmacies where the proprietor spends little time in dispensing duties. Another problem arises when either little or no proprietor salary as such is reported or when the salaries of partners or a very high proprietor salary is reported. Previous cost of dispensing investigators have dealt differently with these problems.

Abrams used "one and one-half times the pharmacist's salary" as an acceptable measure for a proprietor's

salary.[7] Burley, et al. used the going rate for an employee pharmacist plus a "managerial bonus of 2% of sales less $800" for pharmacies with total pharmacy sales of $200,000 or less a year.[8] The managerial bonus of 2% of total pharmacy sales less $800 is the same as 2% of (total pharmacy sales - $40,000). Thus, total sales of a pharmacy must exceed $40,000 before any bonus accrues to the proprietor. Burley gave no rationale for the entire proprietor's salary formula nor gave any clue as to its origin. He did include a table of maximum proprietor salaries for total pharmacy sales, based upon a maximum proprietor salary as a percent of total pharmacy sales (PS/TS) for each of 17 annual sales categories. These ranged from PS/TS of 15.0% for total sales of $40,000 to PS/TS of 5.2% of total sales of $200,000.[9] Burley gave no guidance about pharmacy sales of over $200,000, even though he had two pharmacies in his sample with total "realized" sales of $212,794 and $328,613, respectively.

Slavin continues to use the formula, "going rate for a pharmacist plus two percent of sales in excess of

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7. Personal correspondence from Robert E. Abrams, August 20, 1969.

8. Orin E. Burley, Albert B. Fisher, Jr., and Robert G. Cox, Drug Store Operating Costs and Profits, McGraw-Hill: New York, 1956, p. 25.

9. Ibid., p. 438.

$50,000," as a check on a reasonable "pharmacist-manager" salary.[10] The bonus portion of this salary translates into 2% of (TS - $50,000) compared to Burley's 2% of (TS - $40,000). Slavin uses his formula as a check when editing returns from pharmacy respondents to the annual Lilly Digest surveys of pharmacy operations. This proprietor salary "correction" replaces an actual reported proprietor salary when the actual salary is more than 30% above or below that which is calculated using his formula.[11]

Fuller continues to show a table of Standard Proprietor Compensations, which is displayed for varying total pharmacy sales, in his annual surveys of Canadian pharmacy operations.[12] He does not describe how reported proprietor salaries are edited in these surveys.

Employee pharmacist salaries in the COD(ACA#1) formula may be understated when allocated by the (RXS/TS) ratio. Later it will be shown in this study that "percent of total time spent in prescription duties" times each employee pharmacist salary gives a "better" allocation of

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10. George S. Slavin, Jr., "Financial Management," Minnesota Pharmacist (25:2) November 1970, p. 18.

11. Personal communication with George S. Slavin, Jr., May 7, 1972.

12. For example, see Howard J. Fuller, "Canadian Community Pharmacy in 1972," The Canadian Pharmaceutical Journal (106:8) August 1973, insert following page 248.

this variable than does the ratio of prescription sales to total pharmacy sales. The percent of time factor was acknowledged to be more accurate than RXS/TS even back in 1950-1951.[13]

Previous surveys where the COD(ACA#1) formula was used to determine dispensing costs include those done by Taubman, Crombe and Jacoff among 27 pharmacies in Rhode Island, and by R. A. Gosselin and Company, among 18 pharmacies in Massachusetts. COD(ACA#1)'s in the "fiscal year 1966-67" of from $0.96 through $2.07 (unweighted mean $1.40, median $1.32) were reported by Taubman, et al.[14] Gosselin reported COD(ACA#1)'s of from $0.81 through $2.89 (unweighted mean $1.76, weighted mean $1.65, and median $1.74) for both calendar years 1967 (9 pharmacies) and 1968 (9 pharmacies) taken together.[15]

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13. Burley, et al., op. cit., p. 220.

14. Albert H. Taubman, David H. Crombe, and Michael D. Jacoff, "Projected Fees for Pharmaceutical Services," unpublished paper presented at the American Pharmaceutical Association meeting, Miami Beach, Florida, May 1968.

15. Survey of Pharmacy Operations in Massachusetts in 1968, R. A. Gosselin and Company: Dedham, Massachusetts, October 1969.

2. The COD(ACA#2) Formula

A second COD formula, which is patterned after the COD(ACA#1) formula, is one which can be used instead of the ACA#1 formula whenever the proprietor or manager of a pharmacy is not a pharmacist. This especially would be more appropriate than COD(ACA#1) for chain store pharmacies having a nonpharmacist manager, or in pharmacies where the proprietor or manager primarily works outside of the prescription dispensing area.

This COD(ACA#2) formula can be expressed as:

$$\text{COD(ACA\#2)} = \frac{\text{RPhs} + (\text{RXS}/\text{TS})(\text{TE} - \text{RPhs})}{\text{Rxs}}$$

or as:

$$\text{COD(ACA\#2)} = \frac{(\text{RXS}/\text{TS})\text{PS}}{\text{Rxs}} + \frac{\text{RPhs}}{\text{Rxs}} + \frac{(\text{RXS}/\text{TS})\text{nonRPhs}}{\text{Rxs}} + \frac{(\text{RXS}/\text{TS})\text{nonlabor}}{\text{Rxs}}$$

This formula gives recognition to the fact that a nonpharmacist proprietor or owner of a pharmacy probably will spend less of his time in "prescription department duties" than will a pharmacist proprietor or owner, and thus less of his salary is being allocated to the prescription department than in COD(ACA#1). Employee pharmacist salaries, however, are allocated 100% to the prescription department with this formula, which makes sense in that a pharmacist must be present in a pharmacy's prescription department and related drug product selling area in order for that department area to remain open for

business. Recognition thus is given that employee pharmacists, rather than the manager, are responsible for most of the prescription dispensing service being provided to patrons.

No published surveys using this formula were found.

C. The California Cost of Dispensing Formula

The California COD formula was described in words in the literature but translates into:

$$COD(CALIF) = \frac{PS(\%\ TIME)}{Rxs} + \frac{RPhs(\%\ TIME)}{Rxs} + \frac{nonRPhs(\%\ TIME)}{Rxs} + \frac{(RXS/TS)nonlabor}{Rxs}$$

according to the authors.[16,17] All salaries and wages are allocated to the prescription department based upon "time spent in the prescription department." One of the authors argues that nonlabor expenses can be allocated as a group to the prescription department without any significant loss of precision.[18]

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16. Max Polinsky and Franklin S. Rice, "California Pharmacy Expense Study Operational Factors," California Pharmacy (15:8) February 1969, p. 12.

17. Letter from Max Polinsky to Robert W. Hammel, April 14, 1969.

18. Max Polinsky, "The Professional Fee: Another Look," California Pharmacist (18:5) November 1970, p. 10.

Polinsky and Rice surveyed 4,235 community pharmacies in California by mail in April 1968, and reported an "average" COD(California) of $1.89 for 724 useable replies.[19] The averages among 47 counties ranged from $1.36 through $2.26, although they reported no statistical difference between the Northern Region and the Southern Region of California.[20]

D. The Canada Cost of Dispensing Formula

The Canada cost of dispensing formula appears as:

$$COD(Canada) = 60¢ + \frac{(RXS/TS)(TE - PS)}{Rxs}$$

which can be translated to:

$$COD(Canada) = 60¢ + \frac{(RXS/TS)RPhs}{Rxs} + \frac{(RXS/TS)nonRPhs}{Rxs} + \frac{(RXS/TS)nonlabor}{Rxs}$$

This formula has been Fuller's modification of COD(ACA#1), where 60¢ per prescription has replaced any allocation of the actual proprietor's salary.[21] The

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19. Max Polinsky and Franklin S. Rice, op. cit., p. 14.

20. Ibid., pp. 13-14.

21. Howard J. Fuller, "The Cost of Dispensing," Bulletin of the Ontario College of Pharmacy (11:3) May 1962, p. 51.

figure, 60¢ per prescription, actually started as 50¢ in 1962 but has increased in 10¢ increments in various years in the annual Canadian Pharmaceutical Journal surveys of community pharmacy operations data. In the 1972 survey, 80¢ per prescription was used in calculating costs of dispensing among various categories of pharmacies.[22] The 60¢ figure was used in the surveys from 1965-1968.

Fuller's rationale for the COD(Canada) formula was based on its comparability to the COD(ACA#1) formula. He found the latter formula gave an unrealistically high proprietor's salary per prescription when applied to pharmacies having low ratios of prescription sales to total sales or having a low number of total prescriptions dispensed.[23] He admits that replacing the actual proprietor's salary with a set figure per prescription produced a narrow range of differences among different categories of pharmacies.

E. The Allocation Cost of Dispensing Formulae

Many cost of dispensing studies have been done which assigned total pharmacy salaries and wages to the prescription department based at least in part on "by the

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22. Howard J. Fuller, "Canadian Community Pharmacy in 1972," The Canadian Pharmaceutical Journal (106:8) August 1973, insert following page 248.

23. Howard J. Fuller, "The Cost of Dispensing," op. cit., p. 52.

percentage of time spent" and allocated individual pharmacy nonlabor expense items to the prescription department either (1) by such ratios as prescription sales to total pharmacy sales and prescription department floor area to total pharmacy area, or (2) by direct 100% allocations, the value of prescription department furniture and fixtures (depreciation), or prescription department asset values (insurance, property taxes), plus others. This type of allocation COD formula can be shown as:

$$COD(ALLOC) = \frac{PS(\%\ TIME)}{Rxs} + \frac{RPhs(\%\ TIME)}{Rxs} + \frac{nonRPhs(\%\ TIME)}{Rxs} + \frac{nonlabor(ALLOC)}{Rxs}$$

where nonlabor(ALLOC) represents the individual nonlabor expense item allocations. The rationale emphasis here is based upon more precise allocations of nonlabor cost elements rather than allocating them as a group. This rationale probably has caused the most pleas for uniform cost accounting for all community pharmacies as well.[25]

The relative unimportance of the total nonlabor expense variable as a percent of total prescription department expenses remains unmentioned. Burley, et al. showed nonlabor expenses to be only a median 33% of total

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25. For example, see Hugh A. Cotton and T. Donald Rucker, "Prescription Cost Determination in Kansas," Journal of the American Pharmaceutical Association (NS 12:8) August 1972, p. 415.

prescription department expenses among 12 pharmacies in 1950-1951, while Rodowskas preliminarily showed an "average" 28% or 19% (two alternative labor allocations were attempted) of total prescription department expenses to be nonlabor items among 29 pharmacies in 1970.[26,27] Both of these personal interview surveys, performed 20 years apart, involved time and motion techniques in measuring labor's time in prescription department duties as well as detailed nonlabor expense measurement. They are the only two such surveys known involving as many as 12 pharmacies. It would seem that not only would their ratios of labor to nonlabor expenses be reasonably accurate, but the importance of the nonlabor portion of total prescription department expenses may have become even less important in the past 20 years.

The largest and majority of cost of dispensing studies done to date basically have used the COD(Allocation) formula with minor modifications in allocating nonlabor expense items or with alterations in handling the labor elements. The largest national mail survey about CODs was done in 1966 and was based on 1,638 useable replies from

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26. Burley, et al., op. cit., p. 228.

27. Christopher A. Rodowskas, Jr., "Determining a Dispensing Fee by Cost Accounting Methods," Journal of the American Pharmaceutical Association (NS 13:1) January 1973, p. 52.

pharmacies. The national "average" COD(Allocation) was $1.69.[28] Among seven regional areas the "averages" ranged from $1.41 through $1.93.

Annual cost of dispensing surveys among all community pharmacies in Kansas by the Kansas Department of Social Welfare began in April 1970. Responses from 449 pharmacies were received in 1970 and 458 of the 645 pharmacies in 1971.[29] A pilot study in 1969 showed a cost of dispensing ("average breakeven") of $1.35 per prescription among 107 useable mail respondents.[30,31] The high response rates of the 1970 and 1971 studies partly were due to a penalty imposed on nonrespondents; they received the lowest COD fee found in the survey as repayment for their Medicaid prescription dispensing.[32] The major difference between the Kansas COD formula and COD(Allocation) is that in the Kansas formula, 100% of employee pharmacist salaries are

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28. "NARD: Average Rx Costs $1.69 to Fill," American Druggist (156:11) November 20, 1967, p. 25.

29. Hugh A. Cotton and T. Donald Rucker, op. cit., p. 412.

30. Hugh A. Cotton, "The Actual Cost of Filling a Prescription: Kansas as a Case in Point," PM-The Pharmacist's Management Journal (3:6) June 1969, p. 14.

31. Hugh A. Cotton, "The Results of the Prescription Cost Survey in Kansas," Journal of Kansas Pharmacy (45:4) April 1969, p. 8.

32. Jacob W. Miller, "The Variable Fee-Workable and Working," Minnesota Pharmacist (25:10) July 1971, p. 23.

allocated to the prescription department. This helps make up for having to supply cost data for 49 separate nonlabor expense items.[33]

The Kansas COD, as interpreted by this author, is:

$$COD(KANSAS) = \frac{PS(\%\ TIME)}{Rxs} + \frac{RPhs}{Rxs} + \frac{nonRPhs(\%\ TIME)}{Rxs} + \frac{nonlabor(ALLOC)}{Rxs}$$

Other nonlabor allocation cost of dispensing formulae studies which allocated all personnel's wages and salaries on the basis of time spent in "prescription department duties," or COD(ALLOC), include those done in Indiana,[34,35] Ohio,[36,37] and Michigan.[38] At the time of this writing, a

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33. "How To Figure Cost of Filling a Rx," American Druggist (161:12) June 15, 1970, p. 16.

34. Michael D. Jacoff, "A Standard Cost Analysis of 2,000 Pharmacies," unpublished Doctoral Dissertation, Purdue University, Lafayette, Indiana, August 1961.

35. Michael D. Jacoff and Robert V. Evanson, "An Expense-Cost Analysis for Professional-Fee Planning," Journal of the American Pharmaceutical Association (NS 2:9) September 1962, p. 525.

36. Christopher A. Rodowskas, Jr., "A Brief Report on the Cost of Dispensing a Prescription," Ohio Pharmacist (18:5) May 1969, p. 130.

37. Christopher A. Rodowskas, Jr., "Determining a Dispensing Fee by Cost Accounting Methods," op. cit., p. 8.

38. "Variable Fee Study, Part II: Prescription Dispensing Cost Survey," Michigan Pharmacist (10:1) January 1972, p. 6.

similar COD(ALLOC) study was being done in Kentucky.[39]

Some COD studies were done which asked that pharmacist respondents allocate a portion of each nonlabor expense item to the prescription department, rather than using preset formulae for doing so. Labor allocations were handled differently in each of these studies.

Using the variable name, nonlabor(PS est), to denote respondents' (PS') estimates for nonlabor expense item estimates, these COD formula can be shown as:

$$\text{COD(TEXAS)}^{40} = \frac{\text{PS(\% TIME)}}{\text{Rxs}} + \frac{\text{RPhs (\% TIME)}}{\text{Rxs}} + \frac{\text{nonRPhs(\% TIME)}}{\text{Rxs}} + \frac{\text{nonlabor(PS est)}}{\text{Rxs}}$$

$$\text{COD(IOWA)}^{41} = \frac{\text{(PS + RPhs + nonRPhs)(\% TIME)}}{\text{Rxs}} + \frac{\text{nonlabor(PS est)}}{\text{Rxs}}$$

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39. Norman A. Billups and Harry A. Smith, "Survey to Determine the Cost of Filling a Prescription," The Kentucky Pharmacist (36:7) July 1973, p. 20.

40. Charles A. Walker, "The Cost of Filling a Prescription in Texas," unpublished M.S. Thesis, University of Texas, Austin, Texas, August 1966,

41. C. Boyd Granberg and James DeMuth, "Summary Report on a Prescription Survey," Iowa Pharmacist (24:11) November 1969, p. 19.

$$\text{COD(WASH)}^{42} = \frac{\text{PS(\% TIME)}}{\text{Rxs}} + \frac{\text{(RPhs + nonRPhs)(\% TIME)}}{\text{Rxs}} + \frac{\text{nonlabor(PS est)}}{\text{Rxs}}$$

$$\text{COD(MINN)}^{43} = \frac{\text{(RXS/TS)PS}}{\text{Rxs}} + \frac{\text{RPhs(\% TIME)}}{\text{Rxs}} + \frac{\text{nonRPhs(PS est)}}{\text{Rxs}} + \frac{\text{nonlabor(PS est)}}{\text{Rxs}}$$

In COD(IOWA), all personnel expenses were grouped before a percent time was to be estimated by the respondent. Similarly, in COD(WASH), a percent time was to be estimated against total RPhs and nonRPhs expenses as a group. No rationale for any of the above four COD formulae were offered by their authors.

F. Other Cost of Dispensing Formulae in the Literature

Many cost of dispensing formulae have been proposed which use specialized allocations. Examples of these are three CODs proposed in an indepth Michigan study of 20 community pharmacies done under a Social Security Administration grant to the University of Michigan.[44]

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42. "W.S.P.A. Prescription Cost Survey," The Washington-Alaska Pharmacist (11:3) March 1969, insert pp. A-D.

43. "Time for Rx Cost Analysis," Minnesota Pharmacist (26:5) February 1972, p. 14.

44. "U.S. Wants to Know What it Costs to Fill an Rx," American Druggist (161:3) February 9, 1970, p. 40.

Using the notation of this study, these formulae are interpreted to be:

$$\text{COD(MICH \#1)} = \frac{(PE/TE)PS}{Rxs} + \frac{(PE/TE)RPhs}{Rxs} + \frac{(PE/TE)nonRPhs}{Rxs} + \frac{nonlabor(MICH\ \#1)}{Rxs}$$

where (PE/TE) equals professional employment costs divided by total employment costs, and nonlabor expenses are allocated by (1) (PE/TE) times variable nonlabor costs plus (2) the ratio of prescription department floor area to total pharmacy floor area (RXA/TA) times fixed nonlabor costs, plus (3) the value of the prescription department inventory times 0.08.[45] No reason is given as to why personnel costs are allocated by a ratio which contains personnel costs, normally a violation of good mathematical "sense," since the allocation ratio is a function of the variable being allocated.

$$\text{COD(MICH \#2)} = \frac{(RXS/TS)\overline{PS}}{Rxs} + \frac{(RXS/TS)RPhs}{Rxs} + \frac{(RXS/TS)nonRPhs}{Rxs} + \frac{nonlabor(MICH\ \#2)}{Rxs}$$

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45. Sylvester E. Berki, James W. Richards, and H. Ashley Weeks, "Prescription Dispensing in Twenty Pharmacies: Characteristics, Utilizers, Services, and Costs," unpublished paper presented at the American Pharmaceutical Association meeting, San Francisco, California, April 1971.

In this formula, $\overline{PS}$ = the mean proprietor(s) or manager salary found in the survey, rather than allocating actual PS costs. The nonlabor expenses are allocated by (1) (RXS/TS) times variable nonlabor costs, (2) (RXA/TA) times fixed nonlabor costs. Using the mean PS was a way of "adjusting" for varying PS costs. No rationale was supplied for allocating <u>all</u> personnel costs based upon (RXS/TS). These personnel allocations will produce the lowest absolute dollar allocations to prescription departments than any other COD formulae shown thus far. Usually either the PS or RPhs spend a greater percent of their time in prescription department duties than the ratio, RXS/TS.

$$\text{COD(MICH \#3)} = \frac{(\text{RXS/TS})\overline{\text{PS}}}{\text{Rxs}} + \frac{(\text{RXS/TS})\text{RPhs}}{\text{Rxs}} + \frac{(\text{RXS/TS})\text{nonRPhs}}{\text{Rxs}} + \frac{\text{nonlabor(MICH \#3)}}{\text{Rxs}}$$

This formula allocates nonlabor expenses by (1) (RXS/TS) times variable nonlabor costs, plus (2) (RXA/TA) times fixed nonlabor costs, plus (3) the value of the prescription department inventory times 0.08. This formula produces a slightly higher cost of dispensing than COD(MICH #2).

Results among 17 of the 20 Michigan community pharmacies produced the following results per prescription dispensed[46]:

COD Formula	Unweighted Mean	Median
COD(MICH #1)	$1.79	1.69
COD(MICH #2)	1.11	1.13
COD(MICH #3)	1.16	1.13
COD(ACA #1)	1.70	1.42

Comparative results for COD(MICH #2) and COD(MICH #3) above show the effect of allocating all personnel costs by the ratio prescription sales to total pharmacy sales. The findings of this study will show that these personnel allocations significantly understate true prescription department personnel costs. Unfortunately, one reviewer is sold on COD(MICH #2), saying that "use of any of the other three formulae [(comparing COD(ACA #1), Myers formula (below) and the Paul-McEvilla formula (below)] would result in excess profits for pharmacists and uneconomic operations for the program (a reimbursement program for pharmacy prescription dispensing services)."[47] The reviewer evidently was unaware that using RXS/TS times

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46. Sylvester E. Berki, et al., op. cit., p. 79.

47. David A. Knapp, "Paying for Outpatient Prescription Drugs and Related Services in Third-Party Programs," Medical Care Review (28:8) August 1971, p. 849.

personnel costs was shown to understate significantly prescription department costs in other studies.[48,49]

The Myers formula, mentioned above, is:

$$COD(Myers) = \frac{(RXS/TS)(Total\ Pharmacy\ Expenses)(1.37)}{Rxs}$$

The Myers formula was "derived empirically from 1966 Lilly Digest figures," according to Knapp.[50] No original source of this formula was found, although Myers' work on 1966 Lilly Digest data was reported.[51] The weakness of this formula is that the figure, 1.37, would have to be recomputed from every sample of pharmacies in retrospect. The 1.37 actually is the regression coefficient in a formula using total pharmacy expenses as the dependent variable and prescription sales as one of two independent variables (nonprescription sales was the other independent variable).[52]

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48. Burley, et al., op. cit., p. 220.

49. Christopher A. Rodowskas, Jr., and Jean P. Gagnon, "Personnel Activities in Prescription Departments of Community Pharmacies," Journal of the American Pharmaceutical Association (NS 12:8) August 1972, pp. 407-411.

50. David A. Knapp, op. cit., p. 848.

51. Maven J. Myers, "An Application of the Use of Multiple Regression in Determining the Cost of Dispensing a Prescription," unpublished paper presented at the American Pharmaceutical Association meeting, Miami Beach, Florida, May 1968.

52. Maven J. Myers, "Examination of the Existence of Scale Economies in Community Pharmacy Operations," unpublished paper presented at the American Pharmaceutical Association meeting, Montreal, Canada, May 1969.

The Paul-McEvilla formula referred to above was derived from a study of 10 community pharmacies in the Pittsburgh, Pennsylvania area.[53]

$$COD(PENN) = \frac{[2(RXS/TS) + RXA/TA]PS}{Rxs} + \frac{RPhs}{Rxs} + \frac{(RXS/TS + RXA/TA)nonRPhs}{Rxs} + \frac{(RXS/TS + RXA/TA)nonlabor}{Rxs}$$

Paul "adjusts" for the understating of costs that RXS/TS times personnel costs would give by also allocating personnel and nonlabor costs by the ratio prescription area to total pharmacy area. His rationale is that it "works" when applied to Lilly Digest data.[54] Unfortunately, the formula does not work in a pharmacy where the total RXS/TS plus RXA/TA adds to more than 100%, which would be the case in many pharmacies where RXS/TS is greater than 50%.

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53. Stephen H. Paul, "The Pricing of Prescriptions with Particular Emphasis Devoted to the Fee for Pharmaceutical Service," unpublished Doctoral Dissertation, University of Pittsburgh, Pittsburgh, Pennsylvania, 1967.

54. Stephen H. Paul and Joseph D. McEvilla, "The Pricing of Prescriptions with Particular Emphasis Devoted to the Fee for Pharmaceutical Service," The Pennsylvania Pharmacist (51:9) April 1970, p. 11.

Other COD formulae which are mentioned in the literature are relatively untested. They include two proposed by Harry A. Smith and one anonymously. The Smith formulae were proposed in Kentucky in 1961 and in Mississippi in 1968.

$COD(KENT)^{55}$ = mean number of RPhs per pharmacy in Kentucky (1960) times mean RPh salary in Kentucky (1960) plus (RXS/TS)nonlabor divided by the mean number of total prescriptions dispensed per pharmacy in Kentucky (1960).

$$COD(MISS)^{56} = \frac{[PS_1 + (RXS/TS)(PS - PS_1)]}{Rxs} + \frac{RPhs}{Rxs} + \frac{(RXS/TS)nonRPhs}{Rxs} + \frac{nonlabor(ALLOC)}{Rxs}$$

$$COD(anon)^{57} = \frac{(RXS/TS)(Total\ Pharmacy\ Expenses)}{Rxs} + \frac{\$Rx\ inventory}{Rxs}$$

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55. Harry A. Smith and Howard Hopkins, "Prescription Costs and Pricing Analysis Applicable to Retail Pharmacies in Kentucky," The Kentucky Pharmacist (24:1) January 1961, p. 19.

56. Harry A. Smith, "Determining the Professional Fee," Journal of the American Pharmaceutical Association (NS 8:12) December 1968, p. 646.

57. "How Much Are You Worth?," PM-The Pharmacist's Management Journal (3:8) August 1969, p. 4.

Both of Smith's formulae make use of "going rates" for pharmacist salaries. The COD(MISS) formula uses PS_1, which is the number of hours that the proprietor worked in "prescription department duties" times the hourly wage rate of pharmacists in that pharmacy's area, for example.

The anonymous COD formula was developed by a practicing pharmacist who merely said that it worked for him. The "$Rx inventory" is the dollar value of the prescription department inventory.

G. Other Possible Cost of Dispensing Formulae

From Table I in the Definitions section, we can see that many possible COD formulae can be proposed, merely by changing the allocation method for each or all of the four cost elements in a cost of dispensing calculation.

Other CODs which will be calculated in this study include those tried by the author in unpublished studies. Among these are one used in a study for the Wisconsin Pharmaceutical Association (WPhA), one for the Illinois Pharmaceutical Association (IPhA), and one which will be "built up" from the "best" cost element allocations found in this current study (Wisconsin). These are shown as:

$$COD(WPhA)^{58} = \frac{PS(\%\ TIME)}{Rxs} + \frac{RPhs}{Rxs} + \frac{(RXS/TS)nonRPhs}{Rxs} + \frac{(RXS/TS)nonlabor}{Rxs}$$

$$COD(IPhA) = \frac{PS(\%\ TIME)}{Rxs} + \frac{RPhs}{Rxs} + \frac{nonRPhs(\%\ TIME)}{Rxs} + \frac{(RXS/TS)nonlabor}{Rxs}$$

$$COD(WIS) = \frac{PS(\%\ TIME)}{Rxs} + \frac{RPhs(\%\ TIME)}{Rxs} + \frac{(RXS/TS)nonRPhs}{Rxs} + \frac{(RXS/TS)nonlabor}{Rxs}$$

This study will show comparative results using eight of the CODs shown in this entire Chapter: COD(ACA #1), COD(WPhA), COD(IPhA), COD(CALIF), COD(ACA #2), COD(CANADA), COD(ALLOC), and COD(WIS).

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58. Robert W. Hammel and Kenneth W. Look, "Survey on the Cost of Dispensing Prescriptions in Wisconsin," unpublished paper presented to the Wisconsin Pharmaceutical Association, April 1, 1969.

CHAPTER FOUR

METHODOLOGY

To develop a model for determining a pharmacy's cost of dispensing, both a mail survey and a personal interview survey of a sample of community pharmacy owners or managers in Wisconsin were conducted during 1969.

A. Mail Survey

Actual pharmacy operations data were needed, (1) to test cost of dispensing variables and their variability among pharmacies, and (2) to "build" a cost of dispensing model or formula from these cost variables. Also the sensitivity of individual variables within the formulae needed to be tested among pharmacies. Just how much did proprietors' salaries vary among pharmacies with relatively equal total sales, for example?

Endorsement for a mail survey of community pharmacists was made by the Wisconsin Pharmaceutical Association (WPhA) in January 1969. The association sponsored the mail survey to get 1968 cost of dispensing data from community pharmacies to be able to deal intelligently in consultation with State and Federal government agencies about reimbursements for Medicaid[1] prescriptions in Wisconsin.

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1. Title XIX, or "Medicaid," of the Social Security Amendments Act of 1965 is called the Wisconsin Medical Assistance Program in Wisconsin and covers prescription services for both categorically and medically needy persons.

A pretest mailing was done to test the wording of a mail questionnaire and to check on an expected response rate for a larger mailing. Mailings to 50 community pharmacy owners were made on February 11, 1969, as the pretest group. To get 50 names of pharmacies, a systematic sample of pharmacies was taken. The Wisconsin Pharmaceutical Association's then current mailing list of the 952 member and nonmember community pharmacies in Wisconsin was used as the universe list of pharmacies. From this list of pharmacies, which were arranged by WPhA districts, a systematic sample of every 19th pharmacy name was selected (952/19 = 50), beginning with a randomly chosen first number from one to nineteen. The number 19 randomly was picked, so the pretest list began with the 19th community pharmacy name on their list, and continued with every 19th pharmacy name thereafter.

A mimeographed cover letter (Appendix A), a mimeographed four-page questionnaire (Appendix B), and an empty stamped return envelope addressed to Professor Robert W. Hammel were included in each of the 50 mailings. Outside envelopes bore the University of Wisconsin School of Pharmacy return address, the actual name of the pharmacy owner or manager, the pharmacy address, plus a six cent noncommemorative postage stamp. Respondents were asked to reply by February 19, 1969. Eight of the 50 (16%) pharmacy owners or managers replied by February 27, 1969,

the preselected cutoff date. Seven of these replies were useable (14%). The other reply contained incomplete data.

Question responses were checked carefully for their applicability and correctness of question interpretation. One major change made was to drop the request for pharmacy owners to estimate the percents of individual pharmacy expenses that they would allocate to their prescription departments (Column two under IIB, page 243 of Appendix B). Respondents seemed to have trouble answering this question. The allocations question was used later in the personal interview survey, but was omitted in the main mailing of the mail survey.

