# VALIDATION OF A NEW PRESCRIPTION DATABASE IN MANITOBA: AN OPPORTUNITY TO EVALUATE PHARMACIST PARTICIPATION DRUG UTILIZATION REVIEW

By

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# VALIDATION OF A NEW PRESCRIPTION DATABASE IN MANITOBA: AN OPPORTUNITY TO EVALUATE PHARMACIST PARTICIPATION DRUG UTILIZATION REVIEW

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This M.Sc. thesis is dedicated to Kevin Hall for his support and wisdom.

## Abstract

**Introduction:** The validity of prescription claims databases, as a source of information for population-based research, depends on the completeness of prescription data. The Drug Programs Information Network (DPIN) is a new, electronic prescription database which links all community pharmacies in Manitoba. Pharmacists are required to submit to DPIN all Pharmacare prescriptions, but submission of prescriptions for social assistance recipients and treaty status Indians is voluntary. An assessment of the completeness of prescription data submitted to DPIN was undertaken to determine whether treaty status Indian and social assistance groups were under-represented. A secondary component of the study was to assess pharmacist and pharmacy factors which are associated with voluntary submission of prescriptions to DPIN.

**Study Design:** Prescriptions dispensed in a stratified sample of Manitoba pharmacies were linked by prescription number to prescriptions in DPIN to determine the proportion submitted for the Indian Affairs, Social Services and Pharmacare drug benefit recipient groups. Linked prescriptions were compared for agreement on the drug name and strength, quantity dispensed and number of days supply. Data on pharmacist and pharmacy characteristics were collected from a mail survey of pharmacists.

**Study Population:** Using a 2 stage sampling design, six pharmacies were randomly selected from 10 strata defined by pharnacy location (rural vs urban)and ownership type (chain vs independent), and 3 sociodemographic neighbourhoods as a proxy measure of

pharmacy clientele. Indian Affairs neighbourhoods were composed of Forward Sortation Areas (FSA's) where the proportion of treaty status Indians was > 10% as indicated by a municipal code beginning with the letter 'A' in the Manitoba Health registry. Social Services neighbourhoods contained FSA's in which > 20% of the non-treaty status Indian population lived in neighbourhoods with average household incomes of < $30,000 per year according to Census 1991 data. Pharmacare neighbourhoods were composed of all left-over FSA's.

In the second stage of the sample design, 2 weekdays during the week of March 13, 1995 were randomly selected and prescriptions dispensed on those days becamepart of the study sample, as did the pharmacists who submitted these prescriptions to DPIN. The data source for prescriptions dispensed for Indian Affairs and Social Services recipients was prescriptions claims submitted by pharmacies to the individual drug benefit plans for reimbursement. Pharmacare pharmacy records were reviewed to collect data on the drug name, quantity and days supply. Data access restrictions precluded the abstraction of Pharmacare prescriptions not submitted to DPIN, so the number of Pharmacare prescriptions dispensed was estimated.

**Results:** Of 2196 Indian Affairs and 1879 Social Services prescriptions claims abstracted from a sample of 58 Manitoba pharmacies, a corresponding prescription was found in the DPIN database for 79.7% (95% CI: 78.0 - 81.4%) of Indian Affairs claims, and for 90.1% (95% CI: 88.8 - 91.4%) of Social Services claims. These proportions were significantly lower ($p<0.05$) than the estimated proportion of Pharmacare prescriptions submitted to

DPIN (93%, 95% CI: 92.4 - 93.6%). Ninety-two percent of 8012 Pharmacare prescriptions claims matched the original prescription with respect to drug name, quantity and number of days supply.

The likelihood of high submission of Social Services or Indian Affairs prescriptions to DPIN ($\geq$ 60%) was almost non-existent in pharmacists working in rural independent pharmacies. High submission of Social Services prescriptions was 4 times more likely in pharmacists with previous hospital experience and 22 times more likely in pharmacists who believed that submission of all prescriptions was mandatory. In addition, high submission of Indian Affairs was 1.3 times greater in pharmacists who believed that drug utilization review was important and who thought that DPIN was user friendly.

**Conclusion:** The validity and reliability of the DPIN prescription database for the mandatory submission of Pharmacare prescriptions is comparable to other established prescription databases. In addition, the DPIN database has equal validity in describing prescriptions dispensed for social assistance recipients. However, the DPIN database does not completely describe prescriptions dispensed for treaty status Indians. These findings have implications for the use of the DPIN prescription database in pharmacoepidemiologic studies and for its everyday use by pharmacists for prospective drug utilization review. Both of these consequences impact on the public health of Manitobans, especially treaty status Indians. Drug benefit plan administrators, pharmacy licensing bodies and pharmacy educators have a public responsibility to examine the factors found to be associated with DPIN prescription submission in order to improve the quality of the DPIN database.

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# Chapter One.

## Introduction

Five to thirty percent of hospital admissions are for drug-related problems.[1,2] It is estimated that 80 % of these are preventable, averting unnecessary physician visits, emergency room use or hospitalization.[2] Pharmacoepidemiology, the study of drug use in the population, has become an important tool for detecting drug-related problems in the population and in recommending policy actions for improved health outcomes.[3] However, in the absence of easily accessible databases, pharmacoepidemiologic studies are time-consuming and labour intensive to conduct, and are unlikely to provide timely information regarding drug use in the population.[4] Automated prescription claims databases, which provide detailed prescription data for large populations and can be linked to medical services and hospital discharge databases to obtain information on health outcomes, overcome these obstacles.[5] Examples of these types of databases include the US Medicaid, and Canadian RAMQ and Saskatchewan prescription claims databases.[6] The Drug Programs Information Network (DPIN), is a newly established, electronic, on-line, point-of-sale prescription claims database in Manitoba, linking all pharmacies in the province as of July 1994. The DPIN system was implemented with the aims of facilitating drug insurance plan reimbursement of prescriptions, enhancing pharmacist detection of drug-related problems by providing computer access to complete prescriptions records and establishing a province-wide prescription database.[7]

In order to determine the validity of the DPIN database in describing prescriptions dispensed in Manitoba, an assessment of the completeness and accuracy of prescription data submitted electronically by pharmacists to the DPIN system is required. When the DPIN system was first introduced in Manitoba, it was mandatory to submit to the network all prescriptions reimbursable by the provincial insurer, Manitoba Health (Pharmacare), but voluntary to submit prescriptions reimbursable by the Medical Services Branch of Health Canada (herein referred to as Indian Affairs, the commonly used name of the drug benefits program), Manitoba Family Services (Provincial Social Services) and City of Winnipeg Social Services drug benefit plans.[7] Prescription claims databases, which rely on mandatory submission of prescriptions for reimbursement purposes, have been found to be valid and reliable data sources.[8] However, data from computerized databases, dependent on voluntary entry of data, have been found to be incomplete.[9] The DPIN electronic prescription claims database, which has both a mandatory and voluntary component, may under-represent those populations for which submission of prescription data is voluntary. Those populations include treaty status Indians and social assistance groups. A further implication of voluntary prescription submission is that it may result in incomplete prescription records for individuals who visit multiple pharmacies. For treaty status Indians and social assistance recipients, who already have higher morbidity and mortality rates than the general Canadian population, this may mean an increased risk of drug-related problems that could otherwise have been detected by pharmacists.[10-14]

Therefore, the purpose of this study was to assess the completeness and accuracy of the DPIN electronic prescription data for prescriptions dispensed for Indian Affairs, Provincial Social Services, City of Winnipeg Social Services and Pharmacare drug benefit recipients. The validity of the DPIN electronic database in describing prescriptions dispensed in Manitoba can then be ascertained. As the completeness of the DPIN database is dependent on pharmacist participation, a secondary component of the study was to assess factors which influence pharmacist submission of prescriptions to the database. These factors may also predict pharmacist use of the DPIN system in optimizing drug therapy.

### 1.1 Research Objectives

The primary objective of this research was to assess the agreement between DPIN electronic prescription data and prescriptions dispensed for Pharmacare, Indian Affairs, and Social Services drug benefit recipients. This was a comparison of the mandatory submission of Pharmacare prescriptions, and the voluntary submission of Indian Affairs and Social Services prescriptions.

A secondary objective was to determine factors associated with submission of prescription data to the DPIN database. These factors, which included pharmacist characteristics and the pharmacy environment, have been identified in the literature as being associated with pharmacist professional behaviour. The set of pharmacist characteristics included gender,

year of licensure, level of education, work experience, and perceptions of the DPIN system. The pharmacy environment was characterized by type of pharmacy ownership (independent versus chain), prescription workload and the sociodemographics of the pharmacy clientele.

## 1.2 Rationale for Conducting Research

The future of pharmacoepidemiologic research is largely dependent on the increased use of electronic databases such as the DPIN database, and database validation is an essential component. However, this research study has relevance not only for the population health researcher. Optimal utilization of electronic prescription databases has implications for the pharmacy profession and all policy makers, in the development of policies which promote rational drug use in our society.