A main mailing to 300 pharmacy owners was thought necessary to elicit a desired 50 useable replies. This would be a higher response rate, 20% compared to the 14% useable pretest replies, but use of a better questionnaire format plus requesting less information encouraged a better response. Also, a blank space at the end of the cover letter was provided so that respondents could check if they wanted a confidential report of their own pharmacy's computed dispensing costs. There were 54 pharmacists out of the 68 respondents (79%) who requested and who were sent such a report.

A systematic sample, every third pharmacy of the remaining 902 pharmacies on the WPhA mailing list, was selected for the main mailing starting with the randomly selected third pharmacy on the list. Since 18 pharmacies

from two chain pharmacy corporations appeared in the sample, prior approval for their managers' participation in the study was sought from the chains' respective head offices by letter on February 21, 1969. No approval was received for their individual pharmacy's participation by March 4, so these 18 pharmacies were not mailed questionnaires. Two other pharmacy owners, not among the 300 on the mailing list, were mailed questionnaires upon their request.

The main mailing of questionnaires to 284 (300-18+2) pharmacy owners or managers was done on March 4, 1969. There were 76 (27%) replies by the cutoff date of March 20, 1969. Of these, 60 (21%) were useable replies. These 60 replies had data from 67 pharmacies, as two replies had data for four pharmacies each and another reply had data for two pharmacies. Included among the 16 nonuseable replies were those for four pharmacies which had closed within the past two years, six forms returned blank with apologies, and six which had incomplete data. Eventually, by April 7, 1969, 84 (30%) replies were received of which 68 (24%), representing 75 pharmacies, were useable.

Six useable questionnaires were missing one major piece of data, usually total sales or prescription sales, which was then estimated using 1968 Lilly Digest data for that category of pharmacy based upon prescription sales as a percent of total sales and upon the number of prescriptions dispensed daily. Follow-up telephone calls

to respondents verified most of these estimates. Later in the personal interview survey, more accurate figures were obtained for the missing variable for four of these pharmacies.

A four-page, offset printed cover letter and questionnaire on one folded sheet of paper (Appendix C) and a return addressed stamped envelope (Appendix D) were in each of the mailings. Each outside envelope was addressed to the pharmacy owner or manager by name and stamped upon each envelope was a commemorative six cent stamp plus a red URGENT stamping to encourage a faster opening of the letter. A higher than anticipated useable response rate, 24% in one month versus 14% in the pretest, could have been due in part to the additional care given the main mailing: type of printing used, commemorative stamps, and URGENT stampings, and the report-back-by-request feature. No attempt was made to separate the individual effects of these variables.

Findings for the mail survey are presented for 75 respondents representing 82 pharmacies, which includes 68 respondents (75 pharmacies) from the main mailing and seven respondents (7 pharmacies) from the pretest mailing. Separate mail results also are shown for the 30 respondents (36 pharmacies) who later were personally interviewed.

B. Personal Interview Survey

A sample of 30 Wisconsin community pharmacy respondents was selected from the 75 total useable replies to the mail survey for a personal interview survey. The 30 pharmacies actually represented 36 actual pharmacy operations, since two selected pharmacy respondents gave data for four outlets each. Mean data for each of these four outlet operations were included as two pharmacies in this sample of 30 pharmacies.

The purpose of this survey was to verify the mail data for accuracy, to compare proprietor(s) or manager allocations of total pharmacy expenses to their respective prescription departments with some formula allocations, and to compute their costs of providing ancilliary prescription services, such as delivery, patient record keeping, and charge account services. The costs of continued education and Title XIX and other third party payer prescription services also were examined. The frequency of providing 24-hour emergency prescription service was determined, but costs for such service were not computed.

Personal interview respondents were selected to be representative of community pharmacies in Wisconsin first by geographical location and then by city size. The state was divided into four geographical areas, one area containing 238 pharmacies and three areas each containing

240 pharmacies (Appendix E). The Druggist Route List[2] listed 962 pharmacies in Wisconsin for 1969, but four pharmacies were known to be closed from returned questionnaires. Of the remaining 958 pharmacies, the Wisconsin Pharmaceutical Association had listings for only 952, so the latter number was adopted as the "universe" number of pharmacies for this study.

The four geographical area boundaries were drawn arbitrarily by the author primarily to follow county lines. 1960 county personal income data were used as a guide for selecting areas of relatively uniform income levels.[3]

A letter was mailed to each of the 30 selected pharmacy owners or managers, plus six alternate pharmacies on August 18, 1969 (Appendix F). The need for such an interview was told in the letter and that the author would telephone for an appointment was mentioned. The letter was signed by Professor R. W. Hammel.

Interviews were conducted with the 30 pharmacy owners or managers from August 25 to September 20, 1969. Interviewees were called in advance for appointments; none refused to be interviewed. Interviewees preferred

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2. The Milwaukee Journal and Milwaukee Sentinel Druggist Route List: Milwaukee, Wisconsin, and Upper Michigan Druggist, The Journal Company: Milwaukee, 1969 Edition.

3. Charles W. Collins, An Atlas of Wisconsin, College Printing and Typing Company: Madison, 1968, pp. 162ff.

arranging the interview times up to one week in advance of the interview, and usually scheduled it during the middle of the week. Two interviews were conducted on Mondays, nine on Tuesdays, five on Wednesdays, nine on Thursdays, three on Fridays, and two interviews on Saturdays.

A seven page, mimeographed questionnaire worksheet was used to guide the author while interviewing (Appendix G).

Interviews began with the interviewee verifying data he had submitted on the mail questionnaire and also the author's calculations of such summary statistics as prescription sales as a percent of total sales, their mean prescription charge, and the mean number of prescriptions dispensed daily. Only three of 30 interviewees volunteered providing their profit and loss (income) statements. The author had not insisted on seeing profit and loss statements before the personal interviews began, although a desire "to go over profit and loss statements" with the interviewees was mentioned when pharmacists were telephoned for appointments.

As it turned out, seeing the three income statements proved almost to be unnecessary, as the mail questionnaire data proved to be accurate enough since the costs of dispensing using any of the formulae proved to be within 10¢ of those calculated using the income statements, supplemented by the nonincome data verified by the

interviewee. This could have been a major finding of this entire study, but not enough income statements were seen to verify this fact statistically.[4]

Question sequence varied among the interviews depending upon each respondent's ability to estimate figures. Interviews ran from 45 minutes to three hours each, including work interruptions. All but six interviews took place in the interviewee's pharmacies during working hours. Five interviews were conducted in the pharmacies after working hours; one interview was held in the pharmacy owner's home.

Twenty-three (77%) of the 30 personal interview respondents provided pharmacy operations data for the calendar year 1968. The other respondents' data were for fiscal years ending June 30, 1968 and September 30, 1968 (two respondents each) and ending May 31, 1968, October 31, 1968, and March 31, 1969 (one respondent each).

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4. Max Polinsky and Franklin S. Rice, Jr. found no statistically significant differences between data submitted by 147 respondents who returned income statements with a similar cost of dispensing questionnaire, and data submitted without accompanying income statements by 577 respondents in a 1968 cost of dispensing study among California pharmacies. Their useable response rate had been an overall 17% compared to 24% in this study. Max Polinsky and Franklin S. Rice, Jr., "California Pharmacy Expense Study Operational Factors," California Pharmacy (15:8) February 1969, p. 12.

A sheet showing formulae used to compute costs of dispensing was left with the interviewees at the end of the interviews. Letters were mailed to the six alternate nonparticipating pharmacy owners or managers after the 30 interviews were completed, telling them they would not be interviewed after all.

CHAPTER FIVE

COSTS OF DISPENSING

In order to find a cost of dispensing formula which approximated true prescription department operating expenses on a per prescription basis, two approaches seemed feasible. The first way was to find all available formulae which had been proposed in the literature and test them against one another. In addition, other cost of dispensing formulae could be proposed which also would be included in this test. This way of finding an "ideal" formula lacked a standard against which alternative formulae could be tested.

The second way was to "build" a cost of dispensing formula, which would contain the major cost elements found in prescription department operations. Four such cost elements seemed to be (1) a portion of the proprietor's or the manager's salary, (2) all or part of the employee pharmacist salaries, (3) some nonpharmacist employee wages or salaries, and (4) part of all other nonlabor expenses. Since it was easier and "more sensible" to propose alternative standards, or allocation methods, for each of these four cost elements rather than for a cost of dispensing formula taken as a whole, this second way of finding an ideal cost of dispensing formula was attempted in this study.

A. Construction of an "Ideal" Cost of Dispensing Formula

A cost of dispensing formula for community pharmacies can be seen as consisting of four separate cost elements: (1) proprietor or manager salaries, (2) pharmacist salaries, (3) nonpharmacist salaries, and (4) nonlabor costs. Each of these elements can be computed on a per dispensed prescription basis after the prescription department expense part of each element is separated from the nonprescription department expense.

In this study, the "best" cost estimates of each of these four prescription department expense items were defined and calculated from data collected in the personal interview survey of 30 community pharmacies in Wisconsin. However, since mail collected cost estimates were desired, mail survey results needed comparison with personal interview survey results from these same pharmacies. As will be seen, too many complex questions had to be asked by mail to collect data to compute these "best" cost estimates. Therefore, mail collected estimators for these "best" personal interview collected cost estimates had to be found.

Three "material" mail collected estimators for each of the four "best" personal interview cost estimates of prescription department expenses were defined, calculated, and tested against personal interview results. The four

"closest" mail collected estimators were then combined to form an "ideal" cost of dispensing formula.

All twelve mail collected estimators first were tested for validity (whether results by mail were the same as those found during interviews in the same pharmacies) and the four "closest" mail collected estimators were later tested for practicality (whether results were repeatable from one mail sample of pharmacies to another).

1. The "Best" Personal Interview Cost Estimates of Prescription Department Costs

The basic cost of dispensing per prescription formula appears as:

$$\text{Cost of Dispensing Per Prescription} = \frac{\text{Proprietor salaries + Pharmacist salaries + Nonpharmacist salaries + Nonlabor costs}}{\text{Total number of prescriptions}}$$

or

$$\text{COD} = \frac{\text{PS + RPhs + nonRPhs + nonlabor}}{\text{Rxs}}$$

or

$$\text{COD} = \frac{\text{PS}}{\text{Rxs}} + \frac{\text{RPhs}}{\text{Rxs}} + \frac{\text{nonRPhs}}{\text{Rxs}} + \frac{\text{nonlabor}}{\text{Rxs}}$$

Each of the four elements in the above formula can be estimated several alternative ways. The "best" estimates of each were calculated from data obtained in

the personal interview survey and are defined as follows:

$\frac{PS}{Rxs} = PS(\%\ TIME)_i$ = Proprietor's or manager's salary times the percent of time spent in prescription department duties per dispensed prescription (personal interview estimates)

$\frac{RPhs}{Rxs} = RPh(\%\ TIME)_i$ = The sum of all pharmacists' salaries times the percent of time spent in prescription department duties per dispensed prescription (personal interview estimates)

$\frac{nonRPhs}{Rxs} = SumSvcs_i$ = The sum of all nonpharmacists' wages and salaries allocated in the four prescription services analyses per dispensed prescription (personal interview estimates)

$\frac{nonlabor}{Rxs} = SumPSest_i$ = The sum of nonlabor expense items allocated to the prescription department by estimating pharmacist respondents (personal interview estimates)

Thus an "ideal" COD formula for a given pharmacy would be:

$$COD_i = PS(\%\ TIME)_i + RPh(\%\ TIME)_i + SumSvcs_i + SumPSest_i$$

Throughout this study, this COD formula will be known as COD(BEST).

Since some proprietor or manager salaries and some time estimates differed between those submitted by mail questionnaire and those obtained in the personal interviews, $PS(\%\ TIME)_i$ (interview allocated proprietor's or manager's salary) is used as the best cost estimator rather than $PS(\%\ TIME)_m$ (mail allocated salary). The same is true for $RPh(\%\ TIME)_i$ rather than $RPh(\%\ TIME)_m$.

There were no mail collected estimates for either $SumSvcs_i$ or $SumPSest_i$, because of the lengthy questioning which would be required to collect and calculate these variables. It primarily is because of these two variables that another simpler COD formula be found which could be calculated from data collected by mail survey.

Obviously even better estimates could be developed than the four above; time and motion studies could be done for a period of time to check the accuracy of respondents' estimates of the percent of times spent in prescription department duties, for example. The four selected estimators were the best that were obtained using a one visit personal interview technique.

2. The Mail Collectable Cost of Dispensing Formula Construction

The following variables were collected by mail from each pharmacist respondent and compared to the best cost estimates collected by personal interview:

PS	RPhs	nonRPhs	nonlabor
Interview variables:			
COD_{BEST}=PS(% TIME)$_i$ + RPh(% TIME)$_i$ + $SumSvcs_i$ + $SumPSest_i$			
Mail variables:			
PS_m	RPh_m	$nonRPh_m$	$nonlabor_m$
PS(% TIME)$_m$	RPh(% TIME)$_m$	nonRPh-(% TIME)$_m$	nonlabor-(ALLOC)$_m$
$(RXS/TS)_m PS_m$	$(RXS/TS)_m RPh_m$	$(RXS/TS)_m$-$nonRPh_m$	$(RXS/TS)_m$-$nonlabor_m$

Thus from the data collected there are 3 x 3 x 3 x 3 = 81 possible COD formulae. Combination of the four "closest" mail variables to the personal interview "best" variables should constitute a good mail survey COD formula.

Definitions of the above are: (all expressions are in dollars; m refers to the mail estimate, i refers to the interview estimate)

PS_m = proprietor's or manager's salary

$PS(\%\ TIME)_m$ = PS_m times the percent of time spent in Rx dept. duties

$(RXS/TS)_m PS_m$ = the ratio of Rx sales to total sales times PS_m

RPh_m = the total salaries of all pharmacists employees in a pharmacy

$RPh(\%\ TIME)_m$ = the sum of each RPh times the percent of time spent in Rx dept. duties

$(RXS/TS)_m RPh_m$ = the ratio of Rx sales to total sales times RPh_m

$nonRPh_m$ = the total wages and salaries of all nonpharmacists in a pharmacy

$nonRPh(\%\ TIME)_m$ = the sum of each nonRPh times the percent of time spent in Rx dept. duties

$(RXS/TS)_m nonRPh_m$ = the ratio of Rx sales to total sales times $nonRPh_m$

$nonlabor_m$ = the total nonlabor expenses in a pharmacy (total expenses minus labor expenses)

$nonlabor(ALLOC)_m$ = the sum of individual expense items allocated by preset ratios to the Rx dept.

$(RXS/TS)_m nonlabor_m$ = the ratio of Rx sales to total sales times $nonlabor_m$

Nonlabor expense items were allocated to the prescription department using the following ratios to get nonlabor$(ALLOC)_m$:

Pharmacy Nonlabor Expense Item	Allocation Ratio Used
Rent Heat, light, and power	Rx dept. area to total pharmacy area
Taxes Insurance Advertising Depreciation Delivery Telephone Accounting, legal, and other professional fees Miscellaneous expenses	Rx sales to total pharmacy sales
Licenses, dues, and subscriptions	100% direct allocation

The sum of the above nonlabor expense items times their respective ratios gives us nonlabor$(ALLOC)_m$. This summed variable is similar to that used in most other allocation-type COD studies.

Two types of checks were used:

(1) A validity check:

An unweighted mean per prescription cost element calculated for community pharmacies surveyed by mail will equal a mean calculated for those same pharmacies surveyed by personal interview.

(2) A practicality check:

An unweighted mean per prescription cost element calculated for one sample of community pharmacies surveyed

by mail will equal a mean calculated for another sample of community pharmacies surveyed by mail.

a. Mail vs. Interview Variable Check (Test of Validity)

The validity check used was comparing values found in the mail survey to those found in the personal interviews. Unweighted mean per prescription cost estimates derived from the mail survey were tested against those same unweighted mean estimates derived from the personal interview survey. For example, $\bar{x}\ PS_m = \bar{x}\ PS_i$. This was done for all 12 mail estimators of the four cost variables, to find the four "closest" estimators of the four "best" personal interview allocation estimates.[1] Assumed here is that the personal interview estimates were more correct than the mail estimates.

Results of these per prescription tests were*:

		mail	interview	
$PS_m = PS_i$	$\bar{x}$ =	\$0.89	\$0.88	T(58) = +0.12, Conf.level = 9.8%
	s^2 =	0.25	0.23	F(29,29) = 1.06, Conf.level = 11.7%
		n=30	n=30	

(Cont.)

1. A good description about computing differences between means can be found in William Mendenhall, Introduction to Statistics, Wadsworth: Belmont, California, April 1966, starting on page 151. Differences between variances are discussed starting on page 200.

		mail	interview	
$PS(\%\ TIME)_m = PS(\%\ TIME)_i$	$\bar{x}$ =	\$0.65	\$0.64	T(58) = +0.10, Conf.level = 7.9%
	s^2 =	0.13	0.11	F(29,29) = 1.20, Conf.level = 36.8%
		n=30	n=30	
$(RXS/TS)_m PS_m = (RXS/TS)_i PS_i$	$\bar{x}$ =	0.39	0.38	T(58) = +0.08, Conf.level = 6.3%
	s^2 =	0.04	0.04	F(29,29) = 1.01, Conf.level = 2.8%
		n=30	n=30	
$RPh_m = RPh_i$	$\bar{x}$ =	0.59	0.60	T(52) = -0.11, Conf.level = 8.4%
	s^2 =	0.11	0.11	F(26,26) = 1.01, Conf.level = 2.4%
		n=27	n=27	
$RPh(\%\ TIME)_m = RPh(\%\ TIME)_i$	$\bar{x}$ =	0.50	0.51	T(52) = -0.21, Conf.level = 16.7%
	s^2 =	0.06	0.06	F(26,26) = 1.02, Conf.level = 3.1%
		n=27	n=27	
$(RXS/TS)_m RPh_m = (RXS/TS)_i RPh_i$	$\bar{x}$ =	0.27	0.28	T(52) = -0.24, Conf.level = 18.8%
	s^2 =	0.02	0.03	F(26,26) = 1.25, Conf.level = 42.1%
		n=27	n=27	
$nonRPh_m = nonRPh_i$	$\bar{x}$ =	0.68	0.68	T(56) = +0.06, Conf.level = 5.1%
	s^2 =	0.23	0.21	F(28,28) = 1.12, Conf.level = 23.7%
		n=29	n=29	

		mail	interview	
$nonRPh(\%\ TIME)_m$ = $nonRPh(\%\ TIME)_i$	$\bar{x}$ =	\$0.04	\$0.10	T(48) = -3.15, Conf.level = 99.7%
	s^2 =	0.003	0.01	F(24,24) = 2.24, Conf.level = 94.7%
		n=25	n=25	
$(RXS/TS)_m nonRPh_m$ = $(RXS/TS)_i nonRPh_i$	$\bar{x}$ =	0.25	0.25	T(56) = +0.06, Conf.level = 4.7%
	s^2 =	0.01	0.01	F(28,28) = 1.22, Conf.level = 40.2%
		n=29	n=29	
$nonlabor_m$ = $nonlabor_i$	$\bar{x}$ =	1.05	1.09	T(58) = -0.23, Conf.level = 18.5%
	s^2 =	0.40	0.39	F(29,29) = 1.03, Conf.level = 5.4%
		n=30	n=30	
$nonlabor(ALLOC)_m$ = $nonlabor(ALLOC)_i$	$\bar{x}$ =	0.39	0.39	T(58) = +0.01, Conf.level = 0.6%
	s^2 =	0.03	0.03	F(29,29) = 1.00, Conf.level = 0.9%
		n=30	n=30	
$(RXS/TS)_m nonlabor_m$ = $(RXS/TS)_i nonlabor_i$	$\bar{x}$ =	0.42	0.44	T(58) = -0.41, Conf.level = 31.9%
	s^2 =	0.03	0.03	F(29,29) = 1.14, Conf.level = 28.0%
		n=30	n=30	

*$\bar{x}$ = mean, s^2 = variance, T = t-test (test between means), F = F-test (test between variances). Normal statistical usage as used in this study is that means or variances of variables are significantly different only if the confidence level of T or F is greater than 95%.

Results of the validity test above show that only time allocation of nonpharmacists, nonRPh(% TIME), changed significantly from mail estimation to personal interview estimation. The costs changed from 4¢ per dispensed prescription in the mail results to 10¢ per prescription in those 25 pharmacies which had allocated some nonpharmacist time to prescription department duties. Four of the 30 pharmacies allocated no nonpharmacist time and one pharmacy employed no nonpharmacists.

Thus all but one mail variable, $\text{nonRPh(\% TIME)}_m$, now could be tested against the "best" personal interview estimators of prescription department costs. Results of these tests were:

Test Variable	"Best" Estimator	Test Variable		"Best" Estimator	
PS_m	$= PS(\%\ TIME)_i$	$\bar{x}=$	\$0.89	\$0.64	T(58) = +2.36, Conf.level = 97.8%
(n = 30)		$s^2=$	0.25	0.11	F(29,29) = 2.24, Conf.level = 96.6%
$PS(\%\ TIME)_m$	$= PS(\%\ TIME)_i$	$\bar{x}=$	0.65	0.64	T(58) = +0.10, Conf.level = 7.9%
(n = 30)		$s^2=$	0.13	0.11	F(29,29) = 1.20, Conf.level = 36.8%
$(RXS/TS)_m PS_m$	$= PS(\%\ TIME)_i$	$\bar{x}=$	0.39	0.64	T(58) = -3.54, Conf.level = 99.9%
(n = 30)		$s^2=$	0.04	0.11	F(29,29) = 2.87, Conf.level = 99.4%

Test Variable	"Best" Estimator		Test Variable	"Best" Estimator	
RPh_m	= $RPh(\%\,TIME)_i$	$\bar{x}$=	\$0.59	\$0.51	T(52) = +0.94, Conf.level=65.0%
	(n = 27)	s^2=	0.11	0.06	F(26,26) = 1.82, Conf.level=86.6%
$RPh(\%\,TIME)_m$	= $RPh(\%\,TIME)_i$	$\bar{x}$=	0.50	0.51	T(52) = -0.21, Conf.level=16.7%
	(n = 27)	s^2=	0.06	0.06	F(26,26) = 1.22, Conf.level=3.1%
$(RXS/TS)_m RPh_m$	= $RPh(\%\,TIME)_i$	$\bar{x}$=	0.27	0.51	T(52) = -4.46, Conf.level=100.0%
	(n = 27)	s^2=	0.02	0.06	F(26,26) = 2.87, Conf.level=99.1%
$nonRPh_m$	= $SumSvcs_i$	$\bar{x}$=	0.68	0.13	T(56) = +6.09, Conf.level=100.0%
	(n = 29)	s^2=	0.23	0.01	F(28,28) = 38.8, Conf.level=100.0%
$nonRPh(\%\,TIME)_m$	= $SumSvcs_i$	$\bar{x}$=	0.03	0.13	T(56) = -5.72, Conf.level=100.0%
[INVALIDATED for n=25]	(n = 29)	s^2=	0.003	0.01	F(28,28) = 1.99, Conf.level=92.6%
$nonRPh(\%\,TIME)_i$	= $SumSvcs_i$	$\bar{x}$=	0.09	0.13	T(56) = -2.05, Conf.level=95.5%
	(n = 29)	s^2=	0.01	0.01	F(28,28) = 1.28, Conf.level=47.9%
$(RXS/TS)_m nonRPh_m$	= $SumSvcs_i$	$\bar{x}$=	0.25	0.13	T(56) = +5.27, Conf.level=100.0%
	(n = 29)	s^2=	0.01	0.01	F(28,28) = 1.46, Conf.level=67.6%

Test Variable	"Best" Estimator		Test Variable	"Best" Estimator	
$nonlabor_m$	= $SumPSest_i$	$\bar{x}$=	\$1.05	\$0.49	T(58) = +4.53, Conf.level=100.0%
(n = 30)		s^2=	0.40	0.05	F(29,29) = 7.90, Conf.level=100.0%
$nonlabor\text{-}(ALLOC)_m$	= $SumPSest_i$	$\bar{x}$=	0.39	0.49	T(58) = -1.98, Conf.level=94.7%
(n = 30)		s^2=	0.03	0.05	F(29,29) = 1.50, Conf.level=72.1%
$(RXS/TS)_m$ - $nonlabor_m$	= $SumPSest_i$	$\bar{x}$=	0.42	0.49	T(58) = -1.40, Conf.level=83.4%
(n = 30)		s^2=	0.03	0.05	F(29,29) = 2.00, Conf.level=93.2%

Thus, from above, the mail per prescription variables which are "closest" (on the basis of lowest T scores) to equalling the "best" estimators from the personal interview survey are time allocated proprietor or manager salaries, $PS(\%\ TIME)_m$; time allocated pharmacist salaries, $RPh(\%\ TIME)_m$; the ratio of Rx sales to total sales times nonpharmacist wages and salaries, $(RXS/TS)_m nonRPh_m$; and the ratio of Rx sales to total sales times nonlabor expenses, $(RXS/TS)_m nonlabor_m$.

$$COD_m = PS(\%\ TIME)_m + RPh(\%\ TIME)_m + (RXS/TS)_m nonRPh_m + (RXS/TS)_m nonlabor_m$$

This cost of dispensing formula will be called the Wisconsin COD, or COD(WIS), the remainder of this study.

b. Mail vs. Mail Variable Check (Test of Practicality)

The practicality check was that per prescription variables not differ significantly from one mail sample of pharmacies to another mail sample, that is, the experiment is repeatable. Mean per prescription cost estimates derived from the first 30 pharmacies surveyed by mail were tested against those same mean estimates derived from the last 45 pharmacies surveyed by mail. For example, $\bar{x}$ PS(% TIME)$_m$ (n=30) = $\bar{x}$ PS(% TIME)$_m$ (n=45). This only was done for the four cost elements in the Wisconsin COD formula.

Results were:

		Sample of Pharmacies		
Test Variable		First	Second	
PS(% TIME)$_m$	$\bar{x}$=	\$0.65	\$0.83	T(72) = -1.87, Conf.level = 93.4%
	s^2=	0.13	0.19	F(43,29) = 1.44, Conf.level = 69.3%
		n=30	n=44	
RPh(% TIME)$_m$	$\bar{x}$=	0.50	0.42	T(59) = +1.05, Conf.level = 70.1%
	s^2=	0.06	0.10	F(33,26) = 1.69, Conf.level = 82.7%
		n=27	n=34	

Test Variable		Sample of Pharmacies: First	Second	
$(RXS/TS)_m nonRPh_m$	$\bar{x}=$	\$0.25	\$0.25	T(71) = +0.07, Conf.level = 5.7%
	$s^2=$	0.01	0.01	F(43,28) = 1.00, Conf.level = 2.5%
		n=29	n=44	
$(RXS/TS)_m nonlabor_m$	$\bar{x}=$	0.42	0.41	T(73) = +0.52, Conf.level = 39.2%
	$s^2=$	0.03	0.02	F(44,29) = 1.45, Conf.level = 73.8%
		n=30	n=45	

c. A Test of Practicality on Time Allocated Nonpharmacist Salaries

It appears that all four variables expressed either as a mean or as a variance in the Wisconsin COD formula were "repeatable" within a 95% confidence level between the two mail samples. Also tested was $nonRPh(\%\ TIME)_i$ from the first sample against $nonRPh(\%\ TIME)_m$ from the second sample, because $nonRPh(\%\ TIME)_m$ had been invalidated in the first mail sample. Its mean and variance had been \$0.04 and 0.003, respectively, for n = 25.

Sample of Pharmacies

Test Variable		First	Second	
nonRPh(% TIME)	$\bar{x}$=	$0.10	$0.16	T(53) = -1.61, Conf.level = 88.7%
	s^2=	0.01	0.02	F(29,24) = 2.89, Conf.level = 99.0%
		n=25	n=30	
		(interview)	(mail)	

We see that the means are not significantly different at a 95% confidence level, but that the variances between the two test variables are significantly different. Thus, mail estimates of time allocated nonpharmacist prescription department costs fail to pass both the validity and practicality checks, since significantly different estimates occur in the mail vs. interview results and in the repeatability results.

Although time allocated nonpharmacist wages and salaries collected by mail was invalidated as a test variable because of significant understating, that the same variable collected by interview more closely approximates the best estimator for nonpharmacist prescription department costs. Perhaps if better instructions had been given respondents by mail, this variable may have improved. Until this can be verified, however, the ratio of Rx sales to total sales times nonpharmacist wages and salaries is the "closest" mail

variable to the "best" estimator of nonpharmacist prescription department cost.

B. Criteria and Tests of the Wisconsin COD Formula

In the previous section, an ideal, mail-collectable, cost of dispensing formula was "built up" from the four "closest" estimators of the "best" four estimates of prescription department operating expenses calculated from data collected in personal interviews with 30 community pharmacy owners or managers. It now is necessary to submit this COD formula, hereafter called the Wisconsin COD formula, or COD(WIS), to the 12 criteria of an ideal COD formula and the ten hypotheses outlined in Chapter One. Other proposed COD formulae also will be tested along with COD(WIS) where appropriate.

1. Material Criteria

The Wisconsin COD formula meets the "material" criteria in that (1) each of the four cost elements in the formula are quantifiable in dollars and can be obtained from each pharmacy in a sample of pharmacies, (2) the variables used in the allocation ratios applied against each cost element in the formula are independent of the variables in the cost elements, (3) each cost element allocation will "work" for all pharmacies in the sample, since between 0% and 100% of each cost element will be

allocated to the prescription department in all cases, and (4) only "sensible" allocation ratios were used against each cost element in the formula. Common sense allocation ratios only were used which were positively associated with the cost elements being allocated.

2. Substitutable Criteria

The Wisconsin COD formula was shown to be a combination of four mail variables which were the "closest" to the four "best" personal interview estimates of prescription department costs for a pharmacy or for a group of pharmacies.

$$COD(WIS) = PS(\%\ TIME)_m + RPh(\%\ TIME)_m + (RXS/RS)_m nonRPh_m + (RXS/TS)_m nonlabor_m$$

$$COD(BEST) = PS(\%\ TIME)_i + RPh(\%\ TIME)_i + SumSvcs_i + SumPSest_i$$

HYPOTHESIS 1 -- Test of Substitutability

> An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin surveyed by mail will equal a mean calculated by summing the best estimators of the four cost elements of prescription department expenses for those same pharmacies surveyed by personal interview.

Thus, the hypothesis is that the mean COD(WIS) = mean COD(BEST). Results from the 30 pharmacies surveyed

by personal interview were:

COD Formula	Unweighted Mean	Median	Modal Range	Actual Range
$Wisconsin_i$	$1.78	$1.69	$1.50-$1.74 (n=10)	$1.14-$2.87
$Best_i$	1.72	1.58	1.50- 1.74 (n=10)	1.15- 3.47

The difference between means, $1.78 and $1.72, is significant only at a 25.6% confidence level, T(58) = 0.33, and thus we fail to reject Hypothesis 1 at a 95% confidence level. Therefore COD(WIS) is a good estimator of the "best" COD formula for these 30 pharmacies. The respective weighted means for these COD formula were $1.69 for COD(WIS) and $1.65 for COD(BEST).

Another comparison that could be made between COD(WIS) and COD(BEST) is how they correlate with possible predictor independent variables. Such variables could include demographic variables, such as the geographical location of the pharmacy and the size of the city in which a pharmacy may be located. Other pharmacy size or pharmacy operations variables might include the number of prescriptions dispensed daily, total pharmacy sales, total prescription sales, the number of years the pharmacy has been under the same ownership, and even the "average" (weighted mean) prescription price charged to patrons.

Results of correlation calculations made between COD(WIS)'s, COD(BEST)'s, and the independent variables

listed above showed the following results for the 30 personal interview pharmacies*:

Both COD(WIS)'s & COD(BEST)'s were positively correlated with:	Both COD(WIS)'s & COD(BEST)'s were negatively correlated with:
Community sizes	The number of prescriptions dispensed daily
"Average" prescription prices	Total prescription sales

*Correlation techniques and their meaning will be described more fully in "Adequate Criteria" and "Discriminate Criteria" later in this chapter. Actual correlation coefficients found for COD(WIS) will be presented in the latter section for a larger number of pharmacies (n=75). Absolute values of coefficients found above for n=30 have been omitted due to the small sample size.

There also was a correlation between the geographical location of pharmacies and their calculated COD(WIS)'s and COD(BEST)'s. There was no significant correlation of either cost of dispensing with the variables, total pharmacy sales or number of years the pharmacy has been under the same ownership. "Positively correlated" implies, for example, that as the size of communities in Wisconsin increase, so will both the calculated COD(WIS)'s and COD(BEST)'s for pharmacies located in those communities. "Negatively correlated" implies, for example, that as total prescription sales of pharmacies increase, both the calculated COD(WIS)'s and COD(BEST)'s will decrease for those pharmacies.

Both statements above apply to groups of pharmacies rather than for a single pharmacy, since increasing prescription sales in one pharmacy does not predict either an increase or a decrease in that pharmacy's calculated cost of dispensing, at least according to the correlation test used here.

Because the Wisconsin COD formula is an acceptable estimator of COD(BEST) for both its mean value and for its similarity in being correlated with independent predictor variables, one can say that COD(WIS) more than meets the test of substitutability as defined in Hypothesis I.

3. Valid Criteria

Both validity and practicality checks for the Wisconsin COD formula were necessary, similar to those performed on the per prescription cost elements previously described. The first check was that results by mail would be the same as results by personal interview (test of validity).

HYPOTHESIS II -- Test of Validity

> An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin surveyed by mail will equal a mean calculated for those same pharmacies surveyed by personal interview.

The hypothesis is that the mean $COD(WIS)_m$ = mean $COD(WIS)_i$. Results from the 30 pharmacies were:

COD Formula	Unweighted Mean	Median	Modal Range	Actual Range
Wisconsin (mail)	$1.76	$1.72	$1.50-$1.74 (n=10)	$1.14-$3.07
Wisconsin (interview)	1.78	1.69	1.50- 1.74 (n=10)	1.14- 2.87

The difference between means, $1.76 and $1.78, is significant only at a 14.6% confidence level, T(58) = 0.19, and thus we fail to reject Hypothesis II at a 95% confidence level. Thus the Wisconsin COD formula gives the same mean results by mail as it would if personal interviews were made, at least for this sample of 30 community pharmacies in Wisconsin. The respective weighted means for these two variables were $1.67 for $COD(WIS)_m$ and $1.69 for $COD(WIS)_i$.

Other summary statistics were:

COD Formula	n	Unweighted Mean ±95% Confidence*	Standard Deviation	Weighted Mean
COD(WIS)-mail	30	$1.76±$0.16	0.4552	$1.67
COD(WIS)-interview	30	1.78± 0.17**	0.4626	1.69
COD(WIS)-mail only	45	1.77± 0.14	0.4791	1.68
COD(WIS)-mail + mail	75	1.77± 0.11**	0.4665	1.68
COD(WIS)-mail + interview	75	1.78± 0.11**	0.4730	1.69

*Assumes an infinite size universe of pharmacies.

(Cont.)

**These confidence intervals would be reduced by one cent each when corrected for the actual finite universe size of 952 Wisconsin community pharmacies.[2]

In the last row above, we have combined the personal interview COD(WIS)'s for n=30 with the mail COD(WIS)'s for n=45 to give us 75 COD(WIS)'s which later will be used in this study for correlation calculations. It was felt that this file of 75 COD(WIS)'s formed a more accurate file, pharmacy by pharmacy, than those all mail COD(WIS)'s in the second last row above. Even though the mail COD(WIS) file for n=30 has been shown to be not significantly different from the personal interview COD(WIS) file for n=30, there actually were 16 COD(WIS) value changes when COD(WIS)'s were calculated from personal interview collected data. These value changes, when summarized [12 interview COD(WIS)'s were raised; four interview COD(WIS)'s were lowered from mail COD(WIS) results], only changed both the unweighted mean and the weighted mean for n=30 by two cents and for n=75 by one cent.

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2. The finite universe correction factor is applied here by multiplying the 95% confidence interval, $\pm 1.96 \frac{s}{\sqrt{n}}$, by $\sqrt{\frac{N-n}{N-1}}$, or $\pm 1.96 \frac{s}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}}$, where s = standard deviation; N = universe size, which here is 952 pharmacies; n = sample size; and 1.96 = the test statistic needed to produce a 95%, rather than another percent, confidence interval. The finite correction figure is better explained in Edward C. Bryant, Statistical Analysis, McGraw-Hill: New York, 1966, p. 66.

4. Practical Criteria

The second check for the Wisconsin COD formula was that results by mail survey of one sample of pharmacies would be the same as results by mail survey of a second sample of pharmacies.

HYPOTHESIS III - Test of Practicality

> An unweighted mean cost of dispensing per prescription calculated for one sample of community pharmacies in Wisconsin surveyed by mail will equal a mean calculated for another sample of pharmacies surveyed by mail.

The hypothesis is that the mean COD(WIS), (n=30) = mean COD(WIS), (n=45), both COD's being calculated from mail survey results. Results from the 75 pharmacies were:

COD Formula	Unweighted Mean	Median	Modal Range	Actual Range
Wisconsin (n=30)	$1.76	$1.72	$1.50-$1.74 (n=10)	$1.14-$3.07
Wisconsin (n=45)	1.77	1.67	1.50- 1.74 (n=13)	0.77- 2.90
Wisconsin (n=75)	1.77	1.68	1.50- 1.74 (n=23)	0.77- 3.07

The one cent difference between COD means between the two samples of pharmacies obviously is not significantly different. The weighted COD mean for the 75 pharmacies was $1.68.

Thus the Wisconsin COD formula has been shown to give similar results by mail as by personal interview (the

validity test) and from one sample of pharmacies to another (the practicality test).

5. Responsive Criteria

No hypothesis was tested about the frequency of measuring costs of dispensing among sample pharmacies, as only 1968 data were collected in this study. However, in view of inflationary trends, it is recommended that costs of dispensing be measured annually for a given pharmacy or for a group of pharmacies.

There is no a priori reason to believe the Wisconsin cost of dispensing formula would not be responsive to changes in costs over time.

6. Precise Criteria

Thus far, the mail collectable COD(WIS) has been shown to be a "close" estimator of the more accurate COD(BEST), which was computed from personal interview collected data. The unweighted mean COD(WIS) was shown to be $1.77 for 75 pharmacies in the Practical Criteria discussion, which compares to the $1.72 for 30 pharmacies calculated for the unweighted mean COD(BEST) discussed in the Substitutable Criteria section.

Since data to compute both COD(WIS) and COD(BEST) were collected from a sample of community pharmacies in Wisconsin rather than from the total universe of pharmacies in Wisconsin, their unweighted means may not, in fact, represent the true means for the 952 total

universe number of pharmacies listed by the Wisconsin Pharmaceutical Association in 1968. However, at a 95% level of confidence, the true unweighted COD(BEST) mean for this universe of pharmacies can be hypothesized as being included in the confidence interval calculated for COD(BEST), once the confidence intervals have been adjusted for a universe size which is known.[3]

Using the correct formula for the 30 personal interview pharmacies,[4] COD(BEST) has a 95% confidence interval of $\$1.72 \pm \$0.19$, or \$1.53 through \$1.91. The corresponding 95% confidence interval for COD(WIS) was $\$1.76 \pm \$0.16$ for 30 pharmacies and was $\$1.77 \pm \$0.10$ for 75 pharmacies, using only mail collected data for both calculations. For personal interview collected data, COD(WIS) has a 95% confidence interval of $\$1.78 \pm \$0.16$.

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3. This means that if we randomly sampled groups of any 30 of the 952 community pharmacies an infinite number of times, 95 out of every 100 confidence intervals calculated for the infinite number of unweighted COD means for those samples should, in fact, contain the true universe COD unweighted mean. A fuller explanation as to how to compute confidence intervals is contained in Chapter 5 of Edward C. Bryant's Statistical Analysis, op. cit., beginning on page 71. The finite (universe size is known) correction factor is discussed on page 66 of this same book.

4. The formula used to compute a 95% confidence interval is

$$\bar{x} \pm 1.96 \frac{s}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}}$$

where $\bar{x}$ = the unweighted mean, s = standard deviation, n = the sample size, and N = the universe size. For the above calculation, the 95% confidence interval =

$$\$1.72 \pm (\$1.96)\left(\frac{0.5344}{\sqrt{30}}\right)\left(\sqrt{\frac{952-30}{952-1}}\right) = \$1.72 \pm \$0.19.$$

HYPOTHESIS IV -- Test of Precision

Mail questionnaire returns from at least 75 representative community pharmacies in Wisconsin are needed to compute an unweighted mean cost of dispensing per prescription within 10¢ of the true mean for all community pharmacies in Wisconsin at a 95% level of confidence.

This hypothesis requires that one test the variance of COD(WIS) for 75 pharmacies to see if it was significantly different from the variance required to result in a confidence interval of ±10¢.[5] The variance for the mail collected COD(WIS) was 0.218 compared to the expected variance of 0.195, not a significant difference using a one-tailed F-test at a 95% confidence level.[6] Thus we fail to reject Hypothesis IV.

Assuming that data from 75 respondents can provide an unweighted mean COD(WIS) which is within 10¢ of the true mean, it is possible to compute the number of mail questionnaires that must be mailed to elicit 75 useable replies. If a return rate of 20% is assumed (this study produced 24%), a mailing of 75/0.20 = 375 questionnaires should be used.

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5. The required variance is calculated using part of the confidence interval equation,

$$\text{i.e., } 1.96\left(\frac{s}{\sqrt{n}}\right) = \$0.10.$$

Solving this latter equation for s^2 gives us $s^2 = 0.195$.

6. The F-distribution and the one-tailed F-test are discussed in Edward C. Bryant, op. cit., p. 91ff. The finite correction factor was not used for this test, as both the test variance and the hypothesized variance would have to be treated, resulting in the same F statistic.

7. Adequate Criteria

A prescription price was shown to consist of three elements in the Definitions Section: the cost of ingredients, the cost of dispensing, and a profit element. Also gross margin was shown to be the cost of dispensing plus the profit element. Depending upon how pharmacists price their prescription services, each prescription dispensed may or may not produce a profit for the pharmacist. In the aggregate, however, one should expect that the mean gross margin per prescription dispensed would be positively correlated with the mean cost of dispensing for that pharmacy. By definition, the mean gross margin must be greater than the mean cost of dispensing for that pharmacy to be operating its prescription department at a profit.

During the personal interview portion of the study, pharmacist respondents were asked, "What is your desired net profit on prescription sales?" Only 13 respondents cared to or could reply; 17 respondents gave no estimates. The mean desired net profit on prescription sales was 11.6% (median 10%, mode 10% [n=7]).

HYPOTHESIS V -- Test of Adequacy

Costs of dispensing per prescription, plus a 10% profit before taxes on total prescription sales per prescription, are equal to gross margins per prescription for community pharmacies in Wisconsin.

The hypothesis as stated can be tested as a difference between means test after first adding 10% of each pharmacy's mean prescription price onto that pharmacy's mean cost of dispensing per prescription. We then recompute an unweighted mean of these new "professional fees", or the cost of dispensing plus a profit component per prescription. Summary statistics for the two original variables plus these new "professional fees" were:

COD Formula	Unweighted Mean	Median	Modal Range	Actual Range
Gross margin per Rx	$1.84	$1.85	$2.00-$2.24 (n=9)	$1.05-$2.69
COD(WIS)	1.85	1.79	1.50- 1.74 (n=7)	0.96- 2.90
Mean Rx price	3.93	3.98	3.75- 3.99 (n=8)	2.52- 5.61
COD(WIS) + 10% of mean Rx price	2.25	2.18	2.00- 2.24 (n=7)	1.21- 3.42
	n=34	n=34		

Only 34 respondents either cared to give their gross margin figures or else kept the records necessary to be able to calculate their gross margin data. Fifteen of the 30 personal interview respondents (50%) had an unweighted mean gross margin per prescription of $1.82, while 19 of the 45 mail only respondents (42%) had a similar mean of $1.85.

The difference between the $1.84 mean gross margin per prescription and the $2.25 mean COD(WIS) plus 10% of

the mean prescription price to patrons is significant at a 95% confidence level and thus Hypothesis V is rejected. Therefore, pharmacy respondents were enjoying less than an "adequate" 10% profit on their prescription dispensing, when using COD(WIS) as their cost of dispensing per prescription.

A correlation calculation also was done to see how strongly the 34 COD(WIS)'s were positively correlated with gross margins per prescription in those 34 pharmacies providing the latter data.[7] The correlation coefficient (r) between the two variables was r = +0.239, at best a weakly positive linear relationship. A correlation coefficient of r = +0.239 means that only $(0.239)^2 = 0.057$, or 5.7%, of the variation in COD(WIS) is accounted for by the regression line calculated between these two variables. About 94.3% of the variation in COD(WIS) is accounted for by other factors. Thus a known gross margin per prescription in a given pharmacy serves as a poor predictor for that pharmacy's cost of dispensing, probably because each pharmacy has their own profit "factor" to add to their costs of dispensing per prescription.

Lack of a strong linear relationship between costs of dispensing and gross margins per prescription is not

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7. A discussion of simple linear regression, correlation, and correlation coefficients and their meaning is described in Edward C. Bryant, op. cit., beginning on page 123, and in William Mendenhall, op. cit., beginning on page 212.

surprising, since many pharmacy respondents had only intuitive feelings about what their true prescription department costs were, over and above the cost of ingredients for prescriptions. Their pricing of prescriptions usually were based more upon their costs of ingredients than upon either their costs of dispensing or their desired profits from their prescription dispensing. Also important in their pricing decision was what other pharmacists in their market were charging for prescription services.

Pricing of prescription services to give a preset percent profit on total prescription sales <u>for a given pharmacy</u> should not be based upon the unweighted mean cost of dispensing.

Instead a predetermined amount should be added to a weighted COD mean. For example, assume a pharmacist anticipates the total cost of medication dispensed at $22,000 for 10,000 prescriptions and total costs of dispensing of $18,000 or a weighted mean of $1.80 per prescription. Desiring 10% of total prescription sales as pre-tax profit would mean adding $40,000 ÷ 0.9 = $44,444 or about $0.45 to the weighted COD mean for each prescription. This pharmacist's professional fee would be $1.80 + 0.45 = $2.25, the amount to be added to the ingredient cost of each prescription to produce the desired 10% pre-tax income on the operation of the prescription department.

8. Discriminate Criteria

It would be desirable to be able to predict a cost of dispensing depending upon the demographics of an individual pharmacy, such as where in Wisconsin it was located geographically or in what size city the pharmacy was located. The same would be true if variables about a pharmacy's operations could serve as a predictor for a COD, such as the total sales of a pharmacy or the number of prescriptions dispensed daily.

To be able to test for COD differences among different pharmacy types was acknowledged in the design of the personal interview phase of the study, where respondents were picked first to be representative of four separate geographical regions of Wisconsin, and second to represent different city sizes.

	Number of Pharmacies		
Geographical Region*	Universe	Mail Return	Interviewed
Milwaukee County	240	7	6
Northeast	240	30	8
Southwest	238	14	8
Northwest	240	24	8
Total	958[8]	75	30

*See Wisconsin map, Appendix E.

8. This universe size of 958 Wisconsin community pharmacies later was lowered to 952 pharmacies according to the Wisconsin Pharmaceutical Association's mailing list of pharmacies.

Correlation calculations were made using COD(WIS)'s calculated from personal interview results for n = 30, and using COD(WIS)'s calculated from mail results for the other 45 pharmacies. Thus, the COD(WIS)'s for the n = 75 correlations which follow contain 30 COD(WIS)'s from personal interview results and 45 COD(WIS)'s from mail results. Earlier in this study (test of validity) it was shown that the personal interview COD(WIS)'s produced essentially the same summary statistics as the mail COD(WIS)'s.

HYPOTHESIS VI -- Test of Discrimination

> Costs of dispensing per prescription are equal for pharmacies which otherwise differ by geographical location, by city size, by the number of prescriptions dispensed daily, by total pharmacy sales, by total prescription sales, by the number of years the pharmacy has been under the same ownership, and by the "average" (weighted mean) prescription prices charged to patrons.

a. Pharmacy Demographic Variables as Predictors for Costs of Dispensing

The Wisconsin costs of dispensing calculated for the 75 interview plus mail respondents gave the following unweighted means for the four geographical regions defined for the study:

Geographical Region	Unweighted Mean COD(WIS)	
Milwaukee County	$1.87	(n = 7)
Northeast	1.87	(n = 30)
Southwest	1.72	(n = 14)
Northwest	1.72	(n = 24)
Unweighted Mean	$1.78	(n = 75)

The correlation coefficient between the four geographical regions and the 75 mean COD(WIS)'s was r = 0.126, a very weak linear relationship.

The COD(WIS)'s calculated by city sizes were:

City Size	Unweighted Mean COD(WIS)	
Less than 25,000	$1.75	(n = 45)
25,000 - 49,000	1.76	(n = 17)
50,000 - 99,000	1.77	(n = 5)
100,000 or more	1.99	(n = 8)
Unweighted Mean	$1.78	(n = 75)

The correlation coefficient between the 75 city sizes (representing 60 cities) and the 75 mean COD(WIS)'s was r = +0.102, again a very weak linear relationship, although it was positive. This implies that mean COD(WIS)'s tend to be larger in larger cities.

From the city size table above, it would appear that mean COD(WIS)'s could be significantly higher in Milwaukee

(1960 population 741,324) and in Madison (1960 population 126,706) with mean COD(WIS)'s of $1.91 (n=6) and $2.24 (n=2, but one of these represented mean data for four pharmacy operations), respectively. Since there are only two cities in Wisconsin with a population of over 100,000 (1960 population), and since the pharmacy sample size of eight for these two cities is too small to make meaningful COD comparisons (243 pharmacies in Milwaukee and 47 pharmacies in Madison in 1968), it would appear useful to expand the sample for these two cities in a future study.

A multiple correlation calculation also was performed which tested the COD(WIS)'s against the two pharmacy demographic variables, geographical region and city size, simultaneously.[9] The coefficient of multiple correlation computed among these variables was r = +0.133, meaning that the degree of linear relationship between the dependent variable, COD(WIS), and the two independent variables, geographical region and city size, was only slightly better than either of the two independent variables matched alone against COD(WIS).

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9. Multiple regression and multiple correlation is described in Edward C. Bryant, op. cit., beginning on page 212.

b. Pharmacy Operations or Size Variables as Predictors for Costs of Dispensing

Unweighted mean costs of dispensing calculated and classified by the number of prescriptions dispensed daily were as follows:

Number of Prescriptions Dispensed Daily*	Unweighted Mean COD(WIS)	
Less than 30	$1.98	(n = 10)
30 - 39	1.98	(n = 14)
40 - 49	1.61	(n = 11)
50 - 59	1.93	(n = 9)
60 - 74	1.78	(n = 12)
75 - 99	1.55	(n = 10)
100 or more	1.54	(n = 9)
Unweighted Mean	$1.78	(n = 75)

*These classes of numbers are comparable to the categories used in the 1968 Lilly Digest. Daily dispensing numbers were calculated by dividing the total number of new plus renewal prescriptions dispensed in 1968 by the actual number of days that pharmacies were open for business, even though some pharmacies only were open half days on Saturdays and Sundays.

The correlation coefficient between the two variables was $r = -0.326$, meaning that costs of dispensing tended to decrease as the number of prescriptions dispensed daily increased. This increased productivity is more apparent in the above table after a pharmacy reached 60 or more prescriptions dispensed daily.

Costs of dispensing also tended to be higher in pharmacies with total prescription sales of less than $40,000, as shown in the table below.

Total Prescription Sales	Unweighted Mean COD(WIS)	
Less than $40,000	$1.96	(n = 11)
$40,000 - $49,000	1.75	(n = 10)
$50,000 - $74,000	1.75	(n = 16)
$75,000 - $99,000	1.72	(n = 22)
$100,000 or more	1.78	(n = 16)
Unweighted Mean	$1.78	(n = 75)

The correlation coefficient between total prescription sales and costs of dispensing only was r = -0.213, a weak negative linear relationship. The fact that costs of dispensing may be higher when total prescription sales are less than $40,000 is that, for example, at $40,000 sales, this may include 10,000 prescriptions at $4.00 each. These 10,000 prescriptions (about 30 per day) may be dispensed by one pharmacist earning $12,000 a year (a reasonable "going rate" for a pharmacist's salary in 1968, according to respondents), so the professional labor rate per prescription dispensed is $1.20.[10] Below $40,000 in

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10. Professional labor rate per prescription norms are discussed more fully in "How To Figure Rx Labor Cost," Chain Store Age - Drug Executives Edition (47:5) April 1971, pp. 252-253.

total prescription sales increases the labor rate per prescription dramatically, even though the pharmacist owner or manager may spend less time in "prescription department duties."

The costs of dispensing were neutral when matched with pharmacies based upon total pharmacy sales:

Total Pharmacy Sales*	Unweighted Mean COD(WIS)
Less than $100,000	$1.75 (n = 11)
$100,000 - 149,000	1.76 (n = 17)
$150,000 - 199,000	1.70 (n = 20)
$200,000 - 299,000	1.78 (n = 14)
$300,000 or more	1.94 (n = 13)
Unweighted Mean	$1.78 (n = 75)

*These classes of numbers are comparable to the categories of numbers used in the 1968 Lilly Digest.

The correlation coefficient between total pharmacy sales and costs of dispensing was r = -0.015, a figure not significantly different from zero, even though it appears that pharmacies with higher pharmacy sales had higher costs of dispensing. Actually, the unweighted mean COD(WIS) for pharmacies with total sales of $300,000 to $399,000 was $2.07 (n=7) compared to a mean of $1.79 for the six pharmacies with total pharmacy sales of $400,000 and over. Evidently, the prescription department

activity is more a factor on costs of dispensing than total pharmacy activity, as measured by total dollar sales.

Another correlation calculation was made to check on the reasonableness of the previous statement. The ratio prescription sales to total pharmacy sales can be hypothesized as being negatively correlated with costs of dispensing. Some type of correlation can be expected also if only because two of the four cost elements in the COD(WIS) formula are allocated to prescription departments based upon the ratio of prescription sales to total pharmacy sales.

Unweighted mean costs of dispensing for different categories of the ratio of prescription sales to total pharmacy sales were:

Ratio of Prescription Sales to Total Sales*	Unweighted Mean COD(WIS)	
Less than 30%	$2.02	(n = 15)
30% - 39%	1.74	(n = 21)
40% - 49%	1.75	(n = 18)
50% - 74%	1.68	(n = 16)
75% - 100%	1.64	(n = 5)
Unweighted Mean	$1.78	(n = 75)

*These classes of numbers are comparable to the categories used in 1968 Lilly Digest.

The correlation coefficient between the two variables was r = -0.245, a negative linear relationship being suggested since costs of dispensing tend to increase as the ratios of prescription sales to total sales decrease. The absolute value of this r statistic is larger than that either for prescription sales or for total sales (r = -0.213 and r = -0.015, respectively). That the ratio was included as an allocative formula for the two cost elements, nonpharmacist wages and nonlabor costs may account for part of these differences.

c. Number of Years Under the Same Ownership as a Predictor for Costs of Dispensing

The number of years that a pharmacy has been under the same ownership can be hypothesized as a determinant for a pharmacy's cost of dispensing. More years of experience might tend to increase the efficiency of a pharmacy's operations, and thus decrease that pharmacy's cost of dispensing.

Results in this study show a neutral effect on costs of dispensing, r = +0.020. Some reasons for the lack of more efficient operations as the number of years under the same ownership increased were that some older pharmacists hired employee pharmacists to help ease their working hours. Also, the increased paperwork demands of patient record services and of third party payer prescription services was cited by older respondents as a reason for

their relatively less efficient operations.

Years under the same ownership was a statistic collected only during the personal interviews:

Years Under Same Ownership	Unweighted Mean COD(WIS)	
Less than 5	$1.84	(n = 6)
5 - 9 years	1.77	(n = 12)
10 - 19 years	1.68	(n = 6)
20 or more	1.84	(n = 6)
Unweighted Mean	$1.78	(n = 30)

d. "Average" Prescription Prices as a Predictor for Costs of Dispensing

In the "Adequate Criteria" section of this study, it was shown that gross margins per prescription (prescription prices minus cost of ingredients) was a relatively poor predictor of costs of dispensing (r = +0.239). Thus, "average" (weighted mean, or total prescription sales divided by total number of dispensed prescriptions) prescription prices also can be expected to be as poor a predictor.

Results showed a correlation coefficient of r = +0.560 between average prescription prices and costs of dispensing, a surprisingly high positive linear relationship.[11]

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11. A large correlation study among 1933 community pharmacies located nationwide was reported in 1971, which attempted to identify and quantify independent (Cont.)

Weighted Mean Prescription Price	Unweighted Mean COD(WIS)	
Less than $3.00	$1.36	(n = 4)
$3.00 - $3.49	1.62	(n = 14)
$3.50 - $3.99	1.69	(n = 28)
$4.00 - $4.49	1.90	(n = 24)
$4.50 or more	2.45	(n = 5)
Unweighted Mean	$1.78	(n = 75)

Thus, knowingly or not, respondents were charging patrons more per prescription dispensed when their costs of dispensing were higher. This fact may work to a pharmacy owner's disadvantage, however, if he fails to react to competitive pricing. For example, one respondent complained that he was repeatedly forced to raise prescription prices to cover his perceived operations costs. At the time of the interview in 1969, his prescription prices were significantly higher than his closest competitor (by his own admission). The logic of lowering prescription prices to attract new patrons,

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11. (Cont.) pharmacy operations variables and prescription services variables that might predict the dependent variable, prescription prices, or, Rx prices = f(independent variables). Since CODs = f(mean Rx prices) above, this is partial evidence that CODs may be a function of those same independent variables. See Pharmacy Charges for Prescription Drugs Under Third Party Programs, R. A. Gosselin and Company: Dedham, Massachusetts, May 5, 1971.

and thus lower his operations costs per prescription, had occurred to him but was rejected. The pharmacy closed for good in early 1971.

e. Multiple Variables as a Predictor for Costs of Dispensing

Earlier in this section it was shown that the variables, geographical region and city size, taken together produced a larger positive correlation with costs of dispensing than the two variables taken separately. Other attempts at multiple correlations taken together with costs of dispensing were:

Test Variables Plus COD(WIS)*	Multiple Correlation Coefficient = r	Sample Size
Geographical region, city size	+0.133	n = 75
Geographical region, city size, TS,RXS	+0.318	n = 75
Geographical region, city size, TS, RXS, Margin/Rx	+0.615	n = 34
Geographical region, city size, TS, Rxs/day, Margin/Rx	+0.663	n = 34
Geographical region, city size, TS, Rxs/day, Margin/Rx, owner years	+0.824	n = 15
Geographical region, city size, TS, RXS, Margin/Rx, owner years, average $Rx	+0.905	n = 15
Geographical region, city size, TS, Rxs/day, Margin/Rx, owner years, average $Rx	+0.911	n = 15
Prescription sales, average Rx price	+0.631	n = 75

(Cont.)

*All variables used are described earlier in this section. Unobvious abbreviations include:

TS = Total pharmacy sales
RXS = Prescription sales
Rxs/day = Prescriptions dispensed daily
Average $Rx = Weighted mean prescription price to patrons

Some variables could not be used together with COD(WIS) because they have too high an intercorrelation with each other, thereby producing a misleadingly high multiple correlation coefficient with COD(WIS). For example, the variables, prescription sales and number of prescriptions dispensed daily, taken together produced a correlation coefficient of +0.975. Thus, these two variables were not used together simultaneously as partial predictors of COD(WIS).