# Chapter Two.

## Literature Review

## 2.1 The Validity of Prescription Claims Databases

Most health care databases were developed for administrative purposes. In order to utilize these databases in pharmacoepidemiologic research, their validity must be determined.[4] Establishing the validity of databases involves tests of measurement validity, that is the degree to which the database measures what it is supposed to measure. This is achieved through an assessment of the completeness and accuracy of data contained in the database.[15,16] Completeness of data is defined as the proportion of all exposures or events in the target population that appear in the database. A population-based prescription database should include all prescriptions dispensed for the population served. It is also important to determine whether the database has differential validity, that is, whether it systematically excludes specific populations or specific drugs. For example, the completeness of a prescription database may vary by income level if the introduction of a copayment leads people to obtain their prescriptions at pharmacies not participating in the prescription benefit plan. This situation occurred in the Group Health Cooperative (GHC) prescription database when increases in prescription copayment resulted in client visits to non-GHC pharmacies.[15] Thus, missing persons, or drug exposures, resulting from systematic exclusion, could introduce biases in pharmacoepidemiologic studies.[15,16]

Despite the importance of assessing the data quality of administrative databases, few of the existing prescription databases have been validated.[15] A validation study of the US Medicaid prescription claims database showed that 94% of pharmacy records for 1661

Medicaid recipients were found in the Medicaid database.[8] Various tests of the validity of the GHC of Puget Sound database have found that greater than 95% of postmenopausal women, of the elderly or of persons treated with antidepressants obtained their prescriptions from a GHC pharmacy.[15] In an evaluation of the accuracy of 723 prescription claims for 306 seniors submitted to the Regie de l'Assurance Maladie du Quebec (RAMQ), the drug name and the physician's name on the prescription record matched that of the RAMQ datafile record for 100% and 91% of the prescriptions in the RAMQ database, respectively.[17] These data quality assessments indicate that prescription claims databases can be valid and reliable measures of prescriptions dispensed. Computerized databases dependent on voluntary participation have been found to be less complete. When patient records from a computerized-database of family practitioners in the UK were compared to an established surveillance program, it was found that the recorded rate of influenza was one quarter that of the surveillance program.[9] Therefore, the DPIN prescription database, which relies on mandatory and voluntary submission of prescriptions, may have differential validity for populations in which submission of prescription data is voluntary, or for certain classes of drugs.

## 2.2 Pharmacist Participation in Drug Utilization Review

Although voluntary, Manitoba pharmacists could submit prescriptions reimbursable by the Indian Affairs, Provincial Social services and City of Winnipeg Social Services drug benefit plans to the DPIN system for drug utilization review purposes. Drug utilization

review (DUR) is a systematic process which captures aggregate drug use data in a specific population and analyzes the appropriateness of drug use according to established practices. It can be carried out on archival data, in which case it is referred to as retrospective DUR, or at the time a drug is dispensed, known as prospective DUR.[18] The appeal of prospective DUR is its preventive potential, and the advantage of retrospective review is its ability to identify prescribing patterns.[19] As such, DUR has been proposed as a tool for public health practice.[6] Drug utilization reviews utilizing prescription claims databases have identified associations between drug use and health outcomes. For example, an association between the use of psychotropics and an increased risk of hip fracture was shown utilizing Medicaid prescription claims data.[20] Other well known examples are the studies of asthma mortality and the use of β2-agonists using the Saskatchewan prescription claims database, which were conducted to verify findings from earlier case-control studies.[21] In fact, the Saskatchewan prescription claims database has been utilized by the province's Drug Utilization Committee to address drug usage issues, subsequent to which numerous reports on the appropriate use of drugs have been circulated to health professionals.[22] Even so, the potential of drug utilization review has not yet been realized.[19] Traditionally, DUR has emphasized errors of commission,[23] yet patient noncompliance with drug therapy is one of the common preventable drug-related problems leading to hospitalization.[1]

The pharmacist, as a drug expert, is the ideal health professional to be engaged in these DUR activities, but to what extent have pharmacists been involved in DUR? By

preventing, identifying and solving drug-related problems of individuals, all pharmacists are involved in DUR at the micro level.[24] Pharmacist participation at the macro level through formal DUR programs, has been concentrated in hospital settings where there is easier access to patient information and comprehensive medications records.[25] However, population drug use is better described by prescriptions dispensed by community pharmacists.[6] It has been said that community pharmacists are the most highly accessible health professionals, but the practice of visiting multiple pharmacies by some individuals prevents pharmacists from maintaining complete prescription histories.[24] In a survey of US pharmacist opinion on implementing mandatory prospective DUR in a non-networked pharmacy setting, a majority of pharmacists indicated that lack of information on medications obtained by individuals from other pharmacies would hinder their compliance with the legislation.[26] The electronic, on-line, point-of-sale DPIN prescription network in Manitoba has the capability to reduce this barrier by providing pharmacist access to complete prescription histories at the time a prescription is dispensed. As a definite link has been found between the effectiveness of the pharmacist as caregivers and access to patient medication histories,[27] the DPIN system has the potential to enhance the role of Manitoba pharmacists in preventing, identifying and solving drug-related problems for individuals.

Although community pharmacist participation in some DUR programs has been successful, acceptance of DUR as a professional responsibility has not been universal. Medicaid drug insurance plans in the United States have developed DUR programs which

evaluate prescription claims on an ongoing basis to identify inappropriate drug use. In a survey of pharmacists, 90% indicated that they followed up on the Medicaid DUR information provided. Eighty percent of these pharmacists stated they would likely make drug therapy recommendations in other similar patients.[28] However, in another survey, only 56% of pharmacists indicated that mandatory prospective DUR, where the pharmacist is required to screen for drug-related problems before dispensing medications, is necessary for professional survival.[29] In Manitoba, the submission of prescriptions for treaty status Indians and social assistance recipients to DPIN will eventually become mandatory, improving the completeness of the prescription database for future pharmacoepidemiologic studies.[7] However, unlike pharmacists in the United States who are required to prospectively review drug therapy for certain clients, Manitoba pharmacists, for most part, are not required to utilize the prospective drug utilization capabilities of DPIN.[30] Recently, a well-publicized incident involving a drug addict, who was able to obtain duplicate prescriptions despite the existence of DPIN, has resulted in the Manitoba Pharmaceutical Association mandating that pharmacists intervene when flagged with a DPIN drug therapy duplication code.[31,32] Therefore, identification of factors which predict the extent of pharmacist involvement in DUR will further enhance the prospective capabilities of the DPIN system.

## 2.3 Factors Which Predict Pharmacist Professional Behaviour

Many studies of pharmacist professional behaviour have been conducted to identify pharmacist characteristics or situational variables which predict attributes of their professional behaviour. Multivariate studies have assessed demographic variables such as year of pharmacist licensure, level of education and pharmacy practice setting. This is consistent with one of the theories of professional socialization which states that attitudes, values and beliefs which form one's professional identity are acquired during the formal training period and later in the work setting.[33] Studies have shown that community pharmacists who provided services such as drug therapy monitoring and health education, tended to hold advanced degrees in pharmacy.[34] In a survey of community pharmacists in Quebec, recently licensed pharmacists reported a higher degree of patient counselling.[35] Moreover, community pharmacists were more likely than hospital pharmacists to think that patient counselling was important, but hospital pharmacists were more likely to see their role as drug consultants to physicians.[36] Because hospital pharmacists are generally more exposed to DUR in the hospital setting, they may more likely view DUR as important.[25]

The evaluation of pharmacist attitudes towards a professional service is important because pharmacist attitudes have been shown to affect their delivery of that service. In a study of rural pharmacists, those with a positive orientation towards patient counselling, as measured by a specifically designed scale, were observed to be engaged in the activity

to a greater extent, than those with a less positive view.[37] In addition, males and females may differ in their professional orientations. Historically women have been attracted to nurturing professions such as nursing, where they have been able to work with the public and help others.[38] Although both male and female pharmacists have placed the same importance on patient counselling when surveyed, women have reported more patient counselling than men.[35,36]

Situational variables which affect pharmacist behaviour encompass the pharmacy environment in which they work. Workload factors such as prescription volume and the staffing pattern with respect to the pharmacist and technician ratio, have been found to be negatively related to the reported frequency of patient counselling.[35] Pharmacist participation in mandatory prospective DUR has been found to be time-consuming, and pharmacy managers in the United States have reported the need to hire additional staff in order to comply with the legislation.[39] The type of pharmacy may also have an effect due to different work environments. Pharmacists providing services such as patient monitoring have tended to work in independent pharmacies and less counselling has been observed in chain stores than in independent pharmacies.[34] Even after controlling for the gender of the pharmacist and pharmacist perception of their professional role, pharmacists working in independent stores reported more counselling activities.[35] It has been said that large chain owners might discourage counselling if they felt that it compromised profits (eg. by taking up too much time), while independent owners might rationalize a smaller profit in favour of realizing what they see as their professional responsibilities.[38] Other

internal policies and procedures may guide pharmacist behaviour. The process of prescription transfer by the pharmacist, rather than by the pharmacy technician, has been found to be a significant predictor for the occurrence of patient counselling, independent of pharmacist attitudes and pharmacy workload.[40]

The pharmacy environment also includes the sociodemographics of the neighbourhood in which the pharmacy is located, as studies indicate that the majority of persons patronage pharmacies close to their place of residence.[27,41] In some pharmacies, the provision of services by pharmacists has been found to correlate with their perception of public demand for the service.[42] Thus, focus group discussions which show that pharmacists perceive a higher demand for drug use monitoring in lower socioeconomic groups, suggest that pharmacists would provide these services to low income clients.[43] In fact, household surveys have shown that pharmacists were more likely to counsel persons with lower education and higher drug expenditures.[44] In addition, pharmacies in low-income areas have piloted programs such as medication record cards and health education.[45] However, other studies have shown that pharmacist drug monitoring activities were less satisfactory in low-income areas.[27] Differences in pharmacist practice have also been identified between rural and urban pharmacies, with rural pharmacists providing more information to their clients.[46]

## 2.4 Summary

The potential exists for the DPIN prescription database to under-represent social assistance recipients and treaty status Indians, as submission of prescriptions to DPIN for these individuals is not mandatory. In addition, pharmacist acceptance of DUR as a professional responsibility has not been universal. The extent of pharmacist involvement in other professional activities has been predicted by the female gender, recent graduation, post-graduate education, hospital work experience and positive orientation towards the activity. Situational variables such as pharmacy location in a rural setting, independent pharmacy ownership and low prescription workload have also been positively associated with the provision of professional services. Some pharmacies have targeted their professional services at low income families, while other pharmacies have provided less satisfactory services to this population. Each of these factors may contribute to differences in the completeness and accuracy of prescription data in the DPIN database.

# Chapter Three.

## Conceptual Framework

Although many studies have been conducted to determine predictors of pharmacist professional behaviour, few have examined the relationship between pharmacist variables and participation in DUR programs. Therefore, a conceptual framework (see Figure 1) was proposed in this thesis to describe how pharmacists submit prescriptions to the DPIN system. The first objective of this research was to assess the completeness of prescriptions submitted under the mandatory and voluntary components of the DPIN system. In contrast to previous studies which have relied on pharmacist self-reports to measure professional practice, a strength of the methodology in this study is the use of an objective measure of pharmacist participation in a DUR program, indicated by the proportion of prescriptions voluntary submitted to the DPIN system. A secondary component of this research was to measure pharmacist and pharmacy factors which have been associated with pharmacist professional practice. These factors are shown in the conceptual framework as potential influencers of pharmacist participation in the DPIN system.

In this conceptual model, voluntary submission of prescriptions to DPIN is seen as the outcome of a pharmacist with a set of attributes and perceptions, working in a pharmacy environment. The pharmacy environment includes factors integral to the structure of the pharmacy such as staffing and policies and procedures, as well as external influences such as the characteristics of clients who visit the pharmacy. The interaction between the pharmacist and the pharmacy environment is important because a pharmacist's professional behaviour, acquired during his/her years of pharmacy education and training,

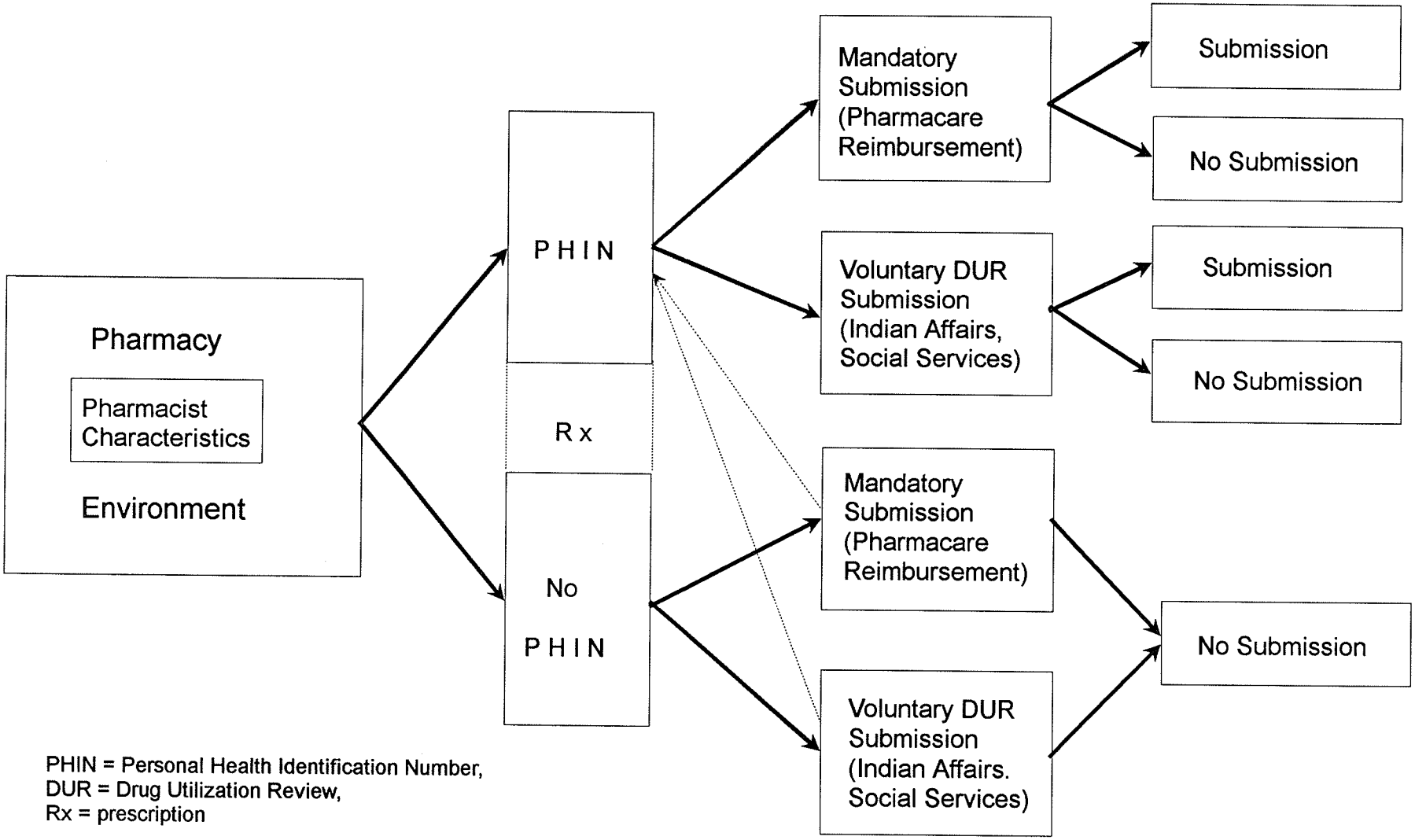



Figure 1. Conceptual Model for the Submission of Prescriptions to DPIN

can be modified by his work environment. This has been shown in multivariate studies of pharmacist professional practice, where relationships have been revealed between pharmacist behaviour and pharmacy structural factors, independent of pharmacist characteristics or attitudes.[34,35,40] In the context of pharmacist voluntary submission of prescriptions to DPIN, this relationship can take on several forms. A pharmacist may have positive perceptions of the DPIN system, perhaps a strong belief in the value of DUR, but an unfavourable work environment, characterized by a heavy prescription workload or clients who frequently do not carry their Personal Health Identification Numbers (PHIN's) which are needed to submit prescriptions to DPIN, may hinder the submission of prescriptions to DPIN. On the other hand, a pharmacist may work in a favourable work environment, but may not see the value of submitting prescriptions to DPIN, if submission is not for reimbursement reasons. Alternatively, regardless of a pharmacist's characteristics or the pharmacy environment, a pharmacist may submit prescriptions to DPIN because of existing polices and procedures which require her/him to do so. This last point underlies the importance of ascertaining pharmacist interpretations of DPIN submission requirements. Lastly, the role of the pharmacy technician in submitting prescriptions to DPIN should not be ignored. Pharmacy technicians work under the supervision of pharmacists. Their behaviour may be influenced by either the staff pharmacist with whom they work or by policies and procedures set up by the pharmacist manager. It is therefore, worthwhile to consider the staff pharmacist and pharmacy manager separately, as different factors may be operative for each.

This conceptual model was developed with the intent of identifying factors associated with pharmacist submission of prescriptions to DPIN. To the extent that these factors are modifiable, outcomes of tests of this model can be used to identify strategies to improve the submission of prescriptions and the completeness of the DPIN database. However, tests of the model can only identify factors which are associated with the submission of prescriptions to DPIN; they do not provide evidence of a causal relationship between pharmacist and pharmacy factors, and pharmacist professional behaviour. In addition, pharmacist submission of prescriptions to DPIN does not reflect pharmacist use of DPIN information for prospective drug utilization review.

# Chapter Four.

## Proposed Hypotheses

Four hypotheses were proposed for study. The **primary hypothesis** was that the proportion of Indian Affairs and Social Services prescriptions voluntarily submitted to DPIN will be lower than the proportion of Pharmacare prescriptions submitted for reimbursement purposes. This hypothesis addressed the issue of the completeness of the DPIN database in describing prescriptions dispensed in Manitoba.

Based on the literature review, three additional hypotheses were put forward to study the relationship between pharmacist voluntary submission of prescriptions to DPIN, and pharmacy and pharmacists factors. These hypotheses were centred on the submission of non-Pharmacare prescriptions to DPIN. **Hypothesis II** was that the proportion of Indian Affairs and Social Services prescriptions submitted to DPIN will be higher in pharmacies located in neighbourhoods whose residents are predominantly Pharmacare recipients, than in pharmacies located in neighbourhoods where a significant proportion of treaty status Indians and social assistance recipients reside. In Hypothesis II, characteristics of pharmacy neighbourhoods were proxy measures for the number of clients who present with Pharmacare, Indian Affairs and Social Services eligible prescriptions, as the majority of people visit pharmacies close to their place of residence.[27,41] This hypothesis was proposed, in part, because of the potential difficulty in obtaining PHIN numbers from treaty status Indians and social assistance recipients who are already required to present identification numbers for the Indian Affairs and Social Services drug benefit plans.

**Hypothesis III**, which addressed the pharmacy environment, was that rural pharmacies, independent pharmacies or pharmacies with low prescription workloads submit a higher proportion of Indian Affairs and Social Services prescriptions to DPIN than their urban, chain pharmacy or high prescription volume pharmacy counterparts.

The final hypothesis, **Hypothesis IV**, was that the following pharmacist characteristics are associated with a greater proportion of Indian Affairs and Social Services prescriptions submitted to the DPIN system: female gender, recent graduation from a school of pharmacy, possession of a postgraduate degree, previous work experience in a hospital setting, positive perceptions of the DPIN system, and belief that submission of all prescriptions to DPIN is mandatory.