9. Inclusive Criteria

Costs of dispensing prescriptions in pharmacies offering such services as prescription delivery, patient record services, prescription charge services, third party payer prescription services, and even the indirect "service," continuing education of pharmacy employees, can be hypothesized as being higher than in pharmacies which do not offer some or all of these services. These added service costs probably appear mainly in the labor cost elements of a cost of dispensing formula, as employees' "per cent time spent in prescription department duties" would increase to cover the time spent in

providing these added prescription services over and above usual dispensing time.

A more complete analysis of the costs of the above prescription services provided patrons by the 30 personal interview pharmacy respondents follows in Chapter Six. Service costs per prescription calculated in that analysis will be tested here against calculated COD(WIS)'s to see if there is any correlation between costs of dispensing and costs of individual prescription services.

HYPOTHESIS VII -- Test of Inclusion

> Costs of dispensing per prescription for community pharmacies in Wisconsin are the same whether or not they include expenses incurred for such prescription department services as prescription delivery, patient records, prescription charge accounts, third party payer prescriptions, or continuing education costs.

Correlation coefficients were calculated between: (1) the costs of dispensing found in the 30 personal interview respondent pharmacies and (2) each of the following six prescription service cost variables:
(a) prescription delivery costs per prescription delivered,
(b) patient record costs per dispensed prescription,
(c) prescription charge costs per charged prescription,
(d) total added wage costs for third party payer prescription services per third party payer prescription,
(e) continuing education cost per prescription, and
(f) the sum of the five per prescription service costs as a single variable.

All six per prescription service cost variables were positively correlated both with the Wisconsin costs of dispensing and, as a confirmation, with the COD(BEST)'s calculated for the 30 personal interview respondents. Correlation coefficients calculated with costs of dispensing, listed in rank order, were:

Prescription Service (Per Prescription)	Correlation Coefficient (r) with COD(WIS)(n=30)	Unweighted Mean Prescription Service Cost Per Prescription
Patient record costs	+0.376	$0.14 (n = 24)
Sum of the five service costs	+0.288	1.72* (n = 30)
Third party services	+0.230	0.62 (n = 30)
Prescription delivery costs	+0.141	0.68 (n = 27)
Prescription charge costs	+0.105	0.36 (n = 30)
Continuing education costs	+0.090	0.02 (n = 28)

*The "Sum of the five service costs" unweighted mean is not calculated by simply adding up the unweighted means of the five services, since different sample sizes for the five services were involved. Also the base number of prescriptions is different for the various services. For example, the prescription delivery cost is per delivered prescription, and the prescription charge cost is per charged prescription. Calculations of the per prescription costs is explained in Chapter Six.

Thus, it appears as if prescription service costs may raise costs of dispensing in community pharmacies which provide some or all of these prescription services

over and above normal dispensing services. Assuming that the correlation coefficient for the sum of the five service costs is accepted as a predictor for a cost of dispensing, the square of this coefficient, $r^2 = (0.288)^2 = 0.083$, or about 8.3% of the variation of a COD(WIS) is accounted for by the linear regression line between these variables. Multiplying this 8.3% times the unweighted mean "sum of the five service costs" of $1.72, yielding 14¢, gives us a possible cost per prescription factor per pharmacy accounted for by prescription services. This same exercise applied against the individual prescription service coefficients yields a sum of only 6¢ per prescription; however, the total summed prescription service cost factor may be the more appropriate to use. A +0.307 correlation coefficient found between the "sum of the five service costs" variable and COD(BEST)'s yields: $r^2 = (0.307)^2 = 0.094 \times \$1.72 = 16¢$ per prescription.

Even though only 30 respondent pharmacies' costs for prescription services were measured, evidence above strongly implies that added prescription service costs do add to a pharmacy's cost of dispensing. A less direct expression of prescription service costs also was tested for correlation with costs of dispensing which, at first glance, tends to lead the investigator to the opposite conclusion reached above. Individual total prescription service costs as a percent of total prescription sales

gave the following correlation coefficients when matched with costs of dispensing:

Prescription Service (As a percent of Prescription Sales)	Correlation Coefficient (r) with COD(WIS) (n=30)
Prescription delivery costs	-0.027
Patient record costs	+0.092
Prescription charge costs	+0.233
Third party services	-0.127
Continuing education costs	-0.129
Sum of the five service costs	+0.013

Making all these correlation coefficients suspect is that total prescription sales are negatively correlated with costs of dispensing, which probably causes several coefficients above either to be less positive or even negative, when a particular prescription service cost as a percent of total prescription sales variable is matched against costs of dispensing. This example is shown to caution other investigators who might attempt a similar correlation where high intercorrelation between parts of variables may exist.[12]

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12. Another caution should be mentioned for investigators who use gross margins per prescription (the dependent variable) as a function of prescription services and then make the inference that CODs then may be a function of those same services, or gross margins (Cont.)

10. Neutral Criteria

Comparison of the Wisconsin cost of dispensing formula results with other possible COD formula results may help show whether we are being "neutral," or relatively unbiased, in the way that prescription department labor could be computed.

The treatment of the labor elements is important as total labor costs were a weighted mean 65.3% of total pharmacy expenses in the 75 pharmacies in this study.

Earlier, in Table I in the Definition section, it was shown that there are at least 18 different ways of allocating labor costs to prescription departments, assuming three ways each for both proprietor or manager salaries and employee pharmacist salaries and two ways for nonpharmacist wages and salaries. Table II which follows shows the results of allocating labor costs plus nonlabor costs to build a table of 18 alternative weighted mean costs of dispensing, assuming nonlabor pharmacy costs are allocated to prescription departments based upon the ratio of prescription sales to total

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12. (Cont.) per Rx = f(Rx services) does not mean CODs = f(Rx services), since we already have shown that CODs ≠ f(gross margins per Rx). See Jean P. Gagnon and Christopher A. Rodowskas, "A Study of the Relationships of Drug Dosage Form, Therapeutic Class and Pharmaceutical Services with the Gross Margins on Prescription Drugs," unpublished study done under Grant Number 3257-A1 from the Social Security Administration (1971).

TABLE II

WEIGHTED MEAN COSTS OF DISPENSING USING ALTERNATIVE ALLOCATION FORMULAE
(n = 75 pharmacies)*

Proprietor Salary Allocation (PS)	Mean**	Employee Pharmacist Allocation (RPhs)	Mean**	Nonpharmacist Allocation (NonRPhs)	Mean**	Nonlabor Allocations	Mean**
1. 100%	= 89¢	1. 100%	= 48¢				
2. Time	= 62¢	2. Time	= 41¢	1. Time	= 11¢	1. Formula	= 40¢
3. $\frac{RXS}{TS}$***	= 37¢	3. $\frac{RXS}{TS}$	= 21¢	2. $\frac{RXS}{TS}$	= 24¢	2. $\frac{RXS}{TS}$	= 42¢

Weighted Mean Costs per Dispensed Prescription

COD Combination	a. PS		b. RPhs		c. NonRPhs		Rx Dept. Labor (a+b+c)		Nonlabor		Weighted Mean COD
A(1+1+1+2)	89¢	+	48¢	+	11¢	=	$1.48	+	$0.42	=	$1.90
B(1+1+2+2)	89¢	+	48¢	+	24¢	=	1.61	+	0.42	=	2.03
C(1+2+1+2)	89¢	+	41¢	+	11¢	=	1.41	+	0.42	=	1.83
D(1+2+2+2)	89¢	+	41¢	+	24¢	=	1.54	+	0.42	=	1.96
E(1+3+1+2)	89¢	+	21¢	+	11¢	=	1.21	+	0.42	=	1.63
F(1+3+2+2)	89¢	+	21¢	+	24¢	=	1.34	+	0.42	=	1.76
G(2+1+1+2)	62¢	+	48¢	+	11¢	=	1.21	+	0.42	=	$1.63
H(2+1+2+2)	62¢	+	48¢	+	24¢	=	1.34	+	0.42	=	1.76
I(2+2+1+2)	62¢	+	41¢	+	11¢	=	1.14	+	0.42	=	1.56
J(2+2+2+2)	62¢	+	41¢	+	24¢	=	1.27	+	0.42	=	1.69
K(2+3+1+2)	62¢	+	21¢	+	11¢	=	0.94	+	0.42	=	1.36
L(2+3+2+2)	62¢	+	21¢	+	24¢	=	1.07	+	0.42	=	1.49

(Cont.)

TABLE II - Cont.

Weighted Mean Costs per Dispensed Prescription

COD Combination	a. PS		b. RPhs		c. NonRPhs		Rx Dept. Labor (a+b+c)		Nonlabor		Weighted Mean COD
M(3+1+1+2)	37¢	+	48¢	+	11¢	=	$0.96	+	$0.42	=	$1.38
N(3+1+2+2)	37¢	+	48¢	+	24¢	=	1.09	+	0.42	=	1.51
O(3+2+1+2)	37¢	+	41¢	+	11¢	=	0.89	+	0.42	=	1.31
P(3+2+2+2)	37¢	+	41¢	+	24¢	=	1.02	+	0.42	=	1.44
Q(3+3+1+2)	37¢	+	21¢	+	11¢	=	0.69	+	0.42	=	1.11
R(3+3+2+2)	37¢	+	21¢	+	24¢	=	0.82	+	0.42	=	1.24
Other COD Combinations											
S(2+2+1+1)	62¢	+	41¢	+	11¢	=	$1.14	+	0.40	=	$1.54
T(3+3+2+1)	37¢	+	21¢	+	24¢	=	0.82	+	0.40	=	1.22
U(60c+3+2+2)	60¢	+	21¢	+	24¢	=	1.05	+	0.42	=	1.47

*Data include variables collected from 30 personal interviews with respondents (rather than their mail submitted variables), plus the 45 mail only respondents.

**"Means" are per prescription weighted means based upon cost element totals for 75 pharmacies or less divided in all cases by the total number of prescriptions dispensed in all 75 community pharmacies.

***The ratio of prescription sales to total pharmacy sales.

pharmacy sales. Changing this nonlabor allocation method to a formula method explained in the next section would double the possible number of allocative methods to 36.

The weighted mean Wisconsin cost of dispensing appears in the table as COD combination number J, or $1.69. Allocated labor costs as a percent of total prescription department costs is 75.1% in this combination. Allocated labor costs percents range from a low of 62.2% of total costs in combination Q to 79.3% of costs in combination B.

Table II helps to illustrate the difference between two types of weighted means and the unweighted mean that the investigator will encounter in COD analysis work. To arrive at any per prescription allocation shown at the top of Table II, for example 100% of RPh salaries, total employee pharmacist salaries in the combined 75 pharmacies were divided by total number of prescriptions dispensed in those 75 pharmacies to give a weighted mean cost of 48¢ per prescription. However, there were no RPh salaries in 14 of the 75 pharmacies, so 48¢ represents total salaries in 61 pharmacies divided by the total prescriptions dispensed in 75 pharmacies.

A <u>true</u> weighted mean would be total salaries in 61 pharmacies divided by total prescriptions dispensed <u>in those 61 pharmacies</u>, or 55¢ in this example (not shown in Table II). The <u>unweighted</u> mean of the RPh salaries per

prescription dispensed in these 61 pharmacies was 54¢ (not shown in Table II) a number closer to but not equal to (except by accident) the true weighted mean of 55¢. Only if the number of prescriptions dispensed (the denominator for both calculations) were equal from pharmacy to pharmacy would the true weighted mean equal the true unweighted mean.[13]

The particular type of "untrue" weighted cost element per prescription means shown in Table II were used to show each cost element's "contribution" to the true weighted CODs shown in the last column of the table (otherwise they would not have added up to equal the true weighted CODs shown).

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13. $\left(\frac{\Sigma Xi}{n_1} \Big/ \frac{\Sigma Yi}{n_2}\right) = \frac{\Sigma Xi}{\Sigma Yi} = \left[\Sigma\left(\frac{Xi}{Yi}\right) \div n\right]$ $(i=1,2,3,\ldots,n)$,

true weighted mean — weighted mean $[n_1=n_2]$ — unweighted mean

when $Y_1=Y_2=Y_3=\ldots=Y_n$

For example,

$$\left(\frac{X_1+X_2+X_3}{Y_1+Y_2+Y_3}\right) = \left[\left(\frac{X_1+X_2+X_3}{Y_1+Y_2+Y_3}\right) \div 3\right] \quad (n=3,\ Y_1=Y_2=Y_3).$$

The easier assumption was that no numerator (Xi) equals zero (i.e., Xi = 0, i=1,2,3,...,n) in order for both weighted means to be equal to each other. This implies then that

$$n_1 = n_2 \text{ for } \left(\frac{\Sigma Xi}{n_1} \Big/ \frac{\Sigma Yi}{n_2}\right).$$

One last technical point again can be raised here. The unweighted COD means are preferred to weighted COD means for statistical purposes in that variability about unweighted COD means can be expressed for a group of pharmacies. That reimbursements be made to pharmacies for third party payer prescription services based upon unweighted mean CODs also is recommended. A fuller discussion of this recommendation appears in the Summary and Recommendations chapter.

11. Simple Criteria

The nonlabor element of prescription department costs can be dealt with on an individual expense item allocation basis or as all nonlabor expense items taken as a group. Certainly simpler calculations would result if grouped nonlabor expense items could be allocated without any significant loss of accuracy.

HYPOTHESIS VIII -- Test of Simplicity

An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin by allocating prescription department nonlabor expenses by the ratio of prescription sales to total pharmacy sales times total pharmacy nonlabor expense will equal a mean calculated by allocating individual pharmacy nonlabor expense items by the following formulae:

Pharmacy Nonlabor Expense Item	Allocation Ratio Used
Rent Heat, light, and power	Rx department area to total pharmacy area
Taxes Insurance Advertising Depreciation Delivery Telephone Accounting, legal, and other professional fees Miscellaneous expenses	Rx sales to total pharmacy sales
Licenses, dues, and subscriptions	100% direct allocation

The hypothesis requires a test of one cost of dispensing formula against another, where the only difference between formulae is in the treatment of the variable, nonlabor expenses.

Prior to this test, it is possible to measure just the effect of the two per prescription nonlabor cost element allocation involved, or prescription sales to total sales times total nonlabor expenses, (RXS/TS)nonlabor, against various ratios times individual nonlabor expense items, nonlabor(ALLOC). Results of this test were (for n=30 personal interview pharmacies):

Nonlabor Expense Allocation Method	Unweighted Mean ±95% Confidence	Weighted Mean
(RXS/TS)nonlabor	\$0.44±\$0.06	\$0.42
Nonlabor(ALLOC)	0.39± 0.07	0.37

The unweighted means above are not significantly different at a 95% level of confidence, nor were

unweighted means calculated from mail submitted data (not shown). Thus, it is unlikely that any two cost of dispensing formulae, which differ only by this one cost element, should produce results which are significantly different.

Referring to Table II in the previous section, cost of dispensing formula combination number I (the California COD), containing (RXS/TS)nonlabor, was tested against cost of dispensing combination S (the Allocation COD), containing nonlabor(ALLOC). All three other cost elements in both COD formulae were identical. Results of this test were (for n=30 personal interview pharmacies):

COD Combination (Formula)	Unweighted Mean ±95% Confidence	Weighted Mean
I (California)	\$1.62±\$0.16	\$1.55
S (Allocation)	1.57± 0.17	1.50

The unweighted mean COD combinations I and S were not significantly different at a 95% level of confidence. Neither were they different for n=75 pharmacies (not shown). Notice that both the unweighted and weighted means have a 5¢ difference between combinations I and S, the same difference that appeared between the allocated cost elements, (RXS/TS)nonlabor, and nonlabor(ALLOC). The 95% confidence intervals have widened in absolute number of cents, however, reflecting, in part, the variability found in the other three cost elements in the

two COD combinations.

Because we failed to reject Hypothesis VIII, we have provided evidence that the easily calculated cost element, (RXS/TS)nonlabor, gives comparable results to the more difficult to calculate, nonlabor(ALLOC). The implications of this result is that nonlabor expense items of a pharmacy's operations can be dealt with as a group, rather than individually, which certainly lessens the need for costly and timely editing and computing from data submitted in a mail questionnaire. Total nonlabor expenses can easily be calculated then by subtracting a respondent's total wages and salaries from total expenses, rather than by adding individual nonlabor expense items. Not only is this simpler, but the questionnaire editor is less likely to make an arithmatic error.

Requiring pharmacists to submit major nonlabor expense items may still be done in a questionnaire, but only as a check on the reasonableness of a respondent's total expense figure.

12. Effective Criteria

The biggest problem encountered in the study was in the apparent minimization by respondents, of a nonpharmacist employee's involvement in "prescription department duties." Earlier in this chapter, it was shown that the best cost element to represent prescription department nonpharmacist employee wages and salaries was the ratio

of prescription sales to total sales times total nonpharmacist wage costs, (RXS/TS)nonRPhs, rather than being based on the reported percent of time that nonpharmacists spend on "prescription department duties," nonRPhs(% TIME). This problem will again be addressed in the next chapter on Costs of Prescription Services.

Including the correct cost element for nonpharmacist labor costs in a selected COD formula seems important enough to test here.

HYPOTHESIS IX -- Test of Effectiveness

> An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin by allocating nonpharmacist prescription department labor expenses by the ratio of prescription sales to total sales times total pharmacy nonpharmacist labor expenses will equal a mean calculated by allocating nonpharmacist labor expenses by percentage of time spent in prescription department duties.

Referring to Table II in the Neutral Criteria section, cost of dispensing combination formula number I (the California COD), containing nonRPhs(% TIME) was tested against combination J (the Wisconsin COD), containing (RXS/TS)nonRPhs. All three other cost elements in both COD formulae were identical. Results of this test were:

COD Combination (Formula)	Unweighted Mean ±95% Confidence (n = 30)	Unweighted Mean ±95% Confidence (n = 75)	Weighted Mean (n = 75)
I (California)	$1.62±$0.16	$1.63±$0.11	$1.56
H (Wisconsin)	1.78± 0.17	1.78± 0.11	1.69

There was a significant difference between unweighted means for n=75 interview plus mail respondents, but at a 90%, rather than at a 95%, level of confidence. Just as the cost element, nonRPhs(% TIME) fails as a good estimator of the "best" allocation for nonpharmacist labor costs, so, too, does the California COD formula tend to fail estimating the Wisconsin COD formula results. In the test of substitutability, it was shown that COD(WIS) was a good estimator of COD(BEST) for n=30 pharmacies.

Hypothesis IX is rejected at a 90% level of confidence. Until pharmacists are better able to estimate nonpharmacist time spent in prescription department duties, the ratio, RXS/TS, times nonpharmacist labor costs remains the more accurate measure of this variable's contribution to costs of dispensing.

C. Comparison of the Wisconsin COD Formula with Other Proposed Formulae

Results using the Wisconsin COD formula, or COD(WIS), have been shown to meet most of the 12 criteria itemized as desirable criteria for any cost of dispensing formula.

Also it was shown that each allocated cost element within COD(WIS) was a good estimator for the four "best" cost elements that were found in a personal interview survey among 30 Wisconsin community pharmacy owners or managers.

One last hypothesis could be tested here, in case other proposed COD formulae also could pass most of the previous hypotheses tests, even though they may not contain the four "best" per prescription cost elements as does COD(WIS).

HYPOTHESIS X -- Test of Comparability

> An unweighted mean cost of dispensing per prescription calculated for community pharmacies in Wisconsin surveyed by mail using the Wisconsin COD formula is as good as or is better than seven alternative COD formulae.

The test will be made by matching COD(WIS) and other COD formulae proposed either in the literature or by the author in other unpublished studies, with COD(BEST).

Following are other proposed COD formulae along with COD(WIS), which could be tested against COD(BEST).

COD Combination (Formula)		COD Formula Elements (divide each by Rxs)
F(ACA#1)COD	=	PS + (RXS/TS)RPhs + (RXS/TS)nonRPhs + (RXS/TS)nonlabor
G(WPhA)COD	=	PS(% TIME) + RPhs + (RXS/TS)nonRPhs + (RXS/TS)nonlabor
H(IPhA)COD	=	PS(% TIME) + RPhs + nonRPhs(% TIME) + (RXS/TS)nonlabor
I(CALIF)COD	=	PS(% TIME) + RPhs(% TIME) + nonRPhs(% TIME) + (RXS/TS)nonlabor
N(ACA#2)COD	=	(RXS/TS)PS + RPhs + (RXS/TS)nonRPhs + (RXS/TS)nonlabor
U(CANADA)COD	=	0.60 + (RXS/TS)RPhs + (RXS/TS)nonRPhs + (RXS/TS)nonlabor
S(ALLOC)COD	=	PS(% TIME) + RPhs(% TIME) + nonRPhs(% TIME) + nonlabor(ALLOC)
J(WIS)COD	=	PS(% TIME) + RPhs(% TIME) + (RXS/TS)nonRPhs + (RXS/TS)nonlabor

Hypothesis X is worded to test COD results from mail collected data. However, since the test involves comparing CODs against COD(BEST), which was derived from personal interview data, it seemed advisable to compute all eight CODs above for both mail and personal interview results. Following is a table showing the unweighted COD means and other comparative summary data (Table III).

Results show COD(WIS) to be as close as or closer to COD(BEST) when alternative unweighted COD means from the mail survey are compared with the unweighted mean

TABLE III

MEAN COMPARISONS OF PER PRESCRIPTION COSTS OF DISPENSING USING ALTERNATIVE ALLOCATION FORMULAE

(n = 30 pharmacies)

COD Formula	Unweighted Mean ±95% Confidence (n=30 Interview)	Unweighted Mean (n=30 Mail)	Weighted Mean (n=30 Interview)	Weighted Mean (n=30 Mail)
ACA #1	$1.81±$0.19	$1.80	$1.68	$1.67
WPhA	1.86± 0.18	1.84	1.75	1.74
IPhA	1.70± 0.18	1.62	1.61	1.54
California	1.62± 0.16	1.55	1.55	1.48
ACA #2	1.61± 0.17	1.58	1.55	1.53
Canada	1.53± 0.10	1.51	1.52	1.50
Allocation	1.57± 0.17	1.51	1.50	1.44
Wisconsin	1.78± 0.17	1.76	1.69	1.67
"BEST"	1.72± 0.19	*	1.65	*

*COD(BEST) could not be calculated from data submitted by mail.

COD(BEST) derived from personal interview collected data ($1.76 compared with $1.72). Data collected in the personal interview survey gave the IPhA COD formula an unweighted mean value of $1.70, however, its mean value in the mail survey was $1.62. We thus fail to reject Hypothesis X, which pertains to mail collected data.

Table IV shows summarized results for the eight alternative CODs for the total 75 interview plus mail only respondents. Notice that the variability about the unweighted means is somewhat constant among the various CODs with the exception of the Canada COD. This, in addition to lower absolute means than other CODs, is caused by substituting 60¢ per prescription into each pharmacy's COD calculation in place of an actual proprietor or manager salary allocation. Thus the "normal" variability around an unweighted mean tends to be reduced when a constant cost figure replaces a varying cost figure. The 60¢ figure compares favorably with the weighted mean PS(% TIME) figure of 62¢ in Table II (but unfavorably with the unweighted mean PS(% TIME) of $0.75); however, the loss of variability tends to "smooth out" reality.

The medians in Table IV tend to be lower than even weighted mean CODs. That unweighted means might be significantly higher than some medians probably is caused by some extreme high COD values; the actual ranges show some of these high values for some CODs. The Wisconsin

TABLE IV

OTHER COMPARISONS OF PER PRESCRIPTION COSTS OF DISPENSING USING ALTERNATIVE ALLOCATION FORMULAE

(n = 75 pharmacies)*

COD Formula	Unweighted Mean ±95% Confidence	Weighted Mean	Median	Mode (to nearest 10c)	Actual Range
ACA #1	$1.89±$0.12	$1.76	$1.75	$1.70 (n = 10)	$0.89 - $3.14
WPhA	1.84± 0.11	1.76	1.72	1.70 (n = 10)	0.77 - 3.23
IPhA	1.70± 0.11	1.63	1.58	1.40 (n = 12)	0.68 - 3.23
California	1.63± 0.11	1.56	1.51	1.40 (n = 15)	0.68 - 2.95
ACA #2	1.51± 0.10	1.51	1.43	1.40 (n = 12)	0.74 - 3.13
Canada	1.45± 0.06	1.47	1.40	1.30 (n = 15)	0.91 - 2.48
Allocation	1.63± 0.12	1.54	1.47	1.30 (n = 13)	0.65 - 3.23
Wisconsin	1.78± 0.11	1.69	1.67	1.70 (n = 10)	0.77 - 2.90

*Data include variables collected from 30 personal interviews with respondent pharmacies (rather than their mail submitted variables), plus the 45 mail only respondent pharmacies.

COD seems to have avoided some of these high values.

Use of the unweighted mean as a better indication of central tendency still is preferred after this analysis. There were good reasons for extremely high or extremely low CODs found among respondents, and an indication of central tendency should recognize these extremes. An unusually low COD can be found, for example, in a small town pharmacy where captive patrons may have to put up with no prescription services over and above usual dispensing time, plus unusually long waits for service from underpaid and overworked pharmacist employees (maybe even the owner's pharmacist wife!). An unusually high COD can be found in a marginally profitable (or unprofitable) pharmacy which dispenses few prescriptions over which high costs must be spread.

CHAPTER SIX

COSTS OF PRESCRIPTION SERVICES

The mail survey showed many pharmacists offered more than minimal services for their patrons. Of the 75 mail respondents, 63, or 84.0%, routinely delivered prescriptions; 57, or 76.0%, routinely maintained a patient record system; 73, or 97.3%, routinely offered a prescription charge account service; and 66 of 74 respondents, or 89.2%, said they routinely provided a 24-hour emergency service. All respondents dispensed prescriptions for beneficiaries of the Wisconsin Medical Assistance Program (Title 19) and for other third party payer beneficiaries.

A. Purposes of the Prescription Services Analyses

To determine the actual costs for pharmacies to provide prescription delivery, patient record, prescription charge account, and third party payer prescription services was one of the purposes of the personal interview survey of 30 pharmacy owners or managers. The pharmacy's cost for their employees' continuing education, an indirect patron service, also was determined. Pharmacy costs to provide 24-hour emergency services were not computed.

Pharmacy costs for these prescription services were computed to develop and use bases for comparing these costs among a group of pharmacies other than by comparing

only absolute dollar costs. At least two bases of comparison for each prescription service were preferred. For example, prescription delivery costs might be computed as costs per delivered prescription as well as costs per prescription delivery trip. Costs per delivered prescription may be far less for delivering large numbers of prescriptions per delivery trip just to nursing homes, for example, than that for delivering only one or two prescriptions per delivery trip to individual patrons. The costs per delivery trip may be similar, however.

A secondary purpose of questioning about delivery, patient record, charge account, and third party prescription services was to measure how much proprietor(s)' or manager's time; individual employee pharmacist's time; and individual employee nonpharmacist's time was spent on them. This was done for two main reasons: (1) adding employee nonpharmacists' times spent on the four services was a check on a respondent's percent estimates of total nonpharmacists' times to be allocated to his prescription department, and (2) time spent on prescription services by each employee along with his wage or salary level allowed measurement and comparison of prescription services labor costs among pharmacies which differed in part because of interpharmacy labor cost differences as well as intrapharmacy labor cost differences.

Interpharmacy wages or salaries are those paid to similarly trained personnel from pharmacy to pharmacy, for example, an employee pharmacist's $5.00 an hour in Pharmacy 1 and an employee pharmacist's $5.50 an hour in Pharmacy 2. Such differences among the surveyed pharmacies were minor.

Intrapharmacy wages or salaries are those paid to employees not similarly trained within the same pharmacy, such as an employee pharmacist's $5.00 an hour in Pharmacy 1 and an employee nonpharmacist's $3.00 an hour in Pharmacy 1. Such differences within the surveyed pharmacies were major.

B. Comparison of Prescription Service Costs

To be able to summarize cost data from the 30 pharmacies for the year 1968, the following comparative formulae were used:

(1) Prescription delivery service.

Bases for comparison:

(a) Prescription delivery cost per delivered prescription.

(b) Prescription delivery cost per prescription delivery trip.

(2) Patient record service.

Bases for comparison:

(a) Patient record service cost per dispensed prescription.

(b) Patient record service cost per patient record maintained.

(3) Prescription charge account service.

Bases for comparison:

(a) Prescription charge account cost per charged prescription.

(b) Total charge account cost per account mailing.

(4) Third party payer prescription services, including Title 19 prescriptions.

Bases for comparison:

(a) Total added wage costs for third party payer prescription services per third party payer prescription.

(b) Total added time necessary for third party payer prescription services per third party payer prescription.

(5) Continuing education expenses.

Basis for comparison:

(a) Total continuing education cost per dispensed prescription.

Other bases for comparison used for each of the above services were:

(1) Total service costs as a percent of total pharmacy sales.

(2) Total prescription service costs as a percent of total prescription sales.

No basis for comparison was established for 24-hour emergency service costs, since lengthy questioning was required to obtain the necessary data, such as costs for an answering service, number of pharmacists' after hours calls per week, and so forth.

All per prescription bases for comparison listed for prescription delivery service, patient record service, prescription charge account service, and third party payer prescription services also were computed after each pharmacy's wage costs had been "converted" into nonpharmacists' wages using the technique described in the next section.

C. Personnel Time Spent on Prescription Services

For each pharmacy, proprietor(s)' or manager's time, employee pharmacist times, and employee nonpharmacist times spent on four pharmacy services (delivery, patient record, charge account, and third party prescription services) were collected for each employee, and individual wages or salaries were used to change these times to wage costs.

1. Comparison of Nonpharmacist Time Spent on Prescription Services

The following calculations were made to separate employee nonpharmacist wages for the four prescription services from the four pharmacy services total costs:

(1) Total employee nonpharmacist wages for delivery services were multiplied by the ratio of the number of prescription delivery trips to total

delivery trips to get nonpharmacist wages for prescription delivery services in each pharmacy.