# Chapter Five.

## Research Methods

## 5.1 Study Design

This quasi-experimental study assessed the agreement between DPIN electronic prescription data and prescriptions dispensed for Pharmacare clients, and the agreement between DPIN data and prescriptions dispensed for Indian Affairs and Social services clients. The study design was considered to be quasi-experimental because it was a comparison of prescriptions submitted under two conditions: mandatory submission of Pharmacare prescriptions and voluntary submission of Indian Affairs and Social Services. Prescription records for Pharmacare, Indian Affairs and Social Services drug benefit recipients were collected from two data sources. A retrospective review of prescription records kept in Manitoba pharmacies was conducted to collect data on prescriptions dispensed for Pharmacare recipients. A retrospective review of prescription claims submitted to Medical Services Branch Indian Affairs), Manitoba Family Services and City of Winnipeg Social Services was undertaken to collect data on prescriptions dispensed for Indian Affairs and Social Services recipients. Electronic prescription data submitted to DPIN were assessed for agreement with information contained on prescriptions records and claims obtained from the review. Data on pharmacist and pharmacy factors were collected by a self-administered questionnaire mailed to pharmacists who dispensed the prescriptions reviewed. Survey responses were linked to the proportion of prescriptions submitted to the DPIN system by each pharmacy.

## 5.2 Source of Data

The registry of DPIN-linked pharmacies was consulted to determine the location and type of the 252 pharmacies in Manitoba. The location and type of pharmacy was linked to Census 1991 data on average household income and Manitoba Health Services registry data on place of residence of treaty status Indians to identify representative Manitoba pharmacies for prescription review. Prescriptions dispensed for Pharmacare recipients in sampled pharmacies on selected days in March 1995 were physically reviewed for information on the prescription number, drug name and strength, frequency of administration, and the quantity and date dispensed.The number of days supply was calculated by dividing the quantity dispensed by the frequency of administration. Data on prescriptions dispensed for Indian Affairs and Social services recipients were obtained from prescription claims submitted by pharmacies to the individual drug benefit programs. The prescription number, drug name and strength, quantity and date dispensed was extracted from the prescription claims data. The American Hospital Drug Formulary System was utilized to describe classes of drugs for prescriptions not submitted to DPIN.

Data on the characteristics of the pharmacist and the pharmacy was obtained from a survey of pharmacists and managers employed in the sampled pharmacies. The Manitoba Pharmaceutical Association's pharmacist registry was consulted to obtain information on the demographics of community pharmacists in Manitoba.

## 5.3 Study Population

**Sampling Strategy:** The sampling frame for the study was the 1994 Manitoba Health registry of DPIN-linked pharmacies. This represented 100% of the 252 pharmacies in Manitoba. Five pharmacies which had closed their operations in 1995 and seven pharmacies which serviced a unique population, such as personal care homes and persons receiving home intravenous therapy, were excluded. A two-stage sampling design was employed to select the sample of prescriptions to be reviewed and the sample of pharmacists to be surveyed. In the first stage, pharmacies were randomly selected from defined strata, as described in the next section. The second stage involved the process of selecting a sample of Pharmacare, Indian Affairs and Social Services prescriptions dispensed in each pharmacy.

**Sample Design:** Manitoba pharmacies were stratified by the sociodemographics of the neighbourhood in which they were located, as a proxy measure of their clientele. The clientele of interest were persons receiving Indian Affairs, Social Services and Pharmacare prescriptions, or in the absence of this data, persons who were eligible for prescription benefits from these drug benefit plans. This included treaty status Indians, who were eligible for prescription benefits from the Indian Affairs drug benefit plan,[47] and persons eligible for social assistance and accompanying Social Services prescription benefits.[48,49] Persons who were not eligible for either Indian Affairs or Social Services prescription benefits were eligible for coverage under the Pharmacare drug benefit program.[7]

Stratification of pharmacies by a proxy measure of their clientele was undertaken under the premise that the pharmacy neighbourhood would be reflective of the dominant pharmacy clientele, which would vary from pharmacy to pharmacy. For example, pharmacies located close to Indian communities or in neighbourhoods with inexpensive housing would likely provide services to a significant population of treaty status Indians and social assistance recipients, respectively. Therefore, pharmacies were stratified by the proportion of treaty status Indians and persons with low average neighbourhood income residing in the pharmacy neighbourhood, as a proxy measure for the proportion of these individuals who present to the pharmacy with prescriptions.

Pharmacy neighbourhood used in the context of this study, refers to a cluster of residences surrounding a pharmacy.[50] The Canadian postal code was used to describe the geographic location of a neighbourhood. In urban areas, the 6-character postal code defines block-faces (one side of a city street between consecutive intersections with other streets), servicing about 30 households. In rural areas, the 6-character postal code denotes an entire area serviced by a rural post office, with an average population of 1,100 persons.[51] In urban settings, the postal code of a pharmacy may be more similar to the concept of a pharmacy neighbourhood in terms of its size, but rural areas are likely serviced by a single pharmacy, in close proximity to the post office.

The aggregation of 6-character postal code areas into areas described by the first 3 characters of the postal code, known as Forward Sortation Areas (FSA's), was utilized as

a convenient method for identifying the sociodemographics of pharmacy neighbourhoods. The 6-character postal codes of Manitobans listed in the Manitoba Health Services registry and 1991 Census were grouped in this manner. From municipal code information in the Manitoba Health Services registry, the number of treaty status Indians residing in a FSA was determined by identifying individuals with a municipal code beginning with the letter 'A'. The proportion of non-treaty status Indians residing in each FSA with an average neighbourhood income of < $30,000 per year, was derived from Census 1991 data. An average neighbourhood income of < $30,000 was utilized as a marker for persons receiving Social Services prescriptions who would normally receive about $15,000 per year in social assistance benefits.[48,49] The FSA's were then grouped, as defined below, to form three strata, characterized by the proportion of persons with treaty Indian status, with low neighbourhood income, and with neither of these sociodemographics residing in these strata. The strata, themselves, were not pharmacy neighbourhoods, but were composed of pharmacy neighbourhoods.

The *Indian Affairs recipient neighbourhoods strata* contained Forward Sortation Areas (FSA's) where > 10% of persons residing were of treaty status Indian origin, as indicated by a municipal code beginning with the letter 'A' in the Manitoba Health Services registry.

The *Social Services recipient neighbourhoods strata* was composed of FSA's in which > 20% of non-treaty status Indians lived in neighbourhoods with average household incomes of < $30,000 per year, as determined from Census 1991 income quintiles. If this criterion was met and the FSA contained > 10% treaty status Indians, the FSA was defined as an Indian Affairs neighbourhood.

The *Pharmacare recipient neighbourhoods strata* was comprised of the FSA's which did not fall into either of these categories.

DPIN-linked pharmacies were placed into the 3 neighbourhood strata according to the FSA of the pharmacy. The neighbourhood strata were further subdivided by the geographic location of the pharmacy as follows: [52]

*Rural Pharmacies* were pharmacies located in an area where the second digit of the postal code was 0, or in a municipality where the population was < 10,000.

*Urban Pharmacies* were pharmacies located in areas where the second digit of the postal code was not 0, or in a municipality where the population was ≥ 10,000.

Finally, pharmacies were stratified by type of pharmacy ownership as follows:

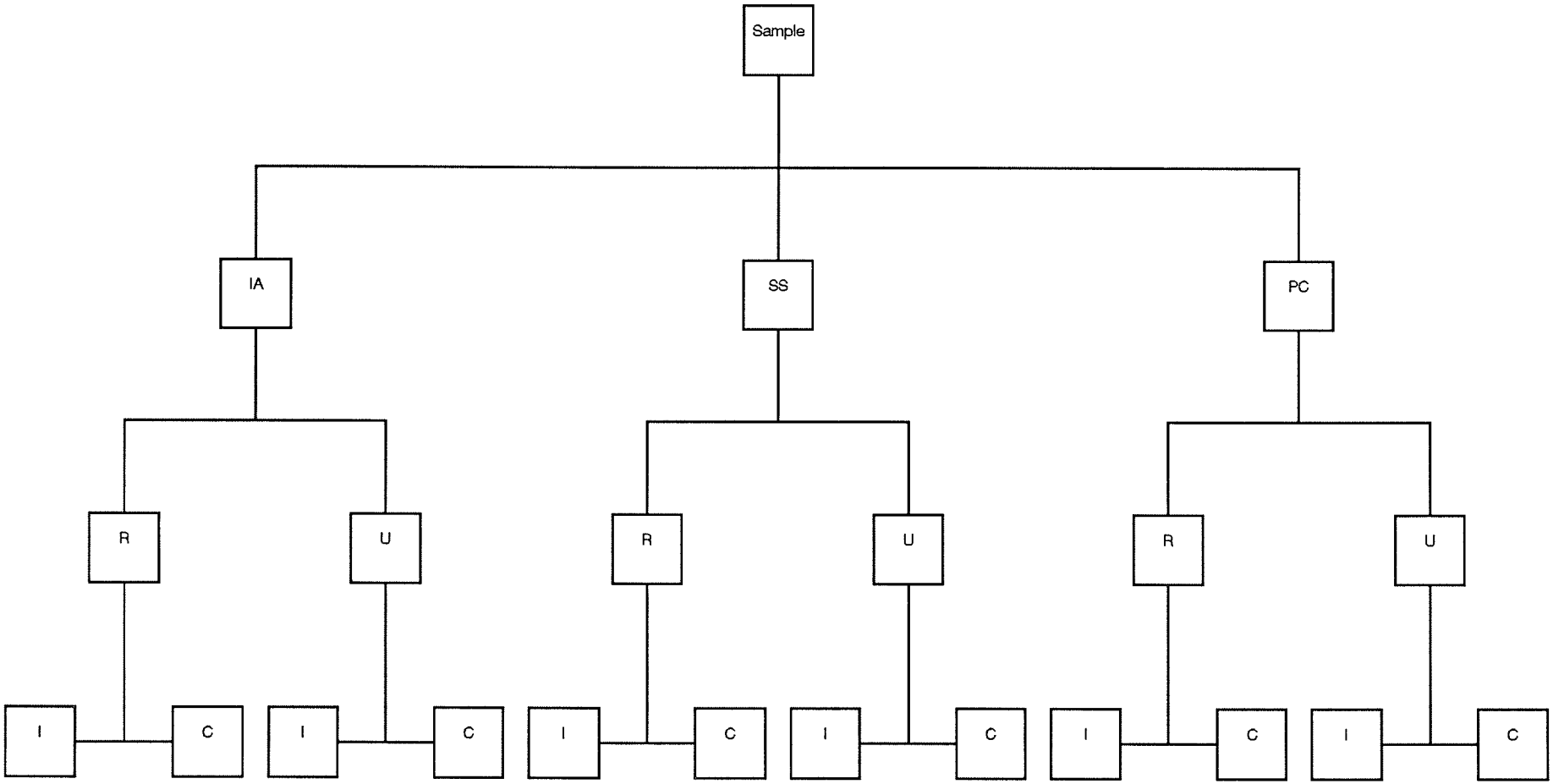
*Chain Pharmacies* were pharmacies which were members of the Canadian Association of Chain Drugstores.[53]

*Independent Pharmacies* were pharmacies which were not members of the Canadian Association of Chain Drugstores.

*Hospital-based Pharmacies*, defined as retail pharmacies located in hospitals, were placed in a separate strata because they potentially serviced both rural and urban neighbourhoods, and because their clientele may not be reflective of the neighbourhoods in which they were located.

A schematic representation of the development of the pharmacy strata is shown in Figure 2 and the FSA's allocated to each strata are shown in Appendix I. The final sampling matrix was composed of nine neighbourhood-pharmacy type strata and a hospital-based pharmacy strata, as there were two few chain pharmacies located in rural areas to create separate strata for rural-chain pharmacies. Five chain pharmacies located in rural areas were grouped with chain pharmacies located in urban areas. Pharmacies which dispensed fewer than 2 standard deviations of the mean number of prescriptions dispensed in the

# Figure 2. Schematic for the Development of Pharmacy Strata




IA=Indian Affairs Neighbourhood, SA=Social Services Neighbourhood, PC=Pharmacare Neighbourhood, R=Rural Pharmacy, U=Urban Pharmacy, C=Chain Pharmacy, I=Independent Pharmacy

strata where they were placed, were excluded for 2 reasons: 1) the proportion of Pharmacare prescriptions submitted based on a small number of Pharmacare prescriptions would be a less precise estimate and 2) the cost of travel to a pharmacy to review only a small number of Pharmacare prescriptions could not be justified. Twelve pharmacies were thus excluded, leaving 228 pharmacies in the study population. (see Appendix I)

Pharmacies were randomly selected, using a random numbers table, within each of the strata in the sampling matrix, with the aim of achieving six pharmacies in each strata, based on sample size calculations. Thus, strata which contained comparatively few pharmacies were over-sampled. To obtain a representative sample of Indian Affairs, Social Services and Pharmacare prescriptions dispensed in each pharmacy, two weekdays during the week of March 13, 1995 were randomly selected with the aid of a random numbers table. Prescriptions dispensed on the sampled days became part of the study sample, as did the pharmacists who had submitted prescriptions to DPIN on those days.

**Sample Size and Statistical Power**: Based on a specified probability of a Type 1 error of 0.05 (one-sided) and a Type II error of 0.05 (Power=95%), the sample size of prescriptions required to detect a 10% difference in the proportion of prescriptions submitted to DPIN among the drug insurer groups was determined as 122 prescriptions per drug insurer group.(see Appendix II) A one-sided test was selected because it was hypothesized that voluntary prescription submission to DPIN would be lower than mandatory submission. Although a total sample of 6 pharmacies was sufficient to provide 122 prescriptions per drug insurer group, 18 pharmacies in each of the 3 pharmacy neighbourhood strata (or a total of 54 pharmacies) were required to provide 289 non-

Pharmacare prescriptions to test Hypothesis No. II, with a probability of Type I error of 0.05. As each neighbourhood strata had been further subdivided into 3 pharmacy type groups of 6 pharmacies, 18 pharmacies per pharmacy type was sufficient to test Hypothesis No. III. No sample size calculations were performed for Hypothesis IV, as this was an exploratory hypothesis.

### 5.4 Study Variables

**Descriptive variables:** The validity and reliability of the DPIN electronic database in describing prescriptions dispensed in Manitoba was evaluated through an assessment of the completeness and accuracy of DPIN prescription data.[15] The completeness of the database was described as the overall proportion of prescriptions submitted to DPIN, and as the proportions of prescriptions submitted for Pharmacare, Indian Affairs and Social services drug benefit recipient groups. A comparison of the proportions of prescriptions dispensed among these three groups enabled the assessment of bias, or differential validity, in prescription submission for different Manitoba populations.[54,55] The proportion of prescriptions submitted was compared by drug class to assess bias, or differential validity, in prescription submission for different types of drugs.

The accuracy of prescription data was evaluated for Pharmacare records in the DPIN database by assessing the agreement between DPIN and original prescription data with

respect to the drug name, directions for use and quantity. The percent agreement was determined for the these data variables, rather than the kappa statistic, because of the infinite number of drug categories which are possible.[56] Potential bias in the accuracy of all prescriptions in DPIN could not be evaluated because original prescription records were not reviewed for Indian Affairs and Social Services recipients. Thus, only the reliability of Pharmacare prescription data in DPIN, that is the measurement of random error resulting from pharmacist mis-interpretation of Pharmacare prescriptions or computer keystroke errors, could be assessed.[54,55] Moreover, the reliability of DPIN Pharmacare prescription data was reported as the reliability of all prescription data in DPIN, as there was no reason to believe that random error during prescription interpretation and computer entry would vary by drug benefit program,

**Dependent variable:** The proportion of Indian Affairs and Social Services prescriptions submitted to DPIN was the dependent variable.(see Table 1)

**Independent variables:** Independent variables were drawn from the domains of pharmacist characteristics and the pharmacy environment.(see Table 1) The pharmacy environment included the prescription workload, the type of pharmacy (independent, chain or hospital-based pharmacy), and the sociodemographics of the pharmacy neighbourhood (Indian Affairs, Social Services, Pharmacare). The prescription workload was determined, using the equation derived by Laurier et al.[35]

$$\text{Prescription workload per pharmacist hour} = \frac{\text{No.of prescriptions dispensed per hour}}{\text{No. of pharmacy staff}}$$

$$= \frac{\text{No. of prescriptions dispensed per day x pharmacy hours of operation}}{[\text{No. of pharmacists} + 0.6(\text{No. of technicians})]\text{working per day}}$$

An average of the workload for each of the two study days was taken. Data on the location of the pharmacy was obtained to further describe the pharmacy environment.

Table 1. Study Variables Used to Test Hypothesis II, III and IV

| HYPOTHESIS | INDEPENDENT VARIABLE | INDEPENDENT VARIABLE TYPE | DEPENDENT VARIABLE |
|---|---|---|---|
| II. Pharmacy Environment | Pharmacy Neighbourhood | Categorical:Indian Affairs Social Services and Pharmacare recipient | % of IA and SS Rx Submitted to DPIN by Neighbourhood |
| III. Pharmacy Environment | Prescription Workload (Rx per hr/no. of staff) | Continuous | % of IA and SS Rx Submitted to DPIN by Pharmacy |
| | Type of Pharmacy | Categorical: Independent Rural, Independent Urban, Chain, Hospital-based | % of IA and SS Rx Submitted to DPIN by Pharmacy |
| IV. Pharmacist Characteristics per Pharmacy | Gender | Dichotomous: Female, Male | % of IA and SS Rx Submitted to DPIN by Pharmacy |
| | Year of Licensure | Continuous or dichotomous: Yes if licensed after 1980 No if not | % of IA and SS Rx Submitted to DPIN by Pharmacy |
| | Postgraduate Education | Dichotomous: Yes, No | % of IA and SS Rx Submitted to DPIN by Pharmacy |
| | Work Experience in a Hospital Setting | Dichotomous: Yes, No or continuous as number of years worked | % of IA and SS Rx Submitted to DPIN by Pharmacy |
| | Perceptions of DPIN Use | Total Score of Responses to Ordinal Scale : High Score=Positive Perception | % of IA and SS Rx Submitted to DPIN by Pharmacy |

IA = Indian Affairs, SS = Social Services, Rx = prescription

Pharmacist characteristics included gender, year of first licensure, level of postgraduate education, work experience in a hospital pharmacy setting and perceptions of the DPIN program. Year of first licensure and the number of years of hospital experience were analyzed as both continuous and dichotomous variables. The dichotomous form of the year of first licensure was expressed as licensure before or after the 1980's, based on major changes in pharmacy under-graduate curriculums, with the introduction of clinically-oriented courses in the 1980's.[57] Pharmacist perceptions of DPIN were expressed as a score derived from pharmacist responses to 21 survey questions regarding the DPIN system, each scored on a 5-point ordinal scale (agree to disagree).

### 5.5 Instrumentation

Three Manitoba Health, Insured Benefits Branch staff reviewed Pharmacare prescription records in sampled Manitoba pharmacies and extracted specific data fields for the researcher. A pilot prescription review was conducted to determine the logistics of the review. Similarly, specific data fields for Indian Affairs and Social services prescription claims were made available by the individual drug benefit program or extracted from the claims data by the researcher. The prescription record and claims data were linked to the DPIN electronic data by the prescription number to determine the presence or absence of a prescription in the database, and to determine the accuracy of data elements such as drug name.