(2) No adjustments on total employee nonpharmacist wages for patient record services were made, as this service was provided only for prescription patrons in each pharmacy surveyed.

(3) Total employee nonpharmacist wages for charge account services were multiplied by the ratio of the number of prescription charges to total charges to get nonpharmacist wages for prescription charge account services in each pharmacy.

(4) Total employee nonpharmacist wages for third party prescription services were calculated by multiplying individual nonpharmacist wages per minute times the <u>additional</u> time in minutes required to handle the paperwork and administration necessary over and above that required for usual prescription dispensing in each pharmacy.

Adding employee nonpharmacist wages from the four prescription services above provides a check on the respondents' estimate of total nonpharmacist time spent in prescription department duties as requested in the mail questionnaire.

If the added wages were higher than the estimated total wages to be allocated, the former really could be accepted as a more accurate reflection of actual employee nonpharmacist prescription department wage expense. For example, the respondent only may have allocated five percent of his nonpharmacist employees' time to prescription department duties, when actually the added wages from the four prescription services amounted to 10% of their time. This latter estimate then can be hypothesized as being more accurate. This total cost still may in fact be underestimated, since employees' time in waiting on prescription patrons in the pharmacy may not have been included in pharmacists' estimates, and specifically is excluded in the evaluation of just the four services noted above.

If the added prescription services wages were less than that estimated by the respondent, then the respondent's percent of employees' time estimate could be hypothesized as being more accurate. He may be including additional time spent by nonpharmacist employees in waiting on prescription patrons, related prescription department ordering, and even housekeeping chores in the prescription department.

2. Comparison of Prescription Services Wage Costs

Prescription services wage costs were computed for each pharmacy, consisting of the proprietor(s)' or manager's salary, employee pharmacists' wages and salaries, and employee nonpharmacists' wages and salaries, depending on which personnel's time was spent on these services. No adjustments were made for interpharmacy wage differences with actual salaries used rather than, for example, a $5.00 an hour wage cost for a pharmacist's time in all pharmacies.

The basis of comparison used to measure the impact of labor costs among surveyed pharmacies was the individual prescription service wage as a percent of the total individual prescription service costs.

3. Conversion of Professional Wage Costs to Nonpharmacist Wage Costs

To resolve the major differences found in intra-pharmacy pay among pharmacies, all professional (proprietor(s), managers and pharmacists, interns, and externs) personnel times spent on individual prescription services had to be "converted" into a common wage rate before total prescription service wage costs could be recomputed. Professional personnel here include the proprietor(s) or the manager of each pharmacy since, by Wisconsin law, he must be a registered pharmacist.

Professional wage costs as a percent of total wage costs for providing the four individual prescription services will be presented first. Next, the "converted" wages will be used to compute new "converted" total service costs, and "converted" prescription service cost bases for comparison among pharmacies will be computed and compared to the original prescription service cost bases.

"Conversion" was done by changing all proprietor and employee pharmacist, intern, and extern prescription service time into wage costs at $3.00 an hour. This was an arbitrary "going rate" for "above average" nonpharmacist clerical help in Wisconsin in 1968 (as determined by asking the pharmacy owners and managers during the survey). Actual employee nonpharmacist wages, which often were lower than $3.00 an hour, were accepted as given and were not "converted" so as to avoid inflating wage costs above actual wage costs. Thus, by definition, total wage costs only could go down upon conversion, not up, since all wages utilized were $3.00 an hour or less.

This conversion of time into solely nonpharmacist time now allows, for example, comparison of prescription service costs per prescription between one pharmacy where patient records are maintained by a pharmacist at $6.00 an hour, and another pharmacy where a nonpharmacist at $1.50 an hour maintained patient records.

Other factors such as the different means of providing services and the extent of the services rendered also could be "converted" to allow a better comparison of bases among pharmacies. However, this was not done in order to preserve the variability of data that you might expect would occur when measuring variables from a heterogeneous sample of pharmacies. The wage conversion that was used merely was done to soften the extreme values found among pharmacies to arrive at a "better" mean value. Both the original and the converted calculations will be presented in the summary statistics to show the effect of this wage conversion.

D. Prescription Delivery Services

Of the four direct prescription service costs to be computed, only the cost of delivery services usually appears in a pharmacy's income statement as such, and usually it only amounts to two percent of total pharmacy sales or less.[1] However, true delivery costs may be (1) understated here because delivery wages usually are excluded from this income statement expense, or (2) overstated here because personal automobile expenses

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1. Income statement delivery costs ranged from weighted averages of 0.2% to 1.7% of total sales in the Lilly Digest's fifty-four categories of operating figures summarized from data submitted by more than 2,000 community pharmacy owners for 1968.

Respondent	Do you routinely deliver prescriptions? Yes	No	Total	% Yes
Personal interview	27	3	30	90.0%
Mail only	36	9	45	80.0%
TOTAL	63	12	75	

"Routinely" deliver was interpreted differently by respondents. This is shown by matching the percents of prescriptions delivered by "routine" deliverers.

% of Rx's Delivered	Do you routinely deliver prescriptions? Yes	No	Total
Less than 5%	10	9	19
5%	12	1	13
More than 5%	41	2	43
TOTAL	63	12	75

Thirteen pharmacists (43.3%) provided delivery services with separate delivery vehicles, either trucks or automobiles, and 17 had no such vehicles. One respondent with four outlets maintained a fleet of six delivery vans; another respondent with four outlets used taxi service for deliveries.

The 17 respondents with no delivery vehicles made deliveries either by personal car, taxicab, or even by mail. Three of these 17 respondents delivered 1% or less of their prescriptions. One respondent maintained a

separate delivery vehicle despite delivering only about one percent of his prescriptions. This respondent had many nonprescription deliveries in his trading area, and he expected prescription deliveries to increase as his pharmacy recently had moved to a shopping center location from a downtown location.

At the other extreme, another respondent who wanted to add "professionalism" to his prescription services, primarily had an employee pharmacist deliver about 4,000 prescriptions in 1968 using that pharmacist's own automobile. About 90% of these prescriptions were delivered to institutions such as nursing homes and small hospitals in the surrounding area.

Charges by taxicab drivers ranged from costs of 40¢ to 80¢ per prescription delivery trip, while parcel post costs were estimated at about 20¢ per mailed prescription. These costs, over and above costs incurred in preparing a prescription for a delivery trip, seemed to influence respondents' decisions to have their own delivery vehicles. The volume of nonprescription deliveries, especially in areas where competitive conditions were such that this service was expected by patrons, probably was a more important factor in these decisions, however.

b. Percent of Prescriptions Delivered

The 30 personal interview respondents delivered an unweighted mean of 14.3% of their prescriptions (median 10%, mode 5% [n=10]). Those 27 who delivered 5% or more of prescriptions delivered a weighted mean of 15.4% and an unweighted mean of 15.7% of all prescriptions (median 10% and mode 5% [n=10]). The 45 respondents included in the mail sample delivered a mean of 13.8% of prescriptions (median 10%, mode 10% [n=9]). Together the 75 delivered an unweighted mean of 14.0% of prescriptions (median 10%, mode 10% [n=16]). The range for the 75 respondents was from 0% through 67% of their prescriptions.

What % of all prescriptions are delivered?	Number of pharmacies n=30	n=45	n=75
Mean percent (unweighted)	14.3%	13.8%	14.0%
Median percent	10%	10%	10%
Mode percent	5% (n=10)	10% (n=9)	10% (n=16)
Actual Range	1%-55%	0%-67%	0%-67%

The majority of the 75 respondents delivered less than 20% of all their prescriptions.

What % of all prescriptions are delivered?	n=30	n=45	n=75	Percent (n=75)
50% or more	2	2	4	5.3%
40%-49%	1	2	3	4.0
30%-39%	1	3	4	5.3
20%-29%	5	5	10	13.3
10%-19%	8	13	21	28.0
0%- 9%	13	20	33	44.0
6%- 9%	0	1	1	
5%	10	3	13	
1%- 4%	3	12	15	
0%	0	4	4	
Total				100.0%

Total prescription delivery cost per delivered prescription was 40¢ for one respondent who delivered 55% of dispensed prescriptions, 22¢ for one delivering 50% of prescriptions, and 30¢ for another delivering 45% of prescriptions. The other high percent delivery pharmacists were in the sample of 45 respondents for which only income statement delivery expenses were available and not total delivery costs. Two pharmacists in that sample delivered 67% and 65%, respectively, of their total prescriptions.

c. Change of Answers Analysis

Among the 30 personal interview respondents, one respondent changed answers on delivery service; he had reported by mail that he delivered 40% of his prescriptions, which was changed to 5% through questioning in person. Two other respondents said they delivered 5% of

their prescriptions while they had given no answer to this question by mail. From mail only results, this would mean that the unweighted mean for 28 pharmacies would have been 16.2% and not 15.7% for the 27 personal interview respondents, not a significant change.

2. Comparison of Prescription Delivery Service Costs

a. Prescription Delivery Costs per Delivered Prescription and per Prescription Delivery Trip

Among the 30 pharmacies where personal interviews were held, the following summary statistics were calculated for the 27 respondents who delivered 5% or more of their prescriptions:

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Prescription delivery cost per delivered prescription (n=27)	$0.68	$0.54	$0.20-$0.29 $0.30-$0.39 (n=5)	$0.13-$1.86
Prescription delivery cost per prescription delivery trip (n=27)	$1.06	$0.72	$0.70-$0.79 (n=5)	$0.28-$4.75

The weighted mean prescription delivery cost per delivered prescription was $0.46 and the weighted mean prescription delivery cost per prescription delivery trip was $0.79.

Including the three respondents who delivered less than 5% of their prescriptions raises the prescription delivery cost per delivered prescription to an unweighted mean of $0.91 and a median of $0.56; mean prescription delivery cost per prescription delivery trip decreases to $1.04 and a median of $0.74.

The large differences between the weighted means and their respective unweighted means above are evidence that pharmacists who deliver larger percents of their total dispensed prescriptions have less delivery cost per prescription. In this sample, for example, those who delivered more than 20% of their total prescriptions had prescription delivery costs per delivered prescription and per prescription delivery trip below the respective weighted means for those comparison bases.

b. Formulae Used to Compute Comparison Bases for Prescription Delivery Service Costs

Prescription delivery costs for each pharmacy were computed by (1) adding the delivery expense total shown in the pharmacy's income statement minus costs for personal use of delivery vehicles plus the wage and salary costs for personnel who provided any delivery services, then (2) multiplying these total delivery service costs times the respondent's estimate of prescription delivery trips as a percent of total delivery trips (Rx means prescription in the formulae

which follow):

$$\text{Prescription delivery costs} = \left(\begin{array}{c}\text{Income statement "delivery expense"} \\ \text{(known)}\end{array} - \begin{array}{c}\text{Personal use costs} \\ \text{(estimated)}\end{array} + \begin{array}{c}\text{Allocated personnel wages and salaries} \\ \text{(estimated)}\end{array}\right) \times \left(\begin{array}{c}\text{Rx delivery \% trips} \\ \hline \text{Total delivery trips} \\ \text{(estimated)}\end{array}\right)$$

(--Total Delivery Service Costs--)

Included in total delivery costs were delivery vehicle maintenance costs as estimated by each respondent, if a separate vehicle was used for delivery. Excluded were vehicle depreciation charges, unless they already were included in that pharmacy's income statement under "delivery expense." Vehicle depreciation charges should be included in total delivery costs in a study like this. It is unknown how many of the 13 respondents, who owned separate delivery vehicles, had included this expense under "delivery expense."

Employee wage costs were computed as will be described in "Personnel Time Spent on Prescription Delivery Services."

To compute prescription delivery costs on a per delivered prescription basis, it was first necessary to know the numbers of prescriptions which had been delivered.

The number of prescriptions delivered from each pharmacy first was computed by asking respondents to estimate what percent of total prescriptions were

delivered:

Total number of delivered prescriptions	=	Total Rxs dispensed	X	% Delivered Rxs / Total Rxs
(first method)		(known)		(estimated)

Another way of computing the number of delivered prescriptions was to multiply the number of prescription delivery trips by the number of prescriptions delivered per prescription delivery trip:

Total number of delivered prescriptions	=	Number of Rx delivery trips	X	Number of Rxs per delivery trip
(second method)		(estimated)		(estimated)

This second method, however, first required calculating the number of Rx delivery trips. This was done by obtaining the respondent's estimate of his total number of delivery trips per week and what percent of these trips involved a prescription delivery:

Number of prescription delivery trips	=	Total delivery trips per week	X	52	X	% Rx delivery trips / Total delivery trips
		(estimated)				(estimated)

The number of prescription delivery trips later was used to compute prescription delivery costs per delivered prescription, where the number of delivered prescriptions

were those calculated in the first method.

Although both ways of computing the total number of delivered prescriptions were tried in the study, the first method appears to be superior since it only involves one estimate and one known variable versus three estimates and no known variables in the latter method.

In this study the first method resulted in a smaller number of dispensed prescriptions being delivered (and, therefore, higher prescription delivery costs per delivered prescription) for 18 of the 30 pharmacies. For 11 pharmacies, a larger number of prescriptions were delivered and in one pharmacy the numbers were the same. Using the second method, the unweighted mean delivery cost per delivered prescription was lowered to $0.53 for the 27 respondents who delivered 5% or more of their prescriptions, compared to a mean of $0.68 using the first method, a difference which is significant at a 99% confidence level. The median was $0.40 per prescription in the second method, compared to $0.54 when the number of delivered prescriptions equalled an estimated percent of total prescriptions dispensed. This median difference probably is significant; however, the sample size of n=27 really is too small to make meaningful conclusions about these differences. The weighted mean prescription delivery cost shifted from $0.46 to $0.34 per prescription using the second method. Generally, though, the second method probably will overstate the number of delivered

prescriptions.

c. Additional Comparative Delivery Statistics

Total delivery costs among the 27 respondents who routinely deliver were a weighted mean of 125% higher than delivery expenses shown on the pharmacies' income statements, primarily due to the inclusion of delivery wages. The unweighted mean increase was 188% (median 142%, modal range 100-199% [n=6]), and the range was from -43% through infinity. Only for two pharmacies were computed total delivery costs lower than income statement delivery expenses and for three pharmacies they were the same figure; the two pharmacists either had included the full wages of delivery personnel who performed other duties or they sometimes had used their delivery vehicles for nondelivery purposes. These overall increased total delivery service costs raised the weighted mean of total delivery costs as a percent of total pharmacy sales from 0.4% to 0.9% of total sales.

Among the 27 pharmacists who routinely deliver, additional total cost statistics were computed about nonprescription delivery costs and nonprescription delivery trips. Nonprescription delivery trips only were made in 14 of these 27 pharmacies.

	Prescription delivery (n=27)	Nonprescription delivery (n=14)	Total delivery (n=27)
	a	c	e
Delivery costs	$47,639 (79.4%)*	$12,351 (20.6%)	$59,990 (100.0%)
	b	d	f
Delivery trips	61,585 (77.7%)*	17,717 (22.3%)	79,302 (100.0%)
Cost per trip (weighted mean)	$0.77 (a÷b)	$0.70 (c÷d)	$0.76 (e÷f)
Cost per trip (unweighted mean)	$1.06	$0.76	$1.06
Cost per trip (median)	$0.72	$0.71	$0.72

*These should be equal percents since both were computed pharmacy by pharmacy by multiplying total delivery costs and total delivery trips times the respondent's estimate of prescription trips as a percent of all delivery trips. Rounding errors, in aggregate, caused these percents to differ by 1.7%.

Respondents in the 27 pharmacies estimated that an unweighted mean of 88.1% of all delivery trips involved the delivery of at least one prescription (median 99%, mode 100% [n=13]), compared to the weighted mean above of 77.7%. The range was from 10% through 100%.

The estimated number of prescriptions per prescription delivery trip ranged from one through six among the 27 pharmacists. The mean number of prescriptions per trip was 2.4 (median 2, mode 2 [n=11]). The actual range was from one to six. As a check on this

estimate, the numbers of prescriptions per prescription delivery trip were computed from respondents' estimates of the total number of prescriptions delivered divided by respondents' estimates of the number of prescription delivery trips. This computed number ranged from 0.4 to 5.5 (mean 2.0, median 1.7, mode 1 [n=11] after rounding). This exercise provided further evidence that respondents gave reasonable estimates of both delivered prescriptions as a percent of total prescriptions dispensed and of prescription delivery trips as a percent of total delivery trips.

d. Delivery Costs as Percents of Total Sales and of Prescription Sales

Total delivery service costs were a weighted mean of 0.9% of total pharmacy sales for the 27 respondents who routinely delivered 5% or more of their prescriptions (compared to a weighted mean of 0.5% of total sales when only income statement delivery expenses were used).

Computed prescription delivery service costs were a weighted mean of 1.8% of prescription sales for the 27 pharmacies. Prescription delivery costs were computed by multiplying total delivery costs by the percent of prescription delivery trips to total delivery trips. Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Mode (rounded to nearest 1%)	Range
Total delivery service costs as a percent of total sales (n=24)	1.1%	0.8%	1% (n=14)	0.1%-4.2%
Prescription delivery costs as a percent of prescription sales (n=24)	2.0%	1.6%	2% (n=9)	0.2%-5.5%

3. Personnel Time Spent on Prescription Delivery Services

Respondents were asked to estimate how many minutes or hours per day, week, or month of the proprietor(s)' or manager's time and each employee's time were spent on delivery services to include time spent receiving calls, preparing delivery orders, and time on the delivery trips. Combined with each person's wage or salary, a total delivery wage cost was determined for each pharmacy. Wage and salary costs were determined both for professional personnel and for nonpharmacist employees. Total delivery wage costs then were multiplied by the percent of prescription delivery trips to total delivery trips to get prescription delivery service wage costs, which are then compared among the 27 respondents who routinely deliver.

a. Comparison of Prescription Delivery Wage Costs

Both total delivery wages and total delivery costs can be multiplied by the percent of prescription delivery trips to total delivery trips to get prescription delivery wages and prescription delivery costs. Both total delivery wages and prescription delivery wages, therefore, equal the same percents of total delivery costs and prescription delivery costs, respectively.

Prescription delivery wages were a weighted mean of 61.6% of total prescription delivery costs for the 27 pharmacies, while nonlabor costs were 38.4% of total costs. The unweighted mean wage cost was 55.0% of total costs (median 58.5%, modal range 50-59% [n=7]) and the range was from 0% through 100%.

The only respondent giving 0% believed no additional employee time, over and above normal dispensing time, was required to prepare prescriptions for delivery which was by mail. Two respondents gave only wage time as total delivery costs (100%); one used his personal car for deliveries for which he did not charge the pharmacy, and the other delivered prescriptions irregularly to institutions by taxicab for which he did not charge the pharmacy. Thus, their only costs were wage costs to prepare prescriptions for delivery!

Professional (proprietor or manager, pharmacist, intern, and extern) personnel wage and salary costs were a weighted mean of 18.0% of total delivery service wage costs. The unweighted mean was 16.6%, the mode 0% (n=21), and the range 0% through 100%. Only six of the 27 pharmacists included any professional personal wage or salary time. The weighted mean was 64.3% of total delivery wage costs for these six pharmacies (unweighted mean 74.6%, median 82.6%, mode 100% [n=2]) and the range 11% through 100%. One of these six respondents practiced in a medical clinic pharmacy which employed only professional personnel.

b. Conversion of Professional Wage Costs to Nonpharmacist Delivery Wage Costs

The six pharmacies' professional wage time was converted to nonpharmacist delivery service wage time at $3.00 an hour in order to compare prescription delivery costs among pharmacies after reducing the impact that a pharmacist's time at $5.00 or more an hour might have on these costs. The intent here was to remove intra-pharmacy wage differentials; this does not mean all pharmacists' time can or should be exempt from prescription delivery services.

After conversion, the weighted mean prescription delivery service cost per delivered prescription was reduced from $0.46 to $0.43. The weighted mean cost per

prescription delivery trip was reduced from $0.79 to $0.74. Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Prescription delivery cost per delivered Rx (n=27)	$0.68	$0.54	$0.20-$0.29 $0.30-$0.39 (n=5)	$0.13-$1.86
Converted prescription delivery cost per delivered Rx (n=27)	$0.62	$0.43	$0.20-$0.29 (n=6)	$0.13-$1.86
Prescription delivery cost per Rx delivery trip (n=27)	$1.06	$0.72	$0.70-$0.79 (n=5)	$0.28-$4.75
Converted prescription delivery cost per Rx delivery trip (n=27)	$1.02	$0.71	$0.60-$0.69 $0.70-$0.79 (n=5)	$0.32-$2.87

In this particular prescription service, "conversion" of the six pharmacies' professional personnel wages and salaries did not significantly reduce the summary statistics in value; however, several of the higher values disappeared, for example, the high $4.75 cost per delivery trip was reduced to $2.87.

Total delivery service costs for the 27 pharmacies ($59,990) were reduced 5.6% by this conversion; total prescription delivery costs ($47,639) were reduced 6.8%; and total delivery wages ($36,938) went down 9.2%.

4. Summary and Recommendations About Delivery Service Cost Measurements

A majority of the 75 pharmacist respondents (84%) routinely delivered prescriptions; the "nondeliverers," in fact, probably do deliver prescriptions, but probably only when asked. Of the thirty personal interview respondents, 27 delivered an unweighted mean of 14.3% of their total prescriptions at an unweighted mean cost of $0.68 per delivered prescription and an unweighted mean cost of $1.06 per prescription delivery trip.

It is recommended that more emphasis be given to unweighted mean costs or medians of delivering rather than to the weighted means. Reimbursement to pharmacy vendors by third party prescription payers should give equal weight to each vendor's costs (the unweighted mean) rather than primarily to the large vendors in the sample (the weighted mean).

In this sample, for example, there were two respondents who each represented four outlets. Weighted means were computed using these pharmacies' mean delivery data, since they were treated as two pharmacies rather than as eight pharmacies. Using these pharmacies as eight units would have reduced the weighted mean for prescription delivery cost per delivered prescription from $0.46 to $0.41 (the largest four unit chain's comparable figure was $0.40). The weighted mean cost per prescription delivery trip would have been raised from

$0.79 to $0.88 (the largest four unit chain's comparable figure was $1.21). Because weighted means shifted so dramatically toward one or two pharmacy chain's contribution, all weighted means were computed treating the chain's mean pharmacy data as one pharmacy among the 27 pharmacies from which prescriptions are routinely delivered.

Weighted means should be used cautiously. Computing statistics from the "average" pharmacy data given in the Lilly Digest, for example, in effect means one is using weighted mean data, that is, delivery expense as a percent of total sales.

From the cost analyses that were done for the 30 personal interview respondents, it is advisable to compute costs only for respondents who deliver 5% or more of their prescriptions. Until that percent of prescriptions is reached, cost data tend to be uncomparable due to the many unusual delivery situations which occur when only a few prescriptions are delivered, such as by taxicab, mail, delivery by personal car "on the way home," and so forth.

It was not determined in this study whether prescription delivery costs can be collected accurately by mail questionnaire. However, the important variables needed to gather this information have been identified. At a minimum one would need delivery service wage costs plus nonwage costs, delivered prescriptions as a percent of total prescriptions, prescription delivery trips as a

percent of total delivery trips, total delivery trips, and the total number of prescriptions dispensed at each pharmacy. Care should be taken to have respondents include vehicle maintenance and vehicle depreciation costs in their nonwage costs if they have a separate delivery vehicle. Personal use costs for the delivery vehicle should be excluded. Wage costs still will represent a larger share of total delivery costs than nonwage costs, however, so much detail about nonwage costs should be avoided. With the above variables, both the prescription delivery cost per delivered prescription and the cost per prescription delivery trip can be determined.

Delivery wages were estimated best by respondents by asking for hours per day or per week spent on delivery service per employee (or even minutes per delivery trip), plus the hourly wage rate of each of these individuals. The hourly wage rate request even worked best for salaried employees. The annual delivery wage costs then can be computed. The number of days per week to be applied to hourly or weekly wage rates also should be requested; pharmacies may be open 7 days a week, but service personnel may work only 5 or 6 days weekly. Omission of these latter data may not be significant enough to warrant the additional question, however.

The total number of deliveries were estimated best on a per week basis. None of the respondents kept good

delivery service records, but their estimates of the above variables seemed reasonable in light of the combined cost results among all the respondents.

It is recommended that a question be added to any future mail questionnaire asking if a per delivery charge is made to recipients and, if so, how much. Unfortunately that question was not included in this study, although competitive pressures among the majority of the personal interview respondents demanded that no charge per delivery be made.

E. Patient Record Prescription Services

Although this prescription department expense rarely occurs in a pharmacy's income statement as such, most pharmacists incur costs for maintaining patient record cards on their patrons. Usually this service amounts to the pharmacist keeping either an individual medication record or a family medication record of all drug products or of all prescriptions purchased by the patron in that pharmacy. A person's card is pulled and observed whenever that patron purchases more drug products, and a record entry is made for each additional drug product purchase that the patron makes. Some pharmacists maintain a complete system, or a card for every person who purchases drug products. Others maintain a partial system, or a card only for active patrons or for families of patrons.

1. Extent of Routinely Provided Patient Record System Services

One question was asked about patient record systems in the mail questionnaire, "Do you routinely maintain a patient record system, i.e., individual records, by patient name, of all Rx's dispensed?" (yes____, no____)

a. Percent of Respondents Who Routinely Maintain a Patient Record System

Twenty-four (80.0%) of the 30 personal interview respondents said they routinely maintain a patient record system for their patrons, while six did not. Among the 45 mail only respondents, thirty-three (73.3%) reported they did. Thus, 57 of the total 75 (76.0%) respondents reported they routinely provided this service.

Do You Routinely Maintain a Patient Record System?

Respondent	Yes	No	Total	% Yes
Personal interview	24	6	30	80.0%
Mail only	33	12	45	73.0%
Total	57	18	75	76.0%

b. Types of Patient Record Systems Maintained

Personal interview respondents were asked to describe their patient record systems. Of the 24 who maintained systems, 21 were relatively complete systems with a card for every patron. Three had partial systems, with one for new prescriptions only, and two were only for active patrons (regular customers).

Types of patient record systems used were:

Patient Record System	Complete	Partial
Their own system	9	2
Safeguard	6	1 (new Rx's only)
Quikchek	2	0
Taxco, ACA, White, Wis. Extension	1 each	0
	21	3

2. Comparison of Patient Record Service Costs

a. Patient Record Service Costs per Prescription and per Patient Record Maintained

Among the 30 pharmacies where personal interviews were held, the following summary statistics were calculated for the 24 pharmacists who routinely maintained patient record systems:

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Patient record service cost per prescription (n=24)	$0.14	$0.11	$0.10-$0.19 (n=10)	$0.02-$0.39
Patient record service cost per patient record maintained (n=24)	$1.43	$1.10	$1.00-$1.99 (n=10)	$0.04-$4.86

The weighted mean patient record service cost per prescription was $0.12 and the weighted mean cost per patient record maintained was $0.58 annually. Neither cost reflects the added initial cost of adopting and implementing a patient medication record service.

As with delivery service, the lesser costs per prescription and per patient record enjoyed by the larger pharmacies in the sample caused the weighted means to be below the unweighted means. Four pharmacies in the sample had costs per patient record above $2.00 which caused the unweighted mean per patient record to be far above the median cost of $1.10. Again, either the use of the unweighted mean or the median is recommended over the weighted mean.

b. Formulae Used to Compute Comparison Bases for Patient Record Service Costs

Patient record system costs for each pharmacy were computed by adding wage and salary costs for personnel who helped maintain or used the patient record system, to the respondent's estimate of the cost per year for patient record keeping supplies:

$$\text{Patient record service costs} = \underset{\text{(estimated)}}{\text{Allocated personnel wages and salaries}} + \underset{\text{(estimated)}}{\text{Patient record keeping supplies per year}}$$

Included in patient record service costs were the cost of the cards and paper used in the system; excluded were the cost of permanent or depreciable file cabinets where the cards were kept. Employee wage costs were computed as will be described in "Personnel Time Spent on Patient Record Services."

Costs per prescription were computed by dividing patient record service costs by the total number of prescriptions dispensed. It was assumed all dispensed prescriptions were included in the patient record system in each pharmacy, although that proved not to be the case in one pharmacy where only new prescriptions were recorded in the system.

Costs per patient record maintained were computed after first obtaining the respondent's estimate of the number of patient records currently active, defined as those in which an entry was made at least once in the past year. Usually this number was estimated to the nearest 100 records.

c. Patient Record Costs as Percents of Total Sales and of Prescription Sales

Total patient record service costs were a weighted mean of 1.3% of total pharmacy sales and 2.8% of prescription sales for the 24 pharmacies which routinely maintained a patient record system. Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Mode (rounded to nearest 1%)	Range
Total patient record service costs as a percent of total sales (n=24)	1.6%	1.4%	1% (n=11)	0.2%-3.8%
Total patient record service costs as a percent of prescription sales (n=24)	3.3%	2.8%	2" (n=7)	0.6%-8.8%

3. Personnel Time Spent on Patient Record Services

Respondents were asked to estimate how many minutes or hours per day, week, or month of the proprietor(s)' or manager's time and each employee's time were spent on patient record services. To be included was time spent posting entries on the patient record cards, sending income tax information to patrons, pulling records and talking to physicians about patients, and, in general, additional time required using patient records to facilitate dispensing over and above the normal dispensing time without such a system. Combined then with each person's wage or salary, a total patient record service wage cost was determined for each pharmacy in which a patient record system was maintained.

Since patient records are predominately a prescription service (exceptions are entries for nonprescription drug purposes), 100% of this total wage cost is considered as prescription service costs. No separation between patient record prescription services and patient record nonprescription services was made.

a. Comparison of Patient Record Wage Costs Among Pharmacies

Patient record service wage costs were a weighted mean of 93.7% of total patient record service costs for the 24 pharmacies which maintained patient record systems;

supplies were 6.3% of total costs. The unweighted mean wage cost was 92.2% of total costs (median 94.8%, mode 99% [n=4]), and the range was from 68.9% through 99.4%.