During the review of Pharmacare prescriptions in individual pharmacies, Manitoba Health auditors obtained information on pharmacy-related variables such as the location of the pharmacy, the hours of pharmacy operation, the total number of prescriptions dispensed, and the number of technicians working on the sampled days. (see Appendix III). Manitoba Health also provided data on the number of pharmacists and pharmacist managers who had submitted prescriptions to DPIN on the days sampled. Data on pharmacist-related variables were collected by mail survey methods. The construction and implementation of the survey was based on the Total Design Method.[58] The survey contained questions on pharmacist demographics and their perceptions of the DPIN system.

The content of questions on pharmacist perceptions of DPIN was derived from themes which emerged during a pilot interview of a pharmacist regarding the DPIN system.(see Appendix IV) For example, questions regarding the implementation of DPIN, the relevance of DPIN to pharmacy clientele, and the perceived value of pharmacist services in using DPIN were based on interview themes. The response of pharmacists to questions on the DPIN system were quantified by asking them to respond to statements on a 5-point ordinal scale (1=strongly agree, 2=somewhat agree, 3=neither agree nor disagree, 4=somewhat, 5=strongly agree). To minimize social desirability bias, confidentiality was emphasized and efforts were made to present questions in a non-threatening manner. The survey and covering letter were pretested in a group of hospital pharmacists on three occasions. The final form of the survey and covering letter are shown in Appendix V.

Survey packages, containing a survey, covering letter and pre-addressed envelope, were assembled and grouped by study pharmacy, according to the number of pharmacists sampled. Survey packages were then addressed with the pharmacist name and mailed to study pharmacies by Manitoba Health staff, with instructions for the manager to distribute the packages to the respective pharmacists. Surveys themselves, were only labelled with a pharmacy-specific identification number. Survey packages were mailed out on September 18, 1995. Following a 2 week deadline for survey return, a phone-call was placed to pharmacies to remind pharmacists (identifiable only by survey number) to return their surveys. Another reminder phone call was made two weeks later. Surveys addressed to pharmacists no longer employed at sampled pharmacies were retrieved and mailed to the home addresses of these pharmacists by the Manitoba Pharmaceutical Association. A reminder letter was sent to these pharmacists two weeks later. If the pharmacist response rate in a particular pharmacy was < 50% then another copy of the survey was sent to the home addresses of these pharmacists. Demographics of the survey responders were compared to demographics of all pharmacists in Manitoba. Non-responders were characterized by the pharmacy in which they worked.

### 5.6 Data Analysis

The completeness of the DPIN database was described by a point estimate and 95% confidence interval of the proportion of all prescriptions submitted by Manitoba pharmacies. The accuracy of prescription information in the database was reported as the percent agreement between the drug name, days supply and quantity specified on the original prescription and data for the same variables recorded in DPIN.

To test the primary hypothesis, prescriptions reimbursable by the Pharmacare, Indian Affairs and Social services drug benefit programs were grouped separately and the proportion of prescriptions submitted to DPIN for each of the drug insurer groups was compared. The second hypothesis was tested by comparing the proportion of Indian Affairs and Social Services prescriptions submitted to DPIN by all pharmacies located in the Indian Affairs and Social Services recipient neighbourhoods with the proportion of these prescriptions submitted by all pharmacies located in the Pharmacare recipient neighbourhood. For the third hypothesis, pharmacies were grouped by rural or urban location, type of ownership and prescription workload, categorized as high or low, and the proportion of Indian Affairs and Social Services prescriptions submitted to DPIN for the groups compared. All comparisons were made using the Chi-Square test.

The dependent variable for Hypothesis IV was transformed from the proportion of Indian Affairs and Social Services prescriptions submitted into a dichotomous variable of high

or low DPIN submission to facilitate comparison of independent variables at the pharmacist level. Pharmacist characteristics were compared for high and low DPIN submitters, using the Chi-square test for categorical variables and the Student t test for continuous variables. Median scores for the DPIN perception scales were compared between high and low submitters using the Kruskal-Wallis non-parametric test. Prior to these comparisons, the scores for pharmacist responses to positive statements about DPIN were reversed (ie. if a pharmacist strongly agreed with a positive statement, the score would be 5 instead of 1) so that more favourable evaluations of DPIN to be represented by higher scores. The reliability and validity of the DPIN perception scales was also assessed.

Relationships among the dichotomous dependent variable, and pharmacist and pharmacy-related independent variables were tested using correlational and logistic regression analysis. Independent variables which were significantly associated with the submission of Indian Affairs and Social Services prescriptions, were expressed as predictors of pharmacist submission in the form of the Wald's odds ratio. All tests in the analysis were conducted manually or with the aid of the SAS system at the $p=0.05$ level of significance.

## 5.7 Ethical Considerations

To maintain the confidentiality of patient information on prescription records the review of Pharmacare prescription records was conducted by an employee of Manitoba Health and the required data fields, devoid of personal identifiers, were extracted for the researcher. Similarly, the required data fields, devoid of personal identifiers, were extracted from prescription claims data for Medical Services Branch, Manitoba Family Services and City of Winnipeg Social Services recipients. The researcher's access to the DPIN prescription database, for comparison with prescription record and claims data, was limited to the same data fields.

The anonymity and confidentiality of both the pharmacist and the pharmacy were also insured by the survey design. Survey packages were addressed with the pharmacist name and mailed to pharmacies by Manitoba Health staff. The researcher was never provided with the names of the pharmacists surveyed. Surveys returned to the researcher were only identifiable by a pharmacy-specific identification number, assigned to facilitate follow-up on surveys not returned. All study data were maintained within the secure computing environment of the Manitoba Centre for Health Policy and Evaluation, University of Manitoba. Full responsibility for the destruction of prescription and survey data at the conclusion of the research was assumed by the researcher.

The study design was approved by the Access and Confidentiality Committee, Manitoba Health and the Faculty Committee on Use of Human Subjects in Research, Faculty of Medicine, University of Manitoba. Authorization to access prescription data for Medical Services Branch, Manitoba Family Services and City of Winnipeg Social Services recipients was granted by the individual drug benefit programs.

### 5.8 Implementation and Chronology of Fieldwork

The thesis research data was collected over a ten month period from February to November 1995. The pilot interview for the survey was conducted in February 1995 and the survey was developed over a five month period from April to August 1995;it was pretested in April, July and August 1995. Manitoba Family Services prescription claims were abstracted during June to July 1995 and City of Winnipeg Social Services prescription claims were abstracted during September 1995. Both the survey mail-out and the Pharmacare prescription review of 58 pharmacies by three Manitoba Health auditors was conducted from September to November 1995.

# Chapter Six.

## The Completeness and Accuracy of the DPIN Prescription Database

The results of the data analysis are presented in Chapters 6 through 9 under the headings of the hypotheses tested. Chapter 10 concludes the results section with findings from multivariate analysis which address Hypotheses II, III and IV. Descriptive data is also presented on the study variables to provide evidence for the generalizability of findings.

The major findings of this research, namely the validity and reliability of the DPIN database, are found in Chapter 6. The chapter begins with a comparison of the composition of the study and Manitoba population of prescriptions, which is needed to generalize findings. The validity and reliability of the DPIN database is then described in terms of the completeness of the database for all prescriptions dispensed, the results of testing Hypothesis I, and the accuracy of prescription data. The chapter also contains data on the differential validity of DPIN in describing different types of prescriptions. As well, the submission of Indian Affairs and Social Services prescriptions is compared within pharmacies to provide support for the separate analysis of these prescriptions in Hypotheses II, III and IV.

## 6.1 The Number and Type of Prescriptions in the Study Sample

Fifty-eight pharmacies were randomly selected from 228 Manitoba pharmacies stratified by the sociodemographics of the pharmacy neighbourhood, ownership type and location. The number of pharmacies, prescriptions and pharmacists sampled per stratum is described in Figure 3. A total of 2196 Indian Affairs, 1408 Provincial Social Services and 471 Winnipeg Social Services prescription claims were submitted to the respective drug benefit programs by study pharmacies over a 2 day period in the week of March 13, 1995. Over the same period, these pharmacies submitted 8012 Pharmacare prescription claims to DPIN. Therefore, Indian Affairs prescriptions comprised 18.2%, Social Services prescriptions comprised 15.5%, and Pharmacare prescriptions comprised 66.3% of the total number of prescription claims in the study sample.

The composition of the prescription sample was compared to the composition of the total number of prescriptions claims submitted annually by Manitoba pharmacies to the Indian Affairs, Social Services and Pharmacare drug benefit programs.(see Table 2) The proportion of prescription claims in the sample which were Indian Affairs, Social Services or Pharmacare prescriptions, was weighted using the sampling fractions reported in Figure 3, to adjust for the fact that pharmacies were not sampled by an equivalent proportion in each stratum. By study design, pharmacies located in Pharmacare neighbourhoods were under-sampled and those located in Indian Affairs neighbourhoods were over-sampled. The study sample contained a statistically significantly greater proportion of Indian Affairs and Social Services prescription claims, and a significantly lesser proportion of

**Indian Affairs-Rural Independent Strata**
6 out of 12 pharmacies sampled (sf=0.5)
572 PC prescriptions in DPIN*
464 IA prescriptions dispensed
84 PSS prescriptions dispensed
0 CSS prescriptions dispensed
1254 total number of prescriptions**
9 out of 9 pharmacists surveyed
82,328 persons residing in areas

**Indian Affairs-Urban Independent Strata**
6 out of 16 pharmacies sampled (sf=0.375)
394 PC prescriptions in DPIN*
231 IA prescriptions dispensed
223 PSS prescriptions dispensed
102 CSS prescriptions dispensed
1332 total number of prescriptions**
7 out of 9 pharmacists surveyed
62,882 persons residing in areas

**Indian Affairs-Chain Pharmacy Strata**
5 out of 5 pharmacies sampled (sf=1)
829 PC prescriptions in DPIN*
279 IA prescriptions dispensed
155 PSS prescriptions dispensed
92 CSS prescriptions dispensed
1547 total number of prescriptions
11 out of 15 pharmacists surveyed
104,306 persons residing in areas

**Hospital-based Pharmacy Strata**
5 out 5 pharmacies sampled (sf=1)
394 PC prescriptions in DPIN*
258 IA prescriptions dispensed
150 PSS prescriptions dispensed
18 CSS prescriptions dispensed
1235 total number of prescriptions
13 out of 13 pharmacists surveyed

**Social Services-Rural Independent Strata**
6 out of 19 pharmacies sampled (sf=0.316)
603 PC prescriptions in DPIN*
198 IA prescriptions dispensed
81 PSS prescriptions dispensed
2 CSS prescriptions dispensed
980 total number of prescriptions***
10 out of 10 pharmacists surveyed
69,308 persons residing in areas

**Social Services-Urban Independent Strata**
6 out 26 pharmacies sampled (sf=0.231)
759 PC prescriptions in DPIN*
244 IA prescriptions dispensed
204 PSS prescriptions dispensed
60 CSS prescriptions dispensed
1603 total number of prescriptions**
12 out of 12 pharmacists surveyed
226,349 persons residing in areas

**Social Services-Chain Pharmacy Strata**
6 out of 26 pharmacies sampled (sf=0.231)
1574 PC prescriptions in DPIN*
107 IA prescriptions dispensed
147 PSS prescriptions dispensed
113 CSS prescriptions dispensed
2302 total number of prescriptions
21 out of 22 pharmacists surveyed
236,706 persons residing in areas

**Pharmacare-Rural Independent Strata**
6 out of 40 pharmacies sampled (sf=0.15)
748 PC prescriptions in DPIN*
107 IA prescriptions dispensed
87 PSS prescriptions dispensed
0 CSS prescriptions dispensed
1113 total number of prescriptions
9 out of 9 pharmacists surveyed
200,850 persons residing in areas

**Pharmacare-Urban Independent Strata**
6 out of 37 pharmacies sampled (sf=0.162)
656 PC prescriptions in DPIN*
115 IA prescriptions dispensed
147 PSS prescriptions dispensed
56 CSS prescriptions dispensed
1603 total number of prescriptions**
9 out of 9 pharmacists surveyed
432,053 persons residing in areas

**Pharmacare-Chain Pharmacy Strata**
6 out of 42 pharmacies sampled (sf=0.143)
1483 PC prescriptions in DPIN*
193 IA prescriptions dispensed
128 PSS prescriptions dispensed
28 CSS prescriptions dispensed
2166 total number of prescriptions
18 out of 20 pharmacists surveyed
509,710 persons residing in areas

**Figure 3.The Number of Pharmacies, Pharmacists and Prescription Sampled Per Strata**

PC=Pharmacare, IA=Indian Affairs, PSS=Provincial Social Services, CSS=City Social Services, sf=sampling fraction
* data not available for the number of PC prescriptions dispensed, ** total number of prescriptions dispensed imputed from the strata average for 1 pharmacy, as data not available, *** total number of prescriptions equivalent to the sum of IA, SS, PC for 1 pharmacy as strata average less than this value

Pharmacare prescription claims, than did the population. Differences between estimated and actual population proportions were however, within 5 % of each other.

Table 2. The Composition of the Prescription Sample and Prescription Population

| Prescription Type | % and No. of Study Claims (np=58) | Weighted % * & No. of Study Claims (np=228) | Population Estimate (95% CI)** | % and Number of Population Claims (np~250) |
|---|---|---|---|---|
| Indian Affairs | 18.2 (2196) | 14.3 (7002) | 14.2 - 14.4 | 12.8 (4609) p<0.001 |
| Social Services | 15.5 (1879) | 14.2 (6919) | 14.1 - 14.3 | 10.5 (3795) p<0.001 |
| Pharmacare | 66.3 (8012) | 71.5 (34,849) | 71.3 - 71.7 | 76.7 (27,645) p<0.001 |
| Total | 100 (12087) | 100 (48772) | | 100 (36,049) |

np = number of pharmacies

* weighted percentages were calculated using the formula: $P(w) = \Sigma \frac{Nh}{N} (Ph)$, where Nh is the number of prescriptions in the population per stratum, N is the total number of prescriptions in the population, and Ph is the proportion of each type of prescription in each stratum.

** The population estimate is the 95% confidence interval of the weighted percentage, calculated from the standard error as follows:standard error $= \Sigma \left( \frac{Nh}{N}^2 [1-fh] \left[ \frac{Ph \times Qh}{nh-1} \right] \right)^{1/2}$, where fh is the sampling fraction in each stratum, Qh is (1-Ph), and nh is the number of prescriptions in the sample per stratum.

Clarification as to what each type of prescription represents is required. Indian Affairs and Social Services prescriptions were submitted to the individual drug benefit programs for reimbursement. Under the assumption that all prescriptions dispensed for Indian Affairs and Social Services recipients are submitted to the individual drug benefit programs because reimbursement is 100%, Indian Affairs and Social Services prescription claims represent the number of prescriptions dispensed by pharmacies. Pharmacare prescriptions on the other hand, were submitted to DPIN for reimbursement purposes. Therefore,

Pharmacare prescriptions claims represent prescriptions submitted to DPIN, and whether they represent prescriptions dispensed will be tested in this study.

Of interest, were the number of prescriptions dispensed for populations covered by the individual drug benefit programs. Translating the weighted number of prescriptions dispensed into a rate per population covered, it was estimated that Manitoba pharmacies dispensed 83 to 115 prescriptions per 1000 treaty status Indians and 81 prescriptions per 1000 social assistance recipients over the study period. These rates were 2 to 3 times higher than the rates determined for the remainder of the Manitoba population, receiving Pharmacare or other prescription benefits.(Table 3) Population rates determined from statistics for all Manitoba pharmacies provided by the individual drug benefit plans, were lower than estimated rates, but the actual number of pharmacies which submitted prescriptions to the drug benefit programs is not known.

Table 3. The Number of Prescriptions Dispensed in Each Drug Benefit Recipient Group

| Drug Recipient Group | Prescriptions/population estimated from sample | Prescriptions/population dispensed in Manitoba |
|---|---|---|
| Indian Affairs | 83-115 /1000[a] | 54-76 /1000[d] |
| Social Services | 81 /1000[b] | 44 /1000[e] |
| Pharmacare & other | 46-47 /1000[c] | Data not available |

a, 7002 Rx claims (weighted) per 60,752-84,675 treaty status Indians in Manitoba Health registry
b, 6919 Rx claims (weighted) per 85,713 provincial/city social assistance recipients
c, 45,465 Rx claims [weighted total # Rx-(IA+SS Rx) ] per 967,096-991,019 Manitoba population excluding treaty status Indians and social assistance recipients
d, 4609 Rx claims per treaty status Indian population
e, 3795 Rx claims per social assistant recipient population

## 6.2 Estimate of the Proportion of Prescriptions Submitted to DPIN

The completeness of the DPIN prescription database for all prescriptions dispensed in pharmacies was assessed by determining the proportion that were submitted to DPIN. Excluding five pharmacies for which the total number of prescriptions dispensed could not be obtained, 53 study pharmacies dispensed 13,570 prescriptions over the 2 day study period. The 53 pharmacies submitted 12,180 of these prescriptions to DPIN, including 3046 Indian Affairs/Social Services prescriptions, 7622 Pharmacare prescriptions and 1512 other drug insurer prescriptions. Therefore, the study sample of pharmacies submitted to DPIN 89.8% of prescriptions dispensed (95% CI:89.3-90.3%).

An estimate of the proportion of prescriptions submitted by all Manitoba pharmacies was obtained by adjusting the proportion submitted by study pharmacies for the fact that pharmacies were disproportionately sampled within each stratum. The population estimate was calculated by the same equations used to derive weighted proportions in Table 2. Thus, it was estimated that 90.5% of prescriptions dispensed by Manitoba pharmacies were submitted to the DPIN system (95% CI: 90.4-90.6%)

## 6.3 Differences in the Completeness of the DPIN Database for Indian Affairs/Social Services Drug Benefit Recipients: Testing Hypothesis I

*"The proportion of Indian Affairs and Social Services prescriptions submitted to DPIN is lower than the proportion of Pharmacare prescriptions submitted."*

A total of 4075 prescription claims were abstracted for Indian Affairs and Social Services recipients for the 2 day sample of 58 Manitoba pharmacies, including 2196 Indian Affairs claims, 1408 Manitoba Social Services claims and 471 Winnipeg Social Services claims. The same prescription, as matched by prescription number, was found in the DPIN database for 3443 claims for an overall submission rate of 84.5% (95% CI=83.4;85.6) The proportion of Indian Affairs prescriptions submitted to DPIN was significantly lower ($X^2$=83.7, $p<0.001$) than the proportion of Social Services prescriptions submitted.

Table 4. The Proportion of Indian Affairs/Social Services Prescriptions Submitted to DPIN

| Prescription Type | Indian Affairs (n=2196) | Social Services (n=1879) | Indian Affairs/Social Services (n=4075) |
|---|---|---|---|
| Proportion Submitted | 79.7% | 90.1% | 84.5% |
| 95% Confidence Interval | 78.0-81.4 | 88.8-91.4 | 83.4-85.6 |

The total number of prescriptions dispensed for Pharmacare eligible recipients could not be ascertained because prescription record access restrictions precluded Pharmacare auditors from reviewing Pharmacare prescriptions dispensed in pharmacies which were

not submitted to DPIN. Therefore, it was necessary to estimate the number of Pharmacare prescriptions dispensed in pharmacies.