Professional (proprietor or manager, pharmacist, intern, and extern) wage costs were a weighted mean of 75.9% of total patient record service wage costs for the 24 pharmacies which maintained patient record systems; nonpharmacists' wage costs were 24.1% of total wage costs. The unweighted mean professional wage cost was 66.4% of total wage cost (median 94.4%, mode 100% [n=10]) and the range was 0% through 100%. The 0% replies were from pharmacists who did not make entries in the records, but such replies also did not consider professional time spent consulting the records and thus are understated.

Professional patient record service wage times were included in 19 of the 24 pharmacies; the unweighted mean professional wage cost as a percent of total wage cost was 83.8% (median 100%, mode 100% [n=10]) in these 19 pharmacies, and the range was from 4.6% through 100%. In more than half of these 19 pharmacies, only professionals worked on patient record services.

b. Conversion of Professional Wage Costs to Nonpharmacist Patient Record Wage Costs

The 19 pharmacies' professional wage time was converted to nonpharmacist patient record service wage time at $3.00 an hour to reduce the impact of pharmacists'

higher salaries. Thus the intrapharmacy wage differential was removed. Again, this does not mean nonpharmacists can or should replace pharmacists in doing patient record service work.

After conversion, the weighted mean patient record service cost per prescription was reduced from $0.12 to $0.08. The weighted mean cost per patient record was reduced from $0.58 to $0.38. Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Patient record service cost per Rx (n=24)	$0.14	$0.11	$0.10-$0.19 (n=10)	$0.02-$0.39
Converted patient record service cost per Rx (n=24)	$0.09	$0.08	$0.00-$0.09 (n=15)	$0.02-$0.20
Patient record service cost per patient record (n=24)	$1.43	$1.10	$1.00-$1.99 (n=10)	$0.04-$4.86
Converted patient record service cost per patient record (n=24)	$0.97	$0.66	$0.00-$0.99 (n=17)	$0.04-$4.36

A significant decrease occurred in the unweighted means per patient record maintained when converted wages were used to compute patient record service costs, from $1.43 to $0.97 per patient record. This decrease also

shows in the per prescription unweighted means.

The substituted use of nonpharmacists to do this type of work seems appropriate to recommend here. However, there is no guarantee that nonpharmacists can do the same work as quickly as professional people, plus pharmacists still must spend time consulting the records when dispensing prescriptions and when recommending the purchase of many nonprescription drug products. Also, the quality and accuracy of work done by nonpharmacists may not be the same as that done by pharmacists. A priori, then, mere cost data are not enough evidence to support such a recommendation.

Conversion of wage rates reduced total patient record service costs ($68,890) for the 24 pharmacies by 35.1% to $44,708; total patient record wages ($64,543) went down 37.5%.

4. Summary and Recommendations About Patient Record Service Cost Measurements

There were 57 of 75 pharmacies (76.0%) in which a patient record system, defined in the questionnaire as a "complete" system, was routinely maintained. Many of the other pharmacists may provide a partial patient record service, especially since many pharmacists are requested by patrons to provide them with a list of all prescription purchases during a calendar year for income tax purposes.

As with prescription delivery services, the same caution applies against using weighted mean data, or mean pharmacy data as presented in the Lilly Digest, to form any judgments about what it costs pharmacists to provide patient record services. The use of unweighted means or medians is recommended.

Also, as with prescription delivery services, no attempt was made to collect patient record service cost data by mail questionnaire. However, the important variables needed here are patient record service wage costs, nonwage ("supplies") costs, the number of patient records currently active, and the total number of prescriptions dispensed at each pharmacy. From these variables, comparable bases could be computed as in this study, patient record service costs per prescription and per active patient record maintained.

Patient record service wage costs are collected best by individual employee on a minutes or hours per day or per week basis plus his wage rate per hour. Traditionally, pharmacists provide patient record services free to patrons with no explicit charge made per prescription. Thus, whether pharmacies do charge for this service or not is a question that may or may not be included on any mail questionnaire in future studies.

F. Prescription Charge Account Services

A portion of total charge account service costs normally appears in a pharmacy's income statement under the entry of "bad debts." Needed to compute more accurate total charge account expenses are such additional cost variables as (1) charge account wages and salaries, (2) charge account supplies, (3) collection service costs, (4) bank or other third party credit card expenses, and (5) charge account mailing expenses. Also needed is a means to separate prescription charge account costs from nonprescription charge account costs.

1. Extent of Routinely Provided Prescription Charge Account Services

Two questions were asked about charge account services in the mail questionnaire, (1) "Do you routinely offer a charge account service?" (yes____, no____), and (2) "Approximately what percent of all prescriptions are charged?" (_____% of Rxs).

a. Percent of Respondents Who Routinely Charge Prescriptions

Among the 30 respondents in the personal interview study, all (100.0%) said they routinely provided prescription charge account services (all charged 5% or more of their total dispensed prescriptions). Forty-three

of the 45 mail only respondents (95.6%) said they routinely provided this service; the other two respondents charged 5% and 2% of their total prescriptions. Thus, in total, 73 of 75 (97.3%) respondents said they routinely provided this service.

Do you routinely offer a charge account service?

Respondent	Yes	No	Total	% Yes
Personal interview	30	0	30	100.0%
Mail only	43	2	45	95.6%
Total	63	2	75	97.3%

b. Percent of Prescriptions Charged

The 30 personal interview pharmacy respondents had charged a weighted mean of 30.0% of their prescriptions compared to an unweighted mean of 28.3% (median 23.5%, mode 10% [n=6]). The 45 mail only respondents charged an unweighted mean of 35.6% of prescriptions; the total 75 pharmacy respondents reportedly charged an unweighted mean of 32.7% of all prescriptions dispensed. The range for the 75 respondents was 2% through 80% of their prescriptions.

What % of all Rxs are charged?	Number of pharmacies n=30	n=45	n=75
Mean percent (unweighted)	28.3%	35.6%	32.7%
Median percent	23.5%	35.0%	30.0%
Mode percent	10% (n=6)	30%,50% (n=7)	50% (n=11)
Range	5%-80%	2%-70%	2%-80%

The majority of the 30 personal interview respondents charged less than 30% of their total prescriptions, while the majority of the 45 mail only respondents charged more than 30% of their prescriptions.

What % of all Rxs are charged?	n=30	n=45	n=75	Percent (n=75)
More than 50%	2	7	9	12.0%
50%	4	7	11	14.7
40-49%	1	5	6	8.0
30-39%	6	13	19	25.3
20-29%	7	7	14	18.7
10-19%	8	4	12	16.0
Less than 10%	2	2	4	5.3
		Total		100.0%

The reason for this difference between the two samples may be a change in the way the question was asked. During the personal interview respondents were

asked not to include in their estimates any prescriptions charged to Title 19 or other third parties, but only those charged to first party payers. Either some respondents had done so and subsequently lowered the percent of charged prescriptions during the interview (eight estimates were lowered; see the next section), or else they believed they should lower their estimates simply because of this instruction. All of the changing respondents claimed the former reason, if any, and not the latter reason.

c. Change of Answers Analysis

Among the 30 personal interview respondents, eight respondents lowered their estimates of the percent of prescriptions that were charged, two respondents raised their percent estimates, and two others gave percent estimates where they had not done so previously on the mail questionnaire.

The twelve new percent estimates had the effect of lowering the previous mail unweighted mean from 32.5% for 28 pharmacies to the personal interview unweighted mean of 28.3%. The median also was lowered from 31.5% to 23.5%. The previous summary statistics were more "in line" with those found among the 45 mail only respondents. One probably can safely conclude, then, that the mail only summary statistics are somewhat inflated.

A better way to ask this percent question in future mail studies probably is the way it was done in the personal interview survey, where the respondent was asked simultaneously to estimate what percent of his prescriptions were Title 19 charged, what percent were other third party charged, and what percent were "regular" charged. Subtracting the summed total of these three percent estimates from 100% then gives the researcher the percent of prescriptions which were paid by cash purchase. The percents of charged prescriptions obtained by the above questioning technique were the ones used in the personal interview summary statistics.

2. Comparison of Prescription Charge Account Service Costs

a. Prescription Charge Costs per Charged Prescription and per Account Mailing

A weighted mean of $0.24 (n=30) prescription charge cost per charged prescription and a weighted mean of $0.81 (n=29) total charge cost per account mailing were found among the 30 pharmacies where personal interviews were held (one pharmacist gave no number of accounts mailed estimate). Following are additional summary statistics for these same 30 pharmacies, all of which had charged 5% or more of their total prescriptions.

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Prescription charge account cost per charged prescription (n=30)	$0.36	$0.22	$0.10-$0.19 (n=12)	$0.07-$2.07
Total charge account cost per account mailing (n=29)	$0.98	$0.79	$0.00-$0.99 (n=18)	$0.17-$2.81

b. Formulae Used to Compute Comparison Bases for Prescription Charging Service Costs

Total charge account service costs first were computed prior to prescription charge account service costs. Respondents first were asked to estimate employee wage and salary costs. (The procedure will be described in "Personnel Time Spent on Prescription Charge Account Services.") Also asked were estimated costs for (1) charge account supplies, (2) bad debts, (3) collection services, (4) bank credit card services, and (5) charge account mailing expenses. Frequently respondents were unable to estimate (1) and (5) separately and 15 of the 30 respondents grouped these two costs together in one estimate. Two other respondents grouped (1) through (5) together as one estimate. Excluded from total charge account costs were costs for purchase of depreciable equipment; depreciation charges for such equipment should

be included in a study like this but they were not. This omission should be of minor significance for this prescription service, however.

Prescription charge account service costs then were computed by multiplying total charge costs times the respondent's estimate of what percent of this total cost should be allocated to the prescription department. An alternative to this may have been to multiply total charge account costs times the percent of prescription sales to total sales. However, a percent of sales may not be the same percent as those of costs.

$$\text{Prescription charge account service costs} = \left(\begin{array}{l}\text{Allocated personnel wages and salaries} \\ \text{(estimated)}\end{array} + \begin{array}{l}\text{Charge account supplies + bad debts + collection services + bank credit card services + charge account mail expenses} \\ \text{(estimated)}\end{array}\right) \times \begin{array}{l}\text{Percent to be allocated to to the Rx department} \\ \text{(estimated)}\end{array}$$

(--Total charge account service costs)

To compute prescription charge account service costs on a per prescription basis, it first was necessary to know the numbers of prescriptions which had been charged. The number of charged prescriptions was computed for each respondent by multiplying his total number of prescriptions dispensed by his estimate of charged prescriptions as a percent of this total.

Total number of charged prescriptions	=	Total Rxs dispensed (known)	X	$\frac{\%\text{Charged Rxs}}{\text{Total Rxs}}$ (estimated)

To compute total charge account service costs per charge account mailing, the second basis for comparing charge costs among respondents, it first was necessary to compute the number of charge account mailings which were made in the previous year. Respondents were asked to estimate the current number of charge accounts currently in use, or "active," plus how often they mailed charge statements to patrons. Annualizing these estimates gave the total number of charge account mailings per year.

Number of charge account mailings	=	Number of charge accounts currently in use (estimated)	X	Number of charge statement mailings per year (known)

Dividing total charge account service costs by this variable then gave costs per charge account mailing. Respondents were not asked to estimate the "number of charge account mailings which included a prescription charge" to be able to get "prescription charge account service costs per prescription charge account mailing." Total costs per account mailing seemed more appropriate

as a basis for comparison among pharmacies. Because of this, however, one cannot meaningfully compute "prescription charge account costs per charge account mailing," because it means spreading prescription service costs over a base which includes both mailings for prescription charges and for nonprescription charges.

c. Nonlabor Charge Account Service Costs

Of the total charge account service costs of $84,161 estimated by the 30 pharmacists, 40.5%, or $34,051, were nonlabor costs. Nonlabor costs per year for the 28 respondents who estimated were:

Nonlabor Costs	Mean*	Total Nonlabor Costs	% of Subtotal Nonlabor Costs
Bad debts (n=28)	$ 418	$11,697	41.1%
Collection services (n=17)	240	4,075	14.3
Bank credit card services (n=11)	116	1,274	4.5
Mailing costs, supplies (n=28)	407	11,400	40.1
Subtotal		$28,446	100.0%
All nonlabor costs (n=2)	$2802	$ 5,605	
Total		$34,051	

*Equals both weighted and unweighted means.

The wide majority of nonlabor costs are for bad debts and for mailing costs and supplies. Subsamples of pharmacies above are too small to say more about absolute costs; the cost mix probably is more accurate than mean costs of any one cost variable.

d. Charge Account Costs as Percents of Total Sales and of Prescription Sales

Total charge account service costs were a weighted mean of 1.1% of total pharmacy sales for the 30 pharmacies which routinely charged 5% or more of their dispensed prescriptions. Computed prescription charge account service costs were a weighted mean of 1.8% of prescription sales for these same 30 pharmacies. Prescription charge account service costs were those which had been allocated to the prescription department (see the previous section).

Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Mode (rounded to nearest 1%)	Range
Total charge account costs as a percent of total sales (n=30)	1.4%	1.0%	1% (n=13)	0.3%–4.7%
Prescription charge account costs as a percent of prescription sales (n=24)	1.8%	1.6%	2% (n=11)	0.1%–5.3%

3. Personnel Time Spent on Prescription Charge Account Services

Respondents were asked to estimate how many minutes or hours per day, week, or month of the proprietor(s)' or manager's time and each employee's time were spent on charge account services to include time spent on recording charges, "pulling and posting" charge account records, and time preparing and mailing charge account statements. In many pharmacies these duties were performed by a bookkeeper, although most employees have to contend with charge account procedures and duties when waiting on patrons.

Times spent on charge account services as a percent of total time was multiplied by each individual's wage or salary, and a total charge account wage cost was determined for each pharmacy. Wage and salary costs were determined both for professional personnel and for nonpharmacist employees.

Total charge account wage costs next were multiplied by the respondent's estimate of the percent allocation to the prescription department to get prescription charge account service wage costs.

a. Comparison of Prescription Charge Account Wage Costs

Prescription charge account service wage costs were a weighted mean of 59.5% of total charge account service

costs among the 30 pharmacies, while nonlabor costs were 40.5% of total costs. The unweighted mean wage cost was 58.0% of total cost (median 57.5%, mode 64% [n=3]) and the range was from 17.3% through 92.9%.

Professional (proprietor or manager, pharmacist, intern, and extern) personnel wage and salary costs were a weighted mean of 26.9% of total charge account service wage costs for the 30 pharmacies. The unweighted mean professional wage cost was 22.4% of total wage cost (median 0%, mode 0% [n=20]) and the actual range was from 0% through 100%.

Professional charge account wage times were included in 10 of the 30 pharmacies; the unweighted mean professional wage cost as a percent of total charge account wage cost was 67.2% (median 75.8%, mode 100% [n=3]) in these 10 pharmacies, and the range was from 18.6% through 100%. Two of the three pharmacies with 100% of the charge account work being done by professionals were medical clinic pharmacies which employed only professional personnel.

b. Conversion of Professional Wage Costs to Nonpharmacist Charge Account Wage Costs

The 10 pharmacies' professional wage time was converted to nonpharmacist charge account service wage time at $3.00 an hour to remove the intrapharmacy wage differential.

After conversion, the weighted mean prescription charge account service cost per charged prescription was reduced from $0.24 to $0.22 (n=30). The weighted mean total charge cost per account mailing was reduced from $0.81 to $0.72 (n=29). Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Prescription charge account cost per charged Rx (n=30)	$0.36	$0.22	$0.10-$0.19 (n=12)	$0.07-$2.07
Converted prescription charge account cost per charged Rx (n=30)	$0.33	$0.18	$0.10-$0.19 (n=14)	$0.07-$1.88
Total charge account cost per account mailing (n=29)	$0.98	$0.79	$0.00-$0.99 (n=18)	$0.17-$2.81
Converted total charge account cost per account mailing (n=29)	$0.88	$0.75	$0.00-$0.99 (n=20)	$0.17-$2.81

Total charge account service costs ($84,161) for the 30 pharmacies were reduced 8.6% to $76,933 by conversion of wages; prescription charge account costs of $53,938 were reduced 10.1% to $48,502.

4. Summary and Recommendations About Charge Account Service Costs Measurement

About 97% (73) of the 75 pharmacists routinely charge prescriptions for their patrons. Half of the 30 personal interview respondents charged 25% or more of their prescriptions in 1968.

Again, no attempt was made to collect charge account service cost data by mail questionnaire. It is recommended that only pharmacists charging 5% or more of their prescriptions be included in such a cost study. The important variables needed would be charge account service wage costs, nonwage charge account costs, the number of "active" charge account mailings (mailings per month probably is better), charged prescriptions as a percent of total prescriptions, total number of prescriptions dispensed, and the respondent's estimate as to the percent of total charge account costs which should be allocated to the prescription department.

Charge account service wage costs are best collected by individual employee on a minutes or hours per week or per month basis (since most billing is monthly), plus his wage rate per hour. Mailing costs are best estimated on a "cost per statement mailed" basis by respondents. Their mailing cost estimates should include a supplies cost estimate. Estimates of costs for depreciation of permanent charge account equipment likely would have a

minor effect on total costs per prescription.

One convenient way to have respondents estimate their charged prescriptions as a percent of total prescriptions is to have them also estimate the percent Title 19 prescriptions plus the percent other third party pay prescriptions simultaneously. This aids the respondent in that he knows third party payer prescriptions should be excluded from his estimate of the percent prescriptions charged to private pay patrons.

G. Title 19 and Other Third Party Payer Prescription Services

Third party payer prescription services primarily differ from normal prescription dispensing services in that additional time and effort are required to do the necessary paper work that accompanies third party payer prescriptions. Also additional time is necessary, usually monthly, to prepare the billing and mailing of prescription charges to the third party payers.

An additional cost is incurred as the cost of capital, as respondents told of a six to eight week wait between dispensing third party payer prescriptions and receiving payment for them. Still other costs are incurred as bad debts when prescriptions are dispensed for persons who no longer are eligible for payments from third party payers, and then who refuse to pay these prescription charges after being notified of their ineligibility.

1. Extent of Third Party Payer Prescription Services

Only one question was asked of mail questionnaire respondents about third party payer prescription services, "Approximate % of all Rxs dispensed are for Wisconsin Medical Assistance Program (Title XIX) beneficiaries?" (_____% of Rxs) Estimates of percents of prescriptions dispensed for other third party payers were elicited in the personal interview survey, along with additional time and costs required to dispense third party payer prescriptions, over and above normal dispensing time and costs.

a. Percent of Third Party Payer Prescriptions Dispensed

The 30 personal interview respondents estimated that a weighted mean of 12.8% of all prescriptions dispensed were paid for by third parties. About 11.2% were for Title 19 beneficiaries and about 1.6% were for other third party payer beneficiaries, or about six Title 19 prescriptions for every "other" third party payer prescription.

The weighted mean of 11.2% Title 19 prescriptions compared to an unweighted mean of 13.0% (median 10%, modes 5%, 20% [n=4]) for the 30 pharmacies. The range was from 2% through 50%. The weighted mean 1.6% for other third party payer prescriptions compared to an

unweighted mean of 2.0% (median "less than 1%," mode "less than 1%" [n=16]). The range was from "less than 1%" through 10%. Together, an unweighted mean of 14.5% of prescriptions were for Title 19 or other third party payers (median 11%, modes 4%, 30% [n=3]), and the range was from 2% through 50%.

All pharmacists claimed to have dispensed some third party payer prescriptions other than Title 19 prescriptions, but 16 respondents said they were less than 1% of all dispensed prescriptions. In the analyses which follow these "less than 1%" answers were treated as 0%. One pharmacist had dispensed 10% of total prescriptions for United Auto Worker prescription insurance plan beneficiaries.

Comparable statistics about the percent of Title 19 prescriptions only for 43 of the 45 mail only respondents (two respondents gave no estimates) and the total 73 respondents are:

	Number of Pharmacies		
What % of Rxs are Title 19?	n = 30	n = 43	n = 73
Mean percent (unweighted)	13.0%	13.3%	13.1%
Median percent	10%	10%	10%
Mode percent(s).	5%, 20% (n=4)	20% (n=5)	20% (n=9)
Range	2%–50%	2%–40%	2%–50%

The majority of both samples of respondents dispensed 10% or more of their total prescriptions for Title 19 beneficiaries.

What % of Rxs are Title 19?	Number of Pharmacies n = 30	n = 43	n = 73	Percent (n=73)
40% or more	1	1	2	2.7%
30%-39%	1	5	6	8.2%
20%-29%	7	6	13	17.8%
10%-19%	7	11	18	24.7%
Less than 10%	14	20	34	46.6%
Total				100.0%

b. Change of Answers Analysis

Among the 30 personal interview respondents, four respondents raised their estimates of the percent of prescriptions that were Title 19, one respondent lowered his estimate, and one other respondent said that 20% of his prescriptions were for Title 19 beneficiaries where he had failed to answer this question on the mail questionnaire.

The five new and one added percent estimates had the effect of raising the unweighted mean percent of dispensed prescriptions that were Title 19 from 12.3% (n=29) to 13.0%, not a significant difference. The median went from 9% to 10%. The range from 2% through 50% was unchanged.

c. Percent Third Party Payer Prescriptions vs Percent Charged and Percent Cash Prescriptions

As described in the prescription charge account services section of this study, the percent of prescriptions question asked of personal interview respondents was changed from the way it was asked of mail respondents. The respondent was asked simultaneously to estimate what percent of his dispensed prescriptions were Title 19, what percent were other third party, and what percent were "regular" charged. The percent "cash paid for" prescriptions than could be computed by subtracting the summed above percents from 100%. Results from this exercise were:

What percent of your total dispensed prescriptions are:	Total Number Rxs	% of Total Rxs
Title 19 prescriptions (n=30)	83,098	11.2%
Other third party prescriptions (n=14)	11,871	1.6
Regular charged prescriptions (n=30)	222,582	30.0
Cash prescriptions (n=30)	424,387	57.2
Total Prescriptions	741,938	100.0%

2. Comparison of Title 19 and Other Third Party Payer Prescription Services

a. Total Added Time and Wage Costs per Third Party Payer Prescription

A weighted mean of $0.53 added wage costs were spent by the 30 pharmacy personal interview respondents for each third party payer prescription dispensed. Added costs were computed from the 30 pharmacies which dispensed Title 19 prescriptions and the 14 pharmacies which dispensed 1% or more of their prescriptions for other third party payer beneficiaries.

Estimated additional time, in minutes, to dispense third party payer prescriptions over normal dispensing time was an unweighted mean of 3.3 minutes. A computed unweighted mean additional time was 7.3 minutes, however. The computation is explained in the next section.

Following are additional summary statistics from the 30 personal interview respondents:

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Total added wage costs for third party payer prescription services per third party payer prescription (n=30)	$0.62	$0.56	$0.50-$0.99 (n=13)	$0.11-$2.51
	(in minutes)		Mode	
Total added time necessary for third party payer prescription services per third party payer prescription (n=30)				
Estimated (in minutes)	3.3	2	2 (n=9)	1-10
Computed (in minutes)	7.3	6	3.7 (n=6)	1-27

Contrasting efficiencies were found among respondents. One respondent where 50% of his total dispensed prescriptions were Title 19 prescriptions, had added wage costs of $0.23 per Title 19 prescription (less than 1% of prescriptions were for other third parties). Another respondent where 30% of prescriptions were Title 19, had added wage costs of $2.51 per Title 19 prescription. About 95% of wage costs were nonpharmacist wages in the first pharmacy, while about 95% of wage costs were the proprietor's salary in the second.

b. Formulae Used to Compute Comparison Bases for Third Party Payer Prescription Services

Total third party payer prescription service costs only were defined as wage costs for time spent over and above usual dispensing time. These times were estimated for each participating employee (this procedure will be described in "Personnel Time Spent on Third Party Payer Prescription Services"). Total costs were computed both for Title 19 and for other third party payer prescription services since the administration and other tasks were similar for both types of services.

No attempt was made after pretests to determine nonwage costs for third party payer prescription services, as the costs of supplies and mailing (claims were mailed in monthly) were minor in comparison to wage costs. However, as third party payer prescriptions as a percent of total dispensed prescriptions rises above, say, 25%, these nonwage costs may become significant. Excluded, too, were bad debts which occasionally occurred when prescription payments were not paid for noneligible beneficiaries who had received prescription services.

Also excluded from total third party prescription service costs were the costs of capital, although respondents had to wait between four and ten weeks between dispensing specific Title 19 prescriptions and

receiving payment for them (unweighted mean 6.8 weeks, median 6 weeks, mode 6 weeks [n=13]). This waiting time exceeded the mean 4 weeks payment time for prescriptions charged to first party payers. Waiting time for Title 19 payments also was lengthened if claims were not submitted by the 10th of each month.

For this study, only wages for times over and above usual dispensing time were included as third party payer prescription service costs.

$$\text{Third party prescription service costs} = \underset{\text{(estimated)}}{\text{Allocated personnel wages and salaries}}$$

The total number of third party payer prescriptions dispensed was computed by multiplying total numbers of prescriptions dispensed by the summed respondents' estimates both of (1) Title 19 prescriptions as a percent of total prescriptions, and of (2) other third party payer prescriptions as a percent of total prescriptions.

$$\text{Total number of third party prescriptions} = \underset{\text{(known)}}{\left(\text{Total Rxs dispensed}\right)} \times \left(\underset{\text{(estimated)}}{\%\frac{\text{Title 19 Rxs}}{\text{Total Rxs}}} + \underset{\text{(estimated)}}{\%\frac{\text{Other third party Rxs}}{\text{Total Rxs}}} \right)$$

Additional time, in minutes, to complete each third party payer prescription transaction, over and above

normal dispensing time, was estimated by each of the 30 pharmacist respondents. This time also was computed for each respondent by summing all the additional employee times, both professional and nonpharmacist, spent on third party payer prescription services per month, converting these times all to numbers of minutes, and dividing this minutes total by the total number of third party payer prescriptions dispensed, to include both Title 19 and other third party payer prescriptions.

$$\text{Number of minutes of added personnel time per third party payer prescription} = \frac{\text{Personnel hours per month spent on Title 19 and other third party Rx services over and above normal dispensing time}}{\text{Number of third party payer prescriptions}} \times 12 \times 60$$

This method may tend to underestimate times spent on third party payer prescription services, as respondents tend to forget to add into their estimates the time spent monthly preparing the often detailed billing forms for reimbursement to third party payers.

c. Third Party Payer Prescription Costs as Percents of Total Sales and of Prescription Sales

Total third party payer prescription service wage costs were a weighted mean of 0.7% of total pharmacy sales for the 30 personal interview respondents. These same

wage costs were a weighted mean of 1.7% of total prescription sales for these same 30 pharmacies. Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Modal (rounded to nearest 1%)	Range
Third party prescription service costs as a percent of total sales (n=30)	1.0%	0.5%	1% (n=13)	0.1%-10.5%
Third party prescription service costs as a percent of prescription sales (n=30)	2.3%	1.2%	1% (n=15)	0.1%-25.4%

Significantly affecting the unweighted mean percents both of total sales and of prescription sales was one respondent's costs of 10.5% of total sales and 25.4% of total prescription sales (Title 19 prescriptions were 30% of his total prescriptions). Without this respondent, who had difficulty with Title 19 paperwork and spent much of his time working with it, the unweighted means above would be lowered to 0.7% of total sales and 1.5% of prescription sales (n=29).

No respondent had costs more than 1.9% of total sales and 5.3% of prescription sales other than the gentleman mentioned above. This discussion reemphasizes the advisability of using medians as statistics of central

value along with the unweighted means.

3. Personnel Time Spent on Third Party Payer Prescription Services

Respondents were asked to estimate how many minutes or hours per day, week, or month of the proprietor(s)' or manager's time and each employee's time were spent on third party payer prescription services over and above usual dispensing time. These times included time for the monthly billing of third party payer charges, the recopying of prescription forms for billing purposes, the checking of beneficiary and purchased products eligibilities, and corresponding with the third party payers themselves.

Times spent on third party payer prescription services as a percent of total time was multiplied by each individual's wage or salary, and a total third party payer prescription service wage cost was determined for each pharmacy. Wages and salaries were determined both for professional personnel and for nonpharmacist employees.

a. Comparison of Third Party Prescription Wage Costs

As noted earlier, third party payer prescription service wage costs were defined as total third party payer prescription service costs, to include both Title 19 prescription services and other third party payer

prescription services.

Professional (proprietor or manager, pharmacist, intern, and extern) personnel wage and salary costs were a weighted mean of 68.2% of total third party payer prescription service wage costs for the 30 pharmacies. The unweighted mean professional wage cost was 67.0% of total wage cost (median 87.8%, mode 100% [n=12]) and the reported range was from 0% through 100%.

Professional third party payer wage costs were included for 25 of the 30 pharmacies; the weighted mean professional wage costs were 80.8% of total third party payer prescription wage costs in these 25 pharmacies (unweighted mean 80.4%, median 92.7%, mode 100% [n=12]) and the range was from 11.3% through 100%. In 12 of these 25 pharmacies, all of the added times were those of professional personnel.

b. Conversion of Professional Wage Costs to Nonpharmacist Third Party Payer Wage Costs

The 25 pharmacies' professional wage times were converted to nonpharmacist third party payer prescription service wage times at $3.00 an hour to remove the intra-pharmacy wage differential. Again, actual nonpharmacists' times were included at their actual rate of pay, usually below $3.00 an hour, to avoid biasing upwards the total third party payer prescription service wage costs. Thus,

after conversion, per third party payer prescription costs really are the minimum costs per prescription that could be computed. Even nonwage costs have been excluded from this figure.

Again, as with some of the previously discussed prescription services, conversion of all professional wage costs into nonpharmacist wage costs does not mean in reality that third party payer prescription services can be performed as quickly, as accurately, or as comprehensively by nonpharmacists as by professional personnel. It is beyond the scope of this cost analysis to recommend this substitution of duties take place.

After conversion, the weighted mean third party payer prescription service wage costs per third party payer prescription, either a Title 19 prescription or another third party payer prescription, was reduced from $0.53 to $0.28 (n=30). Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Modal Range	Range
Total added wage costs for third party payer prescription services per third party payer prescription (n=30)	$0.62	$0.56	$0.50-$0.99 (n=13)	$0.11-$2.51
Converted added wage costs for third party payer prescription services per third party payer prescription (n=30)	$0.41	$0.30	$0.00-$0.49 (n=21)	$0.08-$1.45

Total third party prescription service wage costs ($50,366) for the 30 pharmacies were reduced 46.8% to $26,776 by conversion of professional wages.

4. Additional Findings About Third Party Payer Prescription Services

Three additional questions were asked of the 30 personal interview respondents about third party payer prescription service reimbursements. It should be remembered that these questions were asked of respondents in mid-1969, when the reimbursement rate for Title 19 prescription services was set at a fixed fee of $2.00 per prescription, a rate which had been in effect since 1966. No premium was offered pharmacists for providing such prescription services as delivery, patient record systems,

and so forth. Other third party payers had fixed reimbursement rates on a per prescription basis as well, and the rate was about $2.00 per prescription plus or minus 20¢.

Respondents first were asked whether reimbursements for all pharmacists in Wisconsin (not just themselves) from third parties should be based partially upon a fixed rate of net profit expressed as a percent of total prescription sales and, if so, at what percent of prescription sales. Of the 30 respondents, one respondent said "no" and 16 said "yes" to this question and suggested a mean of 11.6% of prescription sales (median and mode 10% [n=7]); the range was from 5% through 33 1/3% of prescription sales. The other 13 respondents had no comment to this question; none of these respondents earlier had expressed any particular desired net profit either on their total pharmacy sales or on their prescription sales, saying they did not think of profits in those terms.

As explained to respondents, this question really meant did they prefer a fixed reimbursement per prescription, such as $2.00 per prescription, no matter what the cost of ingredients for any given prescription might be (a "dispensing fee"), or did they prefer a changing reimbursement rate per prescription (perhaps a set percent markup based on the cost of ingredients for any given prescription). Clearly the fixed reimbursement

rate per prescription was preferred (16 to 1) by those respondents who answered this question.

A second question asked of respondents was whether pharmacists in Wisconsin ought to be reimbursed from third parties based upon a uniform per prescription rate (such as cost of ingredients plus $2.00 for every prescription), or whether this fee should vary from pharmacy to pharmacy, depending on the pharmacy's location in the state or for some other distinguishable differences among pharmacies. Of 28 respondents answering this question, 15 (54%) wanted a varying fee while 13 preferred a uniform state fee.

Asked if $2.00 per prescription was a satisfactory absolute dollar reimbursement rate for the current year (1969), 21, or 70%, of the 30 respondents said "yes." Asked if they thought $2.00 per prescription would be a satisfactory reimbursement rate if 50% or more of their prescriptions were Title 19 prescriptions, however, 20, or 67%, of the 30 respondents said "no."

5. Summary and Recommendations About Third Party Payer Prescription Service Cost Measurement

The respondents who answered this question (73) dispensed from 2% through 50% of their prescriptions (median 10%) to third party payer beneficiaries, especially to Title 19 beneficiaries. In total there were about six Title 19 prescriptions dispensed for every

other third party payer prescription among the 30 personal interview respondents. Wage costs per third party payer prescription were a median $0.56 for these same 30 respondents.

In future studies, anticipating that third party payer prescriptions will rise as a percent of total prescriptions, it may be advisable to attempt measurement of nonwage third party payer prescription service costs in addition to the wage costs (only the latter was measured here).

Important variables needed for future cost studies, in addition to nonwage costs, would be third party payer prescription service wage costs (over and above normal dispensing time wages), third party payer prescriptions as a percent of total prescriptions (separated between Title 19 and other third party payer prescription percents), and the total number of prescriptions dispensed.

Third party payer prescription service wage costs are collected best by individual employee on a minutes or hours per week or per month basis (since billing usually is monthly), plus his wage rate per hour. Estimation of additional time, in minutes, spent on each third party payer prescription transaction (over and above normal dispensing time) may be asked as a check on the former times estimates, but respondents tend to underestimate total time this way. They tend to forget about time spent monthly, not per prescription, when they must

prepare the often detailed billing forms for reimbursement to third party payers.

H. Continuing Education Prescription Services

To keep as current as possible within the pharmacy profession is encouraged both by the profession itself and by pharmacy's state licensing boards. Pharmacists are encouraged, or even required by some states, for example, if they serve as preceptors to pharmacist interns in Wisconsin, to attend continuing education courses on a regular basis. Also, pharmacists and nonpharmacists may be sent to courses or seminars to further their skills in patient record keeping systems, bookkeeping and accounting, prescription inventory control, and even billing third party payers for prescription services. Costs for this indirect patron prescription service were measured only generally in this study for the 30 personal interview respondents.

1. Extent of Continuing Education Costs

After pretest attempts to detail continuing education activities and costs, the low absolute dollar costs per pharmacy spent per year by respondents indicated that only one question really need be asked, "What is the estimated expense incurred per year for continuing education

for all employees, including yourself?" ($_____) Costs were to include the wage cost of workdays spent attending seminars and institutes, as well as costs for travel to and from such sessions. Costs of correspondence courses, consulting or teaching, and even on-the-job time reading professional journals were to be included in respondents' estimates.

Twenty-eight respondents, including one who reported "zero" costs, had estimated annual mean continuing education costs of $434. The other two respondents had continuing education costs, but could not estimate an absolute dollar amount. The 27 respondents who estimated dollar amounts had mean costs of $450 each.

2. Comparison of Continuing Education Costs

a. Continuing Education Costs per Prescription

A weighted mean continuing education cost of 1.8¢ per prescription was spent by the 28 respondents in 1968. The unweighted mean cost also was 1.8¢ per prescription (median 2¢, mode 2¢ [n=8]). The range was from 0¢ to 6¢ continuing education cost per prescription. Seven of the respondents each had a mean cost of less than 0.5¢ per prescription.

b. Continuing Education Costs as Percents of Total Sales and of Prescription Sales

Total continuing education costs were a weighted mean of 0.18% of total pharmacy sales and a weighted mean of 0.44% of prescription sales for the 28 respondents who gave estimates of costs. Other summary statistics were:

Bases for Comparison	Unweighted Mean	Median	Mode (rounded to nearest 0.1%)	Range
Total continuing education costs as a percent of total sales (n=28)	0.23%	0.16%	0.1% (n=9)	0%-0.66%
Total continuing education costs as a percent of prescription sales (n=28)	0.44%	0.35%	0.1% (n=5)	0%-1.90%

3. Summary and Recommendations About Continuing Education Cost Measurement

Continuing education costs were a median of 2¢ per prescription for 28 of the 30 personal interview respondents. No attempt was made to distinguish what percent of continuing education costs were for professional vs nonpharmacist personnel, although the majority of these costs probably were for professional personnel.

Noting the national trend which may result in formal continuing education becoming a legal requirement for practicing pharmacists in Wisconsin, it is recommended that continuing education costs of pharmacies continue to be measured, perhaps using the crude cost data gathered here as baseline data for measuring cost trends over time. Additional questions about continuing education costs also should be developed.

I. Emergency 24-Hour Prescription Services

Pharmacists often are called upon for prescription services when the pharmacy is not open. Many pharmacists employ telephone answering services to take calls for service after hours. Assignments to respond to the answering service and to attend to these incoming requests for prescription service often are rotated among employee pharmacists of a given pharmacy on a daily or weekly basis. Some community pharmacy owners band together and rotate requests for after-hours prescription services among different pharmacies in a geographical area or in a given community area.

1. Extent of Routinely Provided Emergency 24-Hour Prescription Services

One question was asked mail respondents about 24-hour emergency service, "Do you routinely provide a 24-hour

emergency service?" (yes____, no____)

a. Percent of Respondents Who Routinely Provide 24-Hour Emergency Service

Twenty-five (83.3%) of the 30 personal interview respondents said they routinely provide 24-hour emergency service for their patrons, while five did not. These five respondents all received calls for service after hours, and did respond to them with prescription services. They did not, however, do this "routinely" in their opinion.

Among the 45 mail only respondents, forty-one (93.2%) of the 44 respondents who answered this question replied in the affirmative. In total, 66 of the 74 (89.2%) respondents reported they routinely provided this service.

	Do you routinely provide a 24-hour emergency service?			
Respondent	Yes	No	Total	% Yes
Personal interview	25	5	30	83.3%
Mail only	41	3	44	93.2%
Total	66	8	74	89.2%

2. Total Days and Hours Open per Week

To be able to annualize respondents' data plus to evaluate how close respondents came to providing 24-hour coverage simply by being open for business, it was necessary to ask two additional questions, (1) "Number of

days pharmacy open per week?" (____number of days), and (2) "Number of hours open per week?" (____Number of hours).

a. Extent of Pharmacy Coverage per Week

It is possible for pharmacies to be open for service a maximum of 168 hours per week (seven days times 24 hours per day). The 30 personal interview respondents were open a mean 71.4 hours per week; the 45 mail only respondents were open a mean 71.2 hours per week; together the 75 respondents were open a mean 71.3 hours per week. Therefore, the sample of 75 respondents was open for service about 42.4% of the possible number of hours per week. Thus, after hours coverage was necessary about 57.6% of the time, or 96.7 hours per week.

Hours Open per Week	Number of Pharmacies n=30	n=45	n=75	Percent (n=75)
90-99	2	4	6	8.0%
80-89	6	5	11	14.7
70-79	9	16	25	33.3
60-69	6	16	22	29.3
50-59	7	2	9	12.0
40-49	0	2	2	2.7
Total				100.0%

b. Number of Days Open per Week

The typical respondent was open 6 days a week, and 11.9 hours per day of these 6 days. Actually, many pharmacies were open 6½ or 7 days a week, which means they were open on Sunday morning or all day Sunday. All respondents were open at least 5½ or 6 days a week.

	Days Open per Week			
Respondent	5½ or 6	6½ or 7	Total	%6½ or 7
Personal interview	11	19	30	63.3%
Mail only	15	30	45	66.7%
Total	26	49	75	65.3%

3. Cost Elements of Emergency 24-Hour Prescription Services

Emergency 24-hour prescription service costs were not measured, although data were collected from one personal interview respondent to "guide the way" for future studies.

The respondent received about eight calls per week for emergency prescription services; two calls per week on weekdays and six calls per week on weekends, for a total of about 416 calls per year. This pharmacy was open 8 A.M. to 9 P.M. on weekdays, 8 A.M. to 5 P.M. on Saturdays, and 9 A.M. to 1 P.M. on Sundays, or 78 hours per week. They employed a telephone answering service for after hours calls.

Each of the four employed pharmacists and the proprietor (a pharmacist) was on standby duty for after hours calls for one week periods on a rotating basis. The telephone answering service was to know at all times where to reach the duty pharmacist.

Each call for service from a physician or a patron took an average of one hour per call of the duty pharmacist's time, usually 50 minutes to get ready and to travel to and from the pharmacy, plus 10 minutes in the pharmacy itself providing prescription dispensing services. None of the duty pharmacists received extra wages for providing emergency 24-hour prescription services.

Appropriate cost elements of emergency 24-hour prescription services, over and above normal dispensing costs, might be pharmacist wages or salaries for this off-duty time plus nonwage costs such as travel and automobile costs to and from the pharmacy, and the cost of any telephone answering service. Implicit costs may include "danger" costs (pharmacies are robbed more frequently once the duty pharmacist enters the pharmacy after hours), plus delivery service costs (often the duty pharmacist delivers the requested prescription "on his way home").

4. Summary and Recommendations About Emergency 24-Hour Service Cost Measurements

There were 66 of 74 responding pharmacists (89.2%) who routinely provided a 24-hour emergency service. It is not known how comprehensive these services were, but the pharmacies had to provide this service a weighted mean of 96.7 hours per week that the pharmacies were not open for service.

It is recommended that future studies include the cost measurement of emergency 24-hour prescription services. Practically all pharmacies are called upon to provide after hours services, albeit not routinely, or perhaps they share this service with neighboring pharmacies. Real costs are incurred, however,

Measurement of such variables as the number of emergency after-hours calls per week times 52 times one hour per call times the employee pharmacist wage per hour should give a reasonable estimate of employee wage costs. Added to this, such nonwage costs as automobile expenses (number of calls per week times 52 times average trip in miles per call times X¢ per mile) and the cost of a telephone answering service, if any, should give a "ballpark" estimate of the total annual cost of emergency 24-hour prescription services.

J. Total Nonpharmacist Wage Costs for Four Prescription Services

One of the purposes for determining costs for the personal interview pharmacists to provide prescription delivery, patient record, prescription charge account, and third party payer prescription services, was to obtain total employee nonpharmacist wages attributable to these services. These totals then could be a check on these respondents' ability to estimate on the mail questionnaire what percent of their total employee nonpharmacist times, and therefore, direct wage costs, were spent on prescription department duties.

1. Comparison of Nonpharmacist Wage Costs Spent on Prescription Department Duties

Eleven of the 29 personal interview respondents which employed any nonpharmacists had estimated by mail that a weighted mean of 20.7% of nonpharmacist wage costs should be allocated to the prescription department. These same 11 respondents raised the weighted mean to 24.9% when interviewed and, after the prescription services analysis, this weighted mean rose to 29.2%.

These weighted mean increases, from 20.7% to 24.9% to 29.2% for these 11 respondents' total nonpharmacist wage costs show these original time estimates were considerably understated. Moreover, these figures fail

to reveal the real hesitation all respondents had in allocating nonpharmacists' time spent on prescription department duties. The analysis which follows also signals the fallacies that exist when dealing with weighted means like those above and those which appear in annual compendia, such as the Lilly Digest.

Total allocated nonpharmacist wage costs by the 11 respondents rose from $25,308 to $30,393, or an increase of 20.1%, when they were interviewed. After computing nonpharmacist wage costs in the prescription services analysis, they again rose to $35,660, an increase of 40.9% over the $25,308 that respondents had estimated by mail.

Among the 29 respondents who employed any nonpharmacists, 18 failed to allocate any nonpharmacist times spent on prescription department duties on their mail questionnaire response, despite the fact the instructions were to include time spent on record keeping and delivery. Not explicit, but implied, was that respondents should include time spent waiting on prescription service patrons and even prescription department housekeeping duties.

Actually the above appears to demonstrate the failure to instruct mail questionnaire respondents properly as much as it shows the failure of respondents to allocate time accurately. However, during the personal interviews, respondents said time and time again that they thought

they should avoid allocating nonpharmacist time spent on prescription department duties either because it was not the "professionally correct" fact to admit (even to an investigator from their own profession), or because nonpharmacists legally are not to engage in prescription department duties in Wisconsin.

Even after assuring respondents during the personal interviews that it was "O.K." to allocate nonpharmacist time to prescription department duties, they still tended to underallocate nonpharmacist time as shown by the results of the prescription services analysis.

The 29 personal interview respondents who employed nonpharmacists allocated an unweighted mean 9.6% of nonpharmacist wage costs to the prescription department by mail, 18.7% during the personal interviews, and a calculated 24.2% of these wage costs in the prescription services analysis.

Nonpharmacist Wage Costs Allocated	Unweighted Mean	Median	Mode or Modal Range	Range
By mail questionnaire (n=29)	9.6%	0%	0% (n=18)	0%-95%
During personal interviews (n=29)	18.7%	10%	0%, 5% (n=4)	0%-100%
Personal interview or prescription services analysis* (n=29)	24.2%	20%	10%-19% (n=9)	3.0%-100%

*Uses the higher figure of either the sum of nonpharmacist wage costs from the prescription services analysis or the respondents' estimates of the percent of nonpharmacist wage costs which should be allocated to prescription department duties. The former was higher for 20 respondents, the latter was higher for 9 respondents, and one respondent's figures were the same.

The weighted means for these 29 respondents rose from 6.7% to 17.2% to 29.2% of nonpharmacist wage costs.

2. The "Best Way" to Allocate Nonpharmacist Wage Costs

The results above still may be underestimating the amount of employee nonpharmacist time spent on prescription services, because only an incomplete list of four prescription services were analyzed to sum nonpharmacists' wage costs. If time spent waiting on patrons plus prescription department housekeeping duties were included, these wage costs would be even higher.

Analysis of the cost element "total nonpharmacist wages and salaries" times each pharmacy's prescription sales as a percent of total pharmacy sales, earlier had shown that an unweighted mean of 47.5% of nonpharmacist wages could be allocated to total prescription department costs (or a weighted mean of 41.3%). It would appear that this way of allocating nonpharmacist wages and salaries might be more accurate, than either (1) respondents' percent estimates of nonpharmacist times spent in prescription department duties or (2) a sum of times derived from individual prescription services analyses.

CHAPTER SEVEN

SUMMARY

The study had a threefold purpose: (1) to measure what it cost community pharmacists in Wisconsin to dispense prescriptions in 1968, (2) to find a cost of dispensing formula which separated prescription department costs from other pharmacy costs, and (3) to find a model for measuring the costs of additional prescription services over and above routine dispensing costs.

In the search for a cost of dispensing model, four major prescription department costs were recognized: (1) proprietor(s) and manager salaries (PS), (2) employee pharmacist salaries (RPhs), (3) nonpharmacist wages and salaries (nonRPhs), and (4) nonlabor costs (nonlabor). A personal interview study of 30 community pharmacies in Wisconsin revealed "best" hypothesized variables which formed a summed standard means of expressing these four costs. Comparison of data collected from a prior mail survey of these same 30 pharmacies showed the following variables most closely matched those four hypothesized "standard" interview variables:

$$\text{COD(WIS)} = \text{PS(\% TIME)}_m + \text{RPhs(\% TIME)}_m + (\text{RXS/TS})_m \text{nonRPhs}_m + (\text{RXS/TS})_m \text{nonlabor}_m$$

The four mail collected variables, when summed, formed the "Wisconsin cost of dispensing formula," or COD(WIS). The "standard" personal interview variables, when summed, formed the "best" cost of dispensing formula, or COD(BEST):

$$COD(BEST) = PS(\%\ TIME)_i + RPhs(\%\ TIME)_i + SumSvcs_i + SumPSest_i$$

The cost of dispensing per prescription found in the two surveys of the 30 pharmacies were:

COD Formula	Unweighted Mean	Median	Modal Range	Range
$COD(BEST)_i$	\$1.72	\$1.58	\$1.50-\$1.74 (n=10)	\$1.15-\$3.47
$COD(WIS)_m$	1.76	1.72	1.50- 1.74 (n=10)	1.14- 3.07

The 95% confidence interval for $COD(BEST)_i$ was $\$1.72 \pm \$0.19$; that same interval for $COD(WIS)_m$ was $\$1.76 \pm \$0.16$ for the same 30 pharmacies. A 95% confidence interval for 75 pharmacies surveyed by mail was $\$1.77 \pm \$0.10$ for COD(WIS), inferring that the true unweighted mean for the 952 Wisconsin community pharmacies would be between \$1.67 and \$1.87 at a 95% level of confidence.

COD(WIS) was subjected to twelve desirable criteria for a cost of dispensing formula. Results using COD(WIS)

also were compared among seven other cost of dispensing formulae, and COD(WIS) was shown to be "closer" to COD(BEST) than the alternative formulae.

The Wisconsin cost of dispensing formula, in general, appeared to produce higher costs of dispensing per prescription among pharmacies located in Madison and in Milwaukee than in other cities in Wisconsin. Also, costs per prescription were generally higher in pharmacies (1) which had less than $40,000 in prescription sales, (2) from which less than 40 prescriptions were dispensed daily, and (3) which had less than a ratio of 30% prescription sales to total pharmacy sales. Also, costs of dispensing using COD(WIS) were generally higher in pharmacies which had a weighted mean prescription price to patrons of $4.50 and more. Costs of dispensing among pharmacies of (1) varying total pharmacy sales, (2) varying years of ownership by the same owner, and (3) varying gross margins per prescription generally were the same. Geographical location of pharmacies was inconclusive as a predictor for costs of dispensing except for the Madison and Milwaukee locations.

Costs of dispensing generally were higher per prescription, COD(WIS), for pharmacists offering prescription delivery services (those pharmacists who delivered 5% or more of their prescriptions) and who provided patient record services. COD(WIS) generally increased with increases in the proportion of third party

payer prescriptions to total prescriptions dispensed. Inconclusive results about varying COD(WIS)'s were found in pharmacies offering prescription charge services and in those where continuing education services were provided for their owners or employees.

The weighted mean COD(WIS) found was $1.69 for 75 community pharmacies surveyed by mail (n=45) and in person (n=30). Adding 10% of total prescription sales per prescription for the 75 pharmacies ($0.38) as a profit "component" would give a weighted mean per prescription "dispensing fee" of $2.07 for 1968.

Per prescription mean costs for prescription services measured for the 30 personal interview respondents were:

Prescription Service	Unweighted Mean	Weighted Mean
Prescription delivery costs per delivered Rx (n=27)	$0.68	$0.46
Patient record cost per Rx (n=24)	0.14	0.12
Prescription charge cost per charged Rx (n=30)	0.36	0.24
Third party payer cost per third party Rx (n=30)	0.62	0.53
Continuing education cost per Rx (n=28)	0.02	0.02

Other summary statistics about prescription services provided at the surveyed pharmacies were:

Prescription Service	Percent of Pharmacies Routinely Providing (n=75)	Unweighted Mean, Percent of Prescriptions Dispensed
Prescription delivery	84.0% (5% of Rxs or more)	14.0% (n=75)
Patient records	76.0%	100.0% (n=57)
Prescription charging	97.3% (5% of Rxs or more)	32.7% (n=75)
Third party payer services	100.0%	13.1% (n=73) (Title 19 only)

Another major finding of the study was that pharmacist respondents to the mail survey significantly understated the percent of nonpharmacist time spent in "prescription department duties," when compared to the calculated times of nonpharmacist involvement with specific prescription department services as found in the personal interview survey.

CHAPTER EIGHT

RECOMMENDATIONS

Recommendations from this study include those for individual pharmacy owners, for the pharmacy profession, and for third party payers of prescription services. As these specific recommendations are made, some general recommendations also are offered.

A first general recommendation is that the COD(WIS) formula be used as a good approximate measure of prescription department costs for an individual community pharmacy located in Wisconsin. Allocation of each of the four main cost elements in a prescription department has been shown not only to be "closest" to the computed costs incurred there, but also utilizes data which most pharmacists readily have available to them. Only seven major variables are required: (1) prescription sales, (2) total pharmacy sales, (3) total pharmacy expenses, (4) the proprietor(s) or manager salary allocated to the prescription department by the percent time spent "in prescription department duties," (5) the pharmacist salaries allocated by time, (6) nonpharmacist wages and salaries allocated by the ratio of prescription sales to total pharmacy sales, and (7) the total number of original plus renewed prescriptions dispensed. The simplicity and relative accuracy of allocating nonlabor expenses (total pharmacy

expenses minus all wages and salaries) by the ratio of prescription sales to total pharmacy sales relieves the pharmacy owner from having to initiate new accounting records or to allocate many individual nonlabor expense items using several more complicated formulae or estimates. Allocating total nonpharmacist wages and salaries by a ratio also corrects the pharmacy owner's propensity to understate these employees' necessary involvement with prescription dispensing services (making prescription deliveries, performing prescription department housekeeping chores, waiting on patrons, and so forth) because of possible legal implications (it is unlawful in Wisconsin for nonpharmacists to dispense prescriptions).

Pharmacy owners are advised to use COD(WIS) to compute a cost of dispensing for their pharmacy on an annual basis. If this is done in addition to calculating gross margin per prescription, pharmacy owners better can determine what profits are being generated by their prescription departments compared to their nonprescription departments. Results of these calculations are most important in measuring prescription department costs and profitability on a year to year basis. Shifts in these costs over time can be used in adjusting either their prescription pricing to patrons or in setting an absolute dollar value on their professional fees for prescription dispensing.

The pharmacy owner should be honest with himself in estimating his and his pharmacists' time spent "in prescription department duties" in order for COD(WIS) to be truly useful to him. Also, a pharmacy owner should make certain he includes the costs of some expense items normally not found in his income statement, such as employee bonuses from pretax profits and costs of unpaid or underpaid family employees of the pharmacy.

The pharmacy profession is encouraged to adopt the use of COD(WIS) as a cost of dispensing measurement method to be calculated for a group of community pharmacies. It has been shown in this study that pharmacies generally have all the accounting data necessary to make such calculations, and collection of these data by mail is not only feasible, but also reflects accurate pharmacy expense data. The profession can use these data in summary form (1) to feed back to pharmacy owners via professional journals, and (2) to deal effectively and intelligently with third party payers of prescription services. That the pharmacy profession initiate and complete such cost of dispensing studies is important for two reasons: (1) pharmacy owners may be more inclined to respond to a pharmacy professional group seeking their confidential pharmacy operations data, and (2) experienced members of the pharmacy profession may be best qualified to edit and to interpret pharmacy operations data submitted by pharmacy owners. Also, pharmacy owners

would be more amenable to a representative of the profession interviewing them after data submissions, if a personal interview "audit," or follow-up, were deemed advisable. Also, a panel of pharmacies might be formed and used more successfully by the profession to measure changes in COD(WIS) more accurately from year to year, after first carefully checking on the accuracy of the seven primary data variables for each pharmacy in the panel.

A second general recommendation is that the pharmacy profession calculate an unweighted mean cost of dispensing in Wisconsin, COD_u(WIS), for a sample of community pharmacies rather than a weighted mean, COD_w(WIS). In addition, a standard deviation among these pharmacies' COD(WIS)s should be calculated. Use of the unweighted COD(WIS) is recommended for several reasons:

(1) COD_u(WIS) is unbiased by the size of pharmacies' operations. COD_w(WIS) will be "weighted" towards CODs calculated for pharmacies where unusually high numbers of prescriptions are dispensed.

(2) Measuring CODs from pharmacy to pharmacy (necessary to be able to calculate COD_u) allows the calculation of a standard deviation among CODs for a group of pharmacies. A standard deviation allows the profession to measure variability among CODs for a group of pharmacies. This is important as it was

shown in this study that CODs may be higher in Madison and Milwaukee than in the rest of Wisconsin, for example. Also CODs were higher in pharmacies with prescription sales less than $40,000. Knowledge of the COD standard deviation can suggest the number of pharmacies needed to be surveyed among these special pharmacy groups to demonstrate this COD variability at a known level of confidence.

(3) Measuring CODs from pharmacy to pharmacy allows the calculation of confidence intervals around a COD_u(WIS). These confidence intervals can be used to calculate how many pharmacies would be affected negatively (in the profit sense) given a specific per prescription reimbursement amount by third party payers for prescription services. No such calculation can be made around a COD_w(WIS).

Third party payers of prescription services are encouraged to accept the use of COD(WIS) as an approximate and equitable measure of true prescription department costs. Also, it is recommended that per prescription reimbursement levels for prescription services be based in part upon COD_u(WIS) for a group of pharmacies. Added to COD_u(WIS) should be a per prescription pre-tax profit component such as 10% of the total prescription sales of all the pharmacies in the sample (divided by the total number of prescriptions dispensed in these pharmacies)

from which a COD_u(WIS) was calculated. This profit component amount is the same as taking 10% of the weighted mean per prescription price to patrons. Reimbursement also should recognize that costs of dispensing tend to be higher in pharmacies which offer additional prescription services such as delivery and patient record services.

Reimbursement by third parties based upon COD_u(WIS) rather than on COD_w(WIS) is recommended, even though COD_u(WIS) normally is slightly higher than COD_w(WIS). This especially is recommended in Wisconsin, where pharmacies are reimbursed the same per prescription fee. Some reasons for this higher reimbursement amount include:

(1) Either COD is based on the previous year's cost data. Use of the higher COD helps compensate for increased costs plus inflation for prescription dispensing in the current year.

(2) The higher COD_u(WIS) helps compensate for the costs of added prescription services offered by many pharmacies, such as 24-hour emergency services, physician and patron consulting services, and even training costs for pharmacy interns.

(3) The higher COD_u(WIS) rewards the efficiencies developed by pharmacists which may simultaneously build their prescription dispensing services while lowering their COD(WIS), and yet pays a little

more to the pharmacy with a low prescription volume and a higher COD(WIS) which may be servicing a small, rural community in Wisconsin, where these services may be otherwise unavailable.

(4) The higher COD_u(WIS) gives recognition to the added costs of dispensing a third party payer prescription, with its attendant administrative costs, over and above a first party payer prescription.

A last, general recommendation is that third party payers of prescription services continue to reimburse pharmacies on a per prescription dispensed basis rather than on any alternative basis. Use of a single reimbursement fee for groups of pharmacies also is preferred and is less costly to administer than a reimbursement fee for every single pharmacy, such as in the Title XIX program in Kansas at the present time. Consideration might be given to reimbursement per prescription based upon a set absolute dollar fee rather than upon the cost of ingredients for each prescription plus a dispensing fee. In this scheme, every prescription would cost the third party payer the same amount no matter what the cost of ingredients might be. This set absolute dollar fee per prescription could be calculated by adding COD_u(WIS) plus a mean profit component plus a mean cost of ingredients per prescription. Although mean cost of ingredients determinations were beyond the scope of this present study, the

administrative ease of such a type of reimbursement scheme may inspire the attempt of such a study to evaluate its feasibility.

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APPENDICES

APPENDIX A

PRETEST COVER LETTER TO MAIL PHARMACY RESPONDENTS

THE UNIVERSITY OF WISCONSIN
MADISON 53706

SCHOOL OF PHARMACY
Pharmacy Building
425 North Charter Street

240

11 Feb 69

Dear Colleague,

At the present time the Wisconsin Medical Assistance Program (Title XIX) generally allows Blue Book cost plus $2.00 for each Medicaid prescription you dispense. Is this fee "reasonable", inadequate, or may it be deemed 'too high'?

New Federal regulations state, "The dispensing fee should be ascertained by analysis of pharmacy operational data which includes components of overhead, professional services, and profit.* The Board of Directors of your Wisconsin Pharmaceutical Association strongly believes this type of analysis and its interpretation should be performed by the profession rather than by an outside agency. We are developing a mechanism to do this accurately on a periodic basis using a mail questionnaire and different random samples of pharmacies.

Your cooperation in supplying requested data is vital for us to develop a format to provide meaningful and representative figures without recourse to full-scale audits. WPHA's Board of Directors needs such data to deal intelligently in consultation with State and Federal government agencies.

The operational data requested, and which only you can provide, will be kept confidential. Summary figures only will be reported to WPHA. Please complete the following questionnaire and return it in the enclosed envelope by 19 Feb 69.

Sincerely,

Robert W. Hammel, Professor
Pharmacy Administration

* Federal Register, Vol. 34, No. 17, Saturday, 25 Jan 69, p. 1244.

APPENDIX B

PRETEST MAIL QUESTIONNAIRE

SURVEY ON THE COST OF DISPENSING PRESCRIPTIONS IN WISCONSIN

I. General Information

A. Type

____ chain (4 or more units)
____ independent
____ other _____ (please specify)

B. Location

____ downtown
____ neighborhood
____ shopping center
____ other _____ (please specify)

C. Building

____ own
____ rent

D. Number of hours open per week

_____ (number of hours)

E. Do you routinely provide 24-hour emergency service? ____ yes ____ no

F. Do you routinely deliver prescriptions? ____ yes ____ no

If yes, approximately what % of all prescriptions are delivered? ____ % of Rxs

G. Do you routinely offer a charge account service? ____ yes ____ no

If yes, approximately what % of all prescriptions are charged? ____ % of Rxs

H. Do you routinely maintain a patient record system?
(i.e. individual records, by patient name, of all prescriptions dispensed)
____ yes ____ no

II. Pharmacy Operational Data

NOTE: Accounting data should be used from the most recent twelve month period of which you have records. For your pharmacy, this period ended on _____ _____, 19___.
(month) (day)

(If exact figures are unavailable, please indicate "estimate" where necessary. If it is more convenient, just slip your income and expense statement into this form, complete the 2nd column in IIB and please go on to IIC.)

II. A. Total net sales of pharmacy $_____
Less cost of goods sold $_____
Gross margin $_____

II. B. EXPENSES	1st column	2nd column % of expense you would allocate to Rx Dept.
Employees' wages, including part-time personnel	$_____	_____ %
Other employee benefits (e.g. profit sharing, pension funds, etc.)	$_____	_____ %
Rent (if you own your building, charge for comparable quarters)	$_____	_____ %
Taxes (except on buildings, income, and profit, but include Social Security payments.)	$_____	_____ %
Insurance (except on buildings)	$_____	_____ %
Advertising	$_____	_____ %
Depreciation (except on buildings)	$_____	_____ %
Heat, light and power	$_____	_____ %
Accounting, legal, and other professional fees	$_____	_____ %
Delivery, including auto expense for business purposes	$_____	_____ %
Telephone	$_____	_____ %
Licenses, dues & subscriptions	$_____	_____ %
Miscellaneous expenses	$_____	_____ %
TOTAL EXPENSES	$_____	
Gross margin less expenses (gross profit)	$_____	
Manager's or owner's compensation (salary plus benefits)	$_____	
Net profit (before taxes)	$_____	

II. C. From your BALANCE SHEET

Value of your total inventory at cost $_____
Total assets of your pharmacy $_____
Total liabilities $_____

III. Prescription Department Summary

A. 1. Total original and renewal prescriptions dispensed for the same 12 month period of time.

_____
(number of Rxs)

2. Total prescription sales $_____

3. Value of ending Rx inventory at cost $_____

4. Approximately what % of all Rxs are dispensed for Wis. Medical Assis. Program beneficiaries (Title XIX) _____ % of Rxs

B. Total floor area of the pharmacy _____ sq. ft.

Total floor area of Rx Dept. _____ sq. ft.

C. Personnel expenses

NOTE: To allocate the pharmacy's personnel expenses to your prescription department, please give the wages and the estimated % of time spent by all personnel in prescription department duties. The % of time spent in Rx Dept. duties should include dispensing time, plus time for ordering, record keeping, cleaning, etc.

Personnel	Number	Total salaries & wages	% of time spent in Rx dept. duties
Owner/Manager	____	$_____	_____%
Full-time RPhs	____	$_____	_____%
Part-time RPhs and interns	____	$_____	_____%
Sales Clerks	____	$_____	_____%
All other personnel	____	$_____	_____%

D. What do you believe to be the annual "going wage" for salaried pharmacists in your area of the state?
$_____ per year

E. Please give any other information you believe may influence your dispensing costs:

_____

_____

_____

_____

III. F. If you have maintained Daily Prescription Records such as those recommended by the APhA, please submit the following information for the same 12 months period. If unavailable, please provide data for the most recent month. These records cover the period _____ thru _____, 19____.

Total number of Rxs dispensed _____

Total prescription sales $_____

Total prescription costs
(actual acquisition cost of ingredients) $_____

_____
Name of pharmacy

Thank you for your cooperation!

APPENDIX C

MAIN MAILING COVER LETTER AND MAIL QUESTIONNAIRE

THE UNIVERSITY OF WISCONSIN
Madison 53706

School of Pharmacy
425 N. Charter Street

4 March 1969

Dear Colleague,

What does it cost to dispense a prescription in your pharmacy? At the present time the Wisconsin Medical Assistance Program (Title XIX) generally pays the Blue Book price plus a $2.00 fee for each Medicaid prescription you dispense. Is this fee "reasonable", inadequate, or may it be deemed 'too high'?

A new Federal regulation states, "The dispensing fee should be ascertained by analysis of pharmacy operational data which includes components of overhead, professional services, and profit."[1] This regulation plus the State's current budget deficit convince the Board of Directors of your Wisconsin Pharmaceutical Association that pharmacy soon will have to provide objective cost data. They strongly believe this type of analysis and its interpretation should be performed by the profession rather than by an outside agency.

Your cooperation in supplying requested data is vital to provide meaningful and representative figures without recourse to full-scale audits. WPhA's Board of Directors needs these data to deal intelligently in consultation with State and Federal government agencies.

The operational data requested, which only you can provide, will be kept confidential. Your pharmacy was one of 300 selected randomly from a list of all pharmacies in Wisconsin. Data from your pharmacy will be combined with that from other pharmacies to insure confidentiality.

Please complete the following questionnaire and return it in the enclosed envelope by 12 March 1969. Thank you.

Sincerely,

R. W. Hammel, Professor
Pharmacy Administration

P.S. Please check here_____ if you want a confidential report of the computed dispensing costs for your pharmacy only.

[1] Federal Register (34:17) 25 Jan 69, p. 1244.

SURVEY ON THE COST OF DISPENSING PRESCRIPTIONS IN WISCONSIN

I. GENERAL INFORMATION

A. Number of days pharmacy open per week _____ (number of days)

B. Number of hours open per week _____ (number of hours)

C. Do you routinely provide 24-hour emergency service? yes _____ no _____

D. Do you routinely deliver prescriptions? yes _____ no _____
Approximately what % of all prescriptions are delivered? _____% of Rxs

E. Do you routinely offer a charge account service? yes _____ no _____
Approximately what % of all prescriptions are charged? _____% of Rxs

F. Do you routinely maintain a patient record system? yes _____ no _____
(i.e. individual records, by patient name, of all Rxs dispensed)

G. Do you own or rent your pharmacy building? own _____ rent _____

C. PERSONNEL EXPENSES

NOTE: To allocate the pharmacy's personnel expenses to your Rx Dept., please give the salaries and the estimated % of time spent by all personnel in Rx Dept. duties. The % of time spent in Rx Dept. duties should include dispensing time, plus time for related ordering, record keeping, delivery, etc.

Personnel	Number	Total wages & salaries	% of time spent in Rx Dept. duties
Owner or manager	_____	$_____	_____%
Full-time RPhs	_____	$_____	_____%
Part-time RPhs	_____	$_____	_____%
Interns	_____	$_____	_____%
Sales clerks	_____	$_____	_____%
All other personnel	_____	$_____	_____%

D. What do you believe to be the annual "going wage" for salaried pharmacists in your area of the state?

$_____ per year

E. Do any factors increase or decrease your total dispensing costs for Rxs dispensed under Title XIX?

_____

_____

_____

_____

F. If you keep records of the cost of the drugs you dispense, please submit the following information for the same 12 month period. If unavailable, please provide data for the most recent month.

These records cover the period _____ through _____, 19_____.

Total number of prescriptions dispensed _____

Total prescription volume $_____

Total prescription cost (your acquisition cost) $_____

_____

Name of pharmacy

Thank you for your cooperation!

APPENDIX D

SAMPLE OF A MAIN MAILING OUTSIDE ENVELOPE

After 5 days, return to
THE UNIVERSITY OF WISCONSIN
School of Pharmacy
425 N. CHARTER STREET
MADISON, WISCONSIN 53706

URGENT
Reply Requested

William Schmidlkofer, Mgr.
Rennebohm Drug Stores
Clinic Pharmacies-Jackson Clinic
2300 Badger Lane
Madison, Wis. 53713

APPENDIX E

MAP OF WISCONSIN SHOWING FOUR GEOGRAPHICAL REGIONS USED IN THE STUDY

APPENDIX E

MAP OF WISCONSIN SHOWING FOUR GEOGRAPHICAL REGIONS USED IN THE STUDY

APPENDIX F

COVER LETTER SENT TO POTENTIAL PERSONAL INTERVIEW RESPONDENTS IN THE STUDY

THE UNIVERSITY OF WISCONSIN
MADISON 53706

SCHOOL OF PHARMACY
Pharmacy Building
425 North Charter Street

18 August 69

Thank you for participating in our cost of dispensing survey for the Wisconsin Pharmaceutical Association this past March. Your cooperation helped support the Medicaid prescription program in Wisconsin.

Accounting data can be misinterpreted or incorrectly applied, however, depending upon the investigators and upon the formula methods used to determine costs of dispensing.

We need to test the validity of the major formula methods which have been proposed, and would like to answer any questions you may have about these type analyses. Since this is done properly only in a personal interview, we need permission to visit you in your pharmacy sometime this month or early September to verify some accounting information and also get your ideas on equitable third party reimbursement plans.

The information received, which again will remain confidential, will help us evaluate the soundness of different methods of allocating pharmacy expenses to prescription departments. Useful summary data again will be made available to WPhA for necessary consultations with personnel in State and Federal welfare agencies.

The analyses themselves will be reported in Mr. Look's dissertation, with your individual pharmacy's data grouped with those from other pharmacies to retain their confidentiality. At no time and in no way will your individual data be identified.

Mr. Look will telephone soon to arrange a personal interview. He will need less than an hour's time with you.

Your continued cooperation will be greatly appreciated.

Sincerely,

R. W. Hammel, Professor of
Pharmacy Administration

cc: Kenneth W. Look

RWH:lrf

APPENDIX G

WORKSHEET QUESTIONNAIRE USED IN THE PERSONAL INTERVIEW STUDY

COST OF DISPENSING WORKSHEET

Pharmacy_____ Date_____
City_____

A. Verify classification material on mail return

1. Number of days pharmacy open per week _____ = _____ days/yr.
2. Number of hours open per day _____
3. Own or rent pharmacy building _____
   a. Total floor area of pharmacy _____ sq ft
   b. Total floor area of Rx Dept. _____ sq ft

B. Verify pharmacy operational data for _____ mo. period ending on _____, 19__.

		COMPUTATIONS
1. Total Net Sales of Pharmacy	$_____	
2. Total Rx Sales	$_____	_____%(Rx:Tot.Sales)
3. Total Number of Rxs Disp.	_____Rxs	$____Mean Rx charge
		_____Rxs disp/day

C. New Classification Data

1. Type of Ownership (check)
   _____individual
   _____partnership _____number of partners
   _____corporation _____number of stockholders (_____RPhs)

2. Pharmacy age
   a. No. of yrs. phcy. under same ownership _____yrs (or since _____)
   b. Age of pharmacy building _____ yrs (or built in _____)
   c. Rx Dept. last remodeled _____ yrs (or in what yr _____)

D. Operating Expenses

% time spent in Rx Dept. duties should include dispensing time, plus time for related ordering, record keeping, delivery, etc.

1. Proprietor/Manager (_____ persons included here)

		% of time spent in Rx Dept.duties	Rx Dept. Expenses
Salary	$_____		
Withdrawals	$_____		
TOTAL	$_____	_____%	$_____

COST OF DISPENSING WORKSHEET (Cont.)

D. Operating Expenses (Cont.)

2. Employees' wages, including part-time personnel

	Number	Total Wages & Salaries	% time, Rx Dept. Duties	Rx Dept. Expenses
Full-time RPhs		$	%	$
Part-time RPhs		$	%	$
Intern		$	%	$
Sales Clerks		$	%	$
Other Personnel		$	%	$
TOTAL WAGES		$		$

3. Other employee benefits (bonuses, pension, etc.)

Type	Total Exp.	% alloctd.	Rx Dept. Expenses
	$	%	$
TOTAL	$	%	$

4. Rent (if own) $_____ /month — Actual / Imputed

$	%	$
$	%	$

5. Taxes (Unemployment, Soc. Sec., Pers. prop. tax, but not on buildings, income, & profit)

$	%	$

6. Insurance (not on buildings)

$	%	$

COST OF DISPENSING WORKSHEET (Cont.)

D. Operating Expenses (Cont.)

	Total Exp.	% alloc.	Rx Dept. Expenses
7. Advertising	$_____	_____%	$_____
8. Depreciation (not on buildings)	$_____	_____%	$_____
9. Heat, light, & power _____	$_____	_____%	$_____
_____	$_____	_____%	$_____
_____	$_____	_____%	$_____
TOTAL	$_____	_____%	$_____
10. Delivery, incl. auto exp.	$_____	_____%	$_____
11. Telephone	$_____	_____%	$_____
12. Licenses, dues, and subscrip.	$_____	_____%	$_____
13. Acctg, legal & prof. fees	$_____	_____%	$_____
14. Miscellaneous expenses			
_____	$_____		
_____	$_____		
_____	$_____		
_____	$_____		
_____	$_____		
TOTAL	$_____	_____%	$_____
		TOTAL RX	
TOTAL OPERATING EXP.	$_____	EXPENSES	$_____

(equals _____% of tot. sales) (eq. _____% of Rx Sales)

RX DEPARTMENT ASSETS	Type	Est. Value	Deprec. Value (Balance sheet)
(e.g. fixtures, equip, inventory, delivery vehicles, registers)	_____	$_____	$_____
	_____	$_____	$_____
	_____	$_____	$_____
	_____	$_____	$_____
	_____	$_____	$_____
	_____	$_____	$_____
	TOTAL VALUE	$_____	$_____
Total Pharmacy Assets		BOOK VALUE	$_____

ANALYSIS OF PRESCRIPTION SERVICES

A. DELIVERY SERVICES

1. Verify mail survey

   Do you routinely deliver Rxs? _____ (yes or no)
   Per cent delivered Rxs of total Rxs _____%

2. Delivery costs (1968 P & L) $_____

   a. Do these costs include: (check)

      _____ vehicle maintenance
      _____ employees wages
      _____ nondelivery expenses (e.g. private travel, etc.)
      _____ If yes, estimated cost for delivery alone $_____

   b. Estimate of Rx delivery trips as % of total delivery trips _____%

3. Per cent of employees' time for delivery services, such as receiving calls, preparing orders, time on road, etc.

Employee wage (per wk/mo)	% time on delivery services	total employee labor cost/yr
$_____	_____%	$_____
$_____	_____%	$_____
$_____	_____%	$_____
TOTAL LABOR COST		$_____

4. Estimate:

   a. no. of deliveries per day/week _____
      no. Rx deliveries per day/wk _____
      or
      no. Rxs delivered per day/wk _____

   b. Collect any statistics on delivery costs that interviewee has computed, e.g. $ cost/deliv. item
      $ cost/delivery

TOTAL RX DELIVERY SERVICES EXPENSES $_____

Total Number Rxs Dispensed _____Rxs

Delivery Expense per Rx $_____

B. PATIENT RECORDS SERVICES

1. Verify mail survey

Do you routinely maintain patient records? _____

2. What type of patient record keeping system do you use? (open ended question)

3. Per cent of employees' time for this service, such as recording patient entries, income tax info sendout, etc.)

Employee wage (per wk/mo)	% time on patient records	total employee labor cost/yr
$_____	_____%	$_____
$_____	_____%	$_____
$_____	_____%	$_____
TOTAL LABOR COST		$_____

4. Estimated cost/year for patient record keeping supplies $_____

5. Number of patient records currently active _____

TOTAL PATIENT RECORDS EXPENSES $_____

Total Number Rxs Dispensed _____ Rxs

Patient Record Expense per Rx $_____

C. CHARGE ACCOUNT SERVICES

1. Verify mail survey

Do you routinely charge Rxs? _____
Per cent charged Rxs of total Rxs _____%

2. Per cent of employees' time for charge account services, such as recording charges, mailing time, etc.

Employee wage (per wk/mo)	% time on charge services	total employee labor cost/yr
$_____	_____%	$_____
$_____	_____%	$_____
$_____	_____%	$_____
TOTAL LABOR COST		$_____

ANALYSIS OF PRESCRIPTION SERVICES (Cont.)

C. CHARGE ACCOUNT SERVICES (Cont.)

3. Estimated cost/year for: (P & L entries?)

charge account supplies	$_____
bad debts	$_____
collection services	$_____
bank credit card serv.	$_____
mailing expenses	$_____
TOTAL EXPENSES	$_____

4. Number of charge accounts currently in use _____

TOTAL CHARGE ACCOUNT EXPENSES $_____

(Ask) Per Cent Allocated to Rx Dept. _____%

Total Rx Charge Account Expense $_____

Total Number Rxs Dispensed _____Rxs

Charge Account Expense Per Rx $_____

D. CONTINUING EDUCATION

1. Number of hours spent per week/month (proprietor/manager)

_____ reading professional journals
_____ on correspondence courses
_____ consulting or teaching (in schools, nursing homes, hospitals, etc., outside of regular dispensing consultations)

2. For all employees

Number of workdays per year spent on continuing education (attending seminars, institutes, etc.) _____ days

Number of meetings attended per year (WPhA, local PhA, etc.) _____ days

3. Estimated expense incurred per year for continuing education for all employees, including himself $_____

THIRD PARTY PROGRAMS

1. Verify mail survey

   Per cent Title 19 Rxs of total Rxs _____%

2. Per cent other third party Rxs of total Rxs _____%

3. Per cent of employees' time spent on third party prescription services (over and above usual dispensing time)

Employee wage (per wk/mo)	% time for activity	total employee labor cost/yr
$_____	_____%	$_____
$_____	_____%	$_____
$_____	_____%	$_____
$_____	_____%	$_____
TOTAL LABOR COST		$_____

4. How much additional time, in minutes, does it take to complete each third party Rx transaction (over and above regular dispensing time) _____ minutes

5. Average number of weeks between dispensing Rxs under Title 19 and receiving payment for them _____ weeks/days

6. Factors increasing or decreasing total dispensing costs for Rxs dispensed under Title XIX (open ended).

PROFIT ANALYSIS

1. For their pharmacy

   Desired net profit on total pharmacy sales _____%

   Desired net profit on prescription sales _____%

2. For Wisconsin pharmacies' prescription services

   Should reimbursements from third parties be partially based upon a uniform rate of net profit expressed as a per cent of Rx sales? _____

   If so, what % of Rx sales _____%

   Should reimbursement from third parties be based upon a uniform per prescription rate (such as cost plus $2.00), or should the fee vary from pharmacy to pharmacy, or from one geographical location to another? _____

APPENDIX H

MEASURES OF CENTRAL TENDENCY FOR COMPUTED COSTS OF DISPENSING

APPENDIX H

MEASURES OF CENTRAL TENDENCY FOR COMPUTED COSTS OF DISPENSING

Costs of dispensing were computed for 75 pharmacies in this study. There are three usual ways of expressing central tendency ("averages") among data of these types: the mean, the median, and the mode. Variability usually is shown by the range or by confidence intervals.

There are at least three ways of expressing the mean cost of dispensing for these 75 pharmacies: the unweighted mean, the weighted mean, and a mean calculated for the "average" pharmacy. Only the first two means are legitimate descriptors of central tendency in this case; the latter mean only approximates a true weighted mean. Only the unweighted mean can be used to demonstrate confidence intervals. That is, the unweighted mean is the only mean for which a standard deviation can be computed. These three means are demonstrated here by example only.

Assume the following data (data are actual data from pharmacies in the study):

Prescription Department Costs		Number of Prescriptions Dispensed	Per Prescription Cost of Dispensing
Pharmacy #1	$ 28,337	18,468	$1.5343
Pharmacy #2	35,463	18,126	1.9564
Pharmacy #3	39,230	16,000	2.4518
	$103,030	52,594	$5.9425

An unweighted mean COD, COD_u, would be:

$$COD_u = \frac{\Sigma(COD)_i}{n}, \quad i = 1,2,3 \ (n=3)$$

or

$$\frac{\$1.5343 + \$1.9564 + \$2.4518}{3} = \frac{\$5.9425}{3} = \$1.9808$$

A weighted mean COD, COD_w, would be:

$$COD_w = \frac{\Sigma(\text{Rx Dept. Costs})_i}{\Sigma(\text{Rxs Dispensed})_i}, \quad i = 1,2,3 \ (n=3)$$

or

$$\frac{\$28,337 + \$35,463 + \$39,230}{18,468 \text{ Rxs} + 18,126 \text{ Rxs} + 16,000 \text{ Rxs}} = \frac{\$103,030}{52,594 \text{ Rxs}} = \$1.9589$$

The weighted mean COD also can be calculated:

$$\frac{\bar{x}(\text{Rx Dept. Costs})}{\bar{x}(\text{Rxs Dispensed})}$$

or

$$\frac{\frac{\$103,303}{3}}{\frac{\$52,594}{3}} = \frac{\$34,343}{\$17,531} = \$1.9589$$

This is true because

$$\frac{\bar{x}(\text{Rx Dept. Costs})}{\bar{x}(\text{Rxs Dispensed})} = \frac{\frac{\Sigma(\text{Rx Dept. Costs})_i}{n}}{\frac{\Sigma(\text{Rxs Dispensed})_i}{n}}$$

$$= \frac{\Sigma(\text{Rx Dept. Costs})_i}{n} \times \frac{n}{\Sigma(\text{Rxs Dispensed})_i}$$

$$= \frac{\Sigma(\text{Rx Dept. Costs})_i}{\Sigma(\text{Rxs Dispensed})_i}$$

The difference between the unweighted mean COD and the weighted mean COD can best be shown mathematically:

$$COD_u = \frac{\Sigma(COD)_i}{n} = \frac{\Sigma\left(\frac{\text{Rx Dept. Costs}}{\text{Rxs Dispensed}}\right)_i}{n}, \quad i = 1,2,3 \ (n=3)$$

$$COD_w = \frac{\bar{x}(\text{Rx Dept. Costs})}{\bar{x}(\text{Rxs Dispensed})} = \frac{\Sigma(\text{Rx Dept. Costs})_i}{\Sigma(\text{Rxs Dispensed})_i}, \quad i = 1,2,3 \ (n=3)$$

A third "mean" COD often appears in the literature, but it only represents a single COD calculated for the "average" pharmacy (COD_a).

Assume the following data from the same three pharmacies above:

	Proprietor's Salary (PS)	Rx Sales (RXS)	Total Sales (TS)	$(\frac{RXS}{TS})$	Total Expenses (TE)	Rxs
Pharmacy #1	14,000	71,102	121,723	0.5841	38,546	18,468
Pharmacy #2	15,600	78,538	192,085	0.4088	64,189	18,126
Pharmacy #3	32,000	44,000	183,896	0.2392	62,226	16,000
Total	61,600	193,640	497,704	1.2321	164,961	52,594
Mean	20,533	64,547	165,901	0.4107	54,987	17,531

Using the Abrams formula, COD(ACA #1), where:

$$\frac{\text{Rx Dept. Costs}}{\text{Rxs Dispensed}} = \frac{PS + (\frac{RXS}{TS})(TE - PS)}{Rxs},$$

a tendency is to use the mean values (the "average" pharmacy) calculated above to compute a mean COD(COD_a), or:

$$COD_a = \frac{\bar{x}(PS) + \frac{\bar{x}(RXS)}{\bar{x}(TS)}\left[\bar{x}(TE) - \bar{x}(PS)\right]}{\bar{x}(Rxs)}$$

$$COD_a = \frac{20{,}533 + \frac{64{,}547}{165{,}901}(54{,}897 - 20{,}533)}{17{,}531}$$

$$COD_a = \frac{20{,}533 + (0.3890)(34{,}454)}{17{,}531}$$

$$COD_a = \frac{20{,}533 + 13{,}403}{17{,}531} = \frac{33{,}936}{17{,}531} = 1.9357^{1}$$

Summarizing[2] - COD_u = 1.9808

COD_w = 1.9589

COD_a = 1.9357

Notice that COD_a is a different mean figure. Why is it not the same as COD_w? Perhaps we miscalculated--we

---

1. COD_a may just as easily overstate COD_u and/or COD_w just as it has understated them in this example.

2. The three CODs are more dramatically different when the sample pharmacies differ more in their total sales and in the number of prescriptions dispensed. The reader is encouraged to try more examples.

correctly used $\frac{\bar{x}(RXS)}{\bar{x}(TS)} = 0.3890$ and not $\bar{x}(\frac{RXS}{TX}) = 0.4107$ as we had calculated in the table above--where did we go wrong?

The answer lies in examining the formula for COD_w and COD_a.

$$COD_w = \frac{\bar{x}(\text{Rx Dept. Costs})}{\bar{x}(\text{Rxs Dispensed})}$$

$$COD_a = \frac{\bar{x}(PS) + \frac{\bar{x}(RXS)}{\bar{x}(TS)}[\bar{x}(TE) - \bar{x}(PS)]}{\bar{x}(Rxs)}$$

$$COD_w = \frac{\bar{x}[PS + (\frac{RXS}{TS})(TE - PS)]}{\bar{x}(Rxs)}$$

$$COD_w = \frac{\bar{x}(PS) + \bar{x}[(\frac{RXS}{TS})(TE - PS)]}{\bar{x}(Rxs)} \neq$$

$$\frac{\bar{x}(PS) + \frac{\bar{x}(RXS)}{\bar{x}(TS)}[\bar{x}(TE) - \bar{x}(PS)]}{\bar{x}(Rxs)}$$

To equate the two equations is to say, for example, that $\bar{x}(XY) = \bar{x}(X)\ \bar{x}(Y)$, which is not true.

Assume $X_i = \left(\frac{RXS}{TS}\right)_i$ and $Y_i = (TE - PS)_i$, $i = 1,2,3$ $(n=3)$

Assume:

$$X_1 = 1 \qquad Y_1 = 4$$

$$X_2 = 2 \qquad Y_2 = 5$$

$$X_3 = 3 \qquad Y_3 = 6$$

Therefore,

$$\bar{x}(XY) = \frac{\Sigma X_i Y_i}{n} = \frac{X_1Y_1 + X_2Y_2 + X_3Y_3}{n}$$

$$= \frac{(1 \times 4) + (2 \times 5) + (3 \times 6)}{3}$$

$$= \frac{4 + 10 + 18}{3} = \frac{32}{3} = 10.67$$

Therefore,

$$\bar{x}(X)\bar{x}(Y) = \frac{\Sigma X_i}{n} \times \frac{\Sigma Y_i}{n} = \left(\frac{X_1 + X_2 + X_3}{n}\right)\left(\frac{Y_1 + Y_2 + Y_3}{n}\right)$$

$$= \left(\frac{1 + 2 + 3}{3}\right)\left(\frac{6 + 5 + 4}{3}\right)$$

$$= \left(\frac{6}{3}\right)\left(\frac{15}{3}\right) = 2 \times 5 = 10.00$$

Therefore,

$\bar{x}(XY) \neq \bar{x}(X)\bar{x}(Y)$ by example.

Remembering that:

$$X_i = \left(\frac{RXS}{TS}\right)_i \quad \text{and} \quad Y_i = (TE - PS)_i,$$

we thus have shown directly that:

$$COD_w = \frac{\bar{x}(PS) + \bar{x}[(\frac{RXS}{TS})(TE - PS)]}{\bar{x}(Rxs)} \quad \text{does not equal}$$

$$COD_a = \frac{\bar{x}(PS) + \frac{\bar{x}(RXS)}{\bar{x}(TS)}[\bar{x}(TE) - \bar{x}(PS)]}{\bar{x}(Rxs)}$$

More directly we also have shown that:

$$COD_w \neq \frac{\bar{x}(PS) + \bar{x}(\frac{RXS}{TS})[\bar{x}(TE) - \bar{x}(PS)]}{\bar{x}Rxs}$$

which also erroneously may be calculated as an "average" COD. That it equals none of our three "means" can be done by example, using our sample data above:

$$COD_? = \frac{\bar{x}(PS) + \bar{x}(\frac{RXS}{TS})[\bar{x}(TE) - \bar{x}(PS)]}{\bar{x}(Rxs)}$$

$$= \frac{20,533 + (0.4107)(54,987 - 20,533)}{17,531}$$

$$= \frac{20,533 + (0.4107)(34,454)}{17,531}$$

$$= \frac{20,533 + 14,150}{17,531} = \frac{34,683}{17,531} = 1.9783$$

$COD_u = 1.9808$

$COD_w = 1.9589$

$COD_a = 1.9357$

$COD_? = 1.9783$

The major point of this discussion has been to show that it is important to say which "mean" COD has been calculated when reporting results of a survey of a group of pharmacies. The importance of the absolute value of whatever mean COD is reported may be important in deciding upon a fee level for third-party reimbursement for dispensing services. Pharmacy owners or managers also may look to this mean COD in comparing it to their own calculated COD.