There is a strong incentive for pharmacies to submit all Pharmacare prescriptions to DPIN because they are reimbursed by Manitoba Health once client deductibles are reached. However, it was postulated that Pharmacare prescription submission to DPIN was not 100% because of the possibility of non-submission subsequent to DPIN system down time and subsequent to client requests. The estimate number of Pharmacare prescriptions dispensed in pharmacies was derived as follows:

(1) Total number of prescriptions dispensed in a pharmacy = total number of

| Indian Affairs prescriptions | Social Services prescriptions | Pharmacare prescriptions | Other drug insurer prescriptions * |
|---|---|---|---|

* Other drug insurer prescriptions included prescriptions reimbursed by the Veteran Affairs, RCMP, Workers Compensation, Rx Plus, Blue Cross, Assure and miscellaneous drug insurance programs, and prescriptions not reimbursed by any drug insurance program.

(2) Estimated number of Pharmacare prescriptions dispensed =

[total number of prescriptions dispensed] minus

[number of Indian Affairs, Social Services and other drug insurer prescriptions dispensed]

= [13570] - [3588 + number other drug insurer prescriptions dispensed]

The total number of prescriptions dispensed was obtained from the pharmacy during the Pharmacare prescription review. Five pharmacies were excluded from this total because statistics were not available for the total number of prescriptions dispensed, or were under-reported (ie. the total number of prescriptions reported was less than the total number of Indian Affairs, Social Services and Pharmacare claims). The number of Indian Affairs and Social Services prescriptions dispensed was equivalent to the number of claims submitted to the respective drug benefit programs, under the assumption that pharmacists sent in all claims because reimbursement for these prescriptions was 100%. The total number of other drug insurer prescriptions could not be determined, but was estimated from the number of other drug insurer prescriptions submitted to DPIN as follows:

(3) Number of other drug insurer prescriptions dispensed =

$$\frac{\text{number of other drug insurer prescriptions submitted to DPIN}}{\text{estimated proportion of other drug insurer prescriptions submitted to DPIN}}$$

Following the substitution of equation (3) into equation (2), the proportion of Pharmacare prescriptions submitted to DPIN was calculated.

(4) Estimated proportion of Pharmacare prescriptions submitted to DPIN =

$$\frac{\text{Number of Pharmacare prescriptions submitted to DPIN}}{\text{Estimated number of Pharmacare prescriptions dispensed}}$$

The proportion of other drug insurer prescriptions submitted to DPIN was estimated to be equivalent to the proportion of Indian Affairs and Social Services prescriptions

submitted, as reported in Table 3, because all of these prescriptions were submitted for DUR, not reimbursement purposes. A sensitivity analysis of the derivation of the proportion of Pharmacare prescriptions submitted to DPIN was conducted by varying the proportions of other drug insurer prescriptions submitted (see Table 5).

Table 5. Sensitivity Analysis for Estimating the Proportion of Pharmacare (PC) Prescriptions (Rx) Submitted to DPIN

| Proportion of Other Rx submitted | Number of Other Rx | Number of PC Rx | Estimated Proportion PC Rx Submitted | Confidence Interval |
|---|---|---|---|---|
| 64%[a] | 2360 | 7622 (7631)[b] | 100 % | |
| 70% | 2160 | 7822 (7831) | 97.4% (97.3%)c | 97.0-97.8% |
| 75% | 2016 | 7966 (7975) | 95.7% (95.6%) | 95.3-96.1% |
| 80% | 1890 | 8092 (8101) | 94.2% (94.1%) | 93.7-94.7% |
| 85% | 1789 | 8193 (8202) | 93.0% (92.9%) | 92.4-93.6% |
| 90% | 1680 | 8302 (8311) | 91.8% (91.7%) | 91.2-92.4% |
| 95% | 1592 | 8390 (8399) | 90.8% (90.7%) | 90.2-91.4% |
| 100% | 1512 | 8470 (8479) | 90.0% (89.9%) | 89.4-90.6% |

Five pharmacies were excluded because the total number of prescriptions dispensed was not available or was less than the number of prescription claims.

a, this was the lowest possible proportion of other insurer prescriptions submitted because the number of Pharmacare prescriptions dispensed could not be less than 7622, the number submitted.

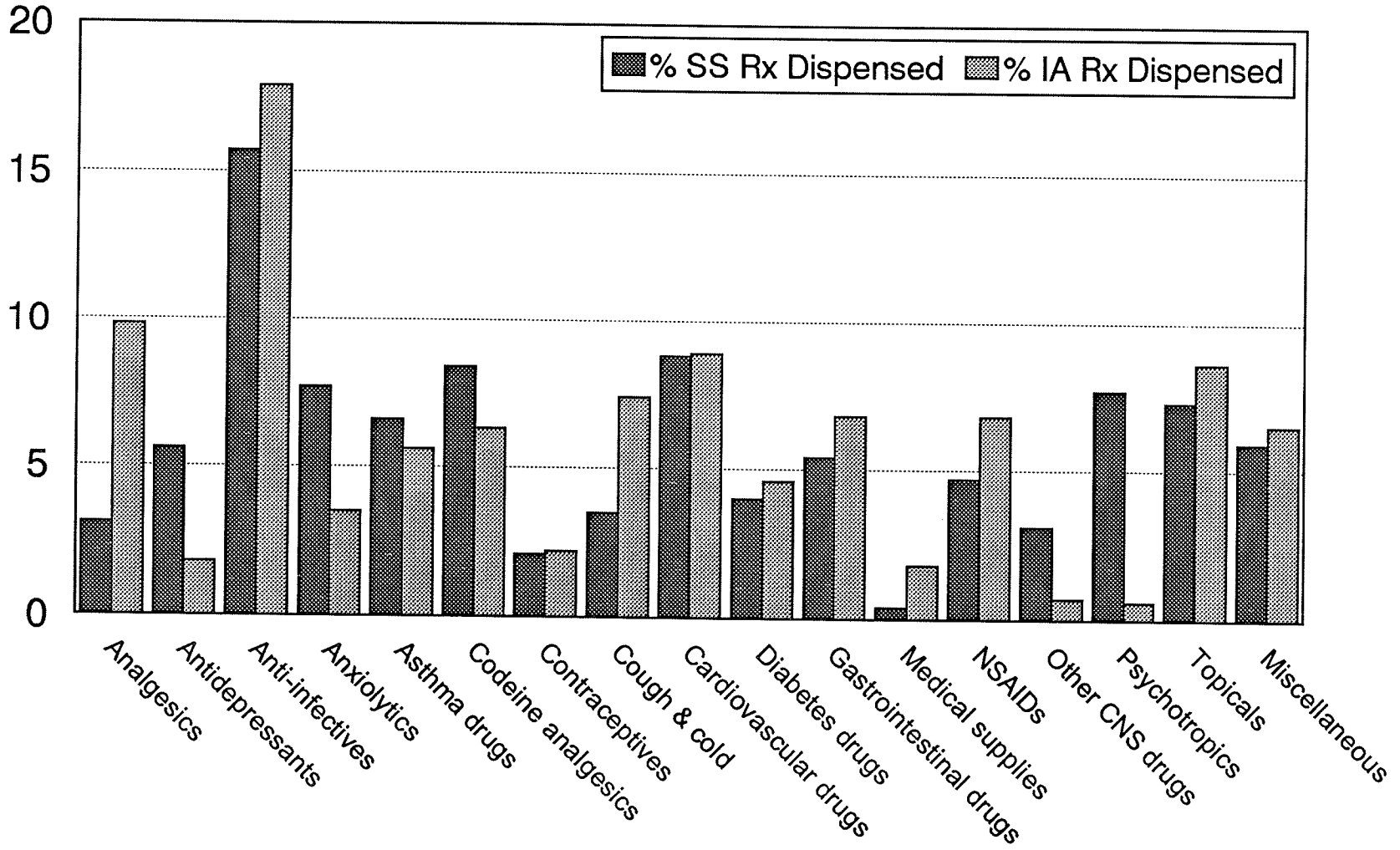
b,c, in 3 pharmacies, the number of Pharmacare and other drug insurer prescriptions submitted to DPIN were greater than the difference between the total number of prescriptions dispensed and the number of Indian Affairs and Social Services claims by 9 prescriptions. If these 9 prescriptions are added to the total number of prescriptions dispensed, the estimated number of Pharmacare prescriptions dispensed increases by 9, resulting in lower proportions calculated.

When the proportion of other drug insurer prescriptions submitted to DPIN assumed the value obtained for Indian Affairs and Social Services prescriptions (85%), the estimated proportion of Pharmacare prescriptions submitted to DPIN was 93%, significantly higher ($X^2$=331,$p<0.001$) than the proportion of Indian Affairs prescriptions (79.3%), and of the proportion of Social Services prescriptions (91.6%, $X^2$=4.43, $p<0.05$) submitted. According to the sensitivity analysis conducted, the proportion of Pharmacare prescriptions submitted to DPIN could range from a minimum value of 90% to a maximum value of 94.2%. This maximum value is achieved when the proportion of other drug insurer prescriptions submitted is minimally equivalent to that of Indian Affairs prescriptions, as there is no reason to believe that the proportion submitted would be lower. Once the proportion of other drug insurer prescriptions exceeded 90%, the estimated proportion of Pharmacare prescriptions submitted (91.8%), was not significantly different from the proportion of Social Services prescriptions submitted ($X^2$=0.088, NS).

## 6.4 Differences in the Completeness of the DPIN Database for Individual Drug Classes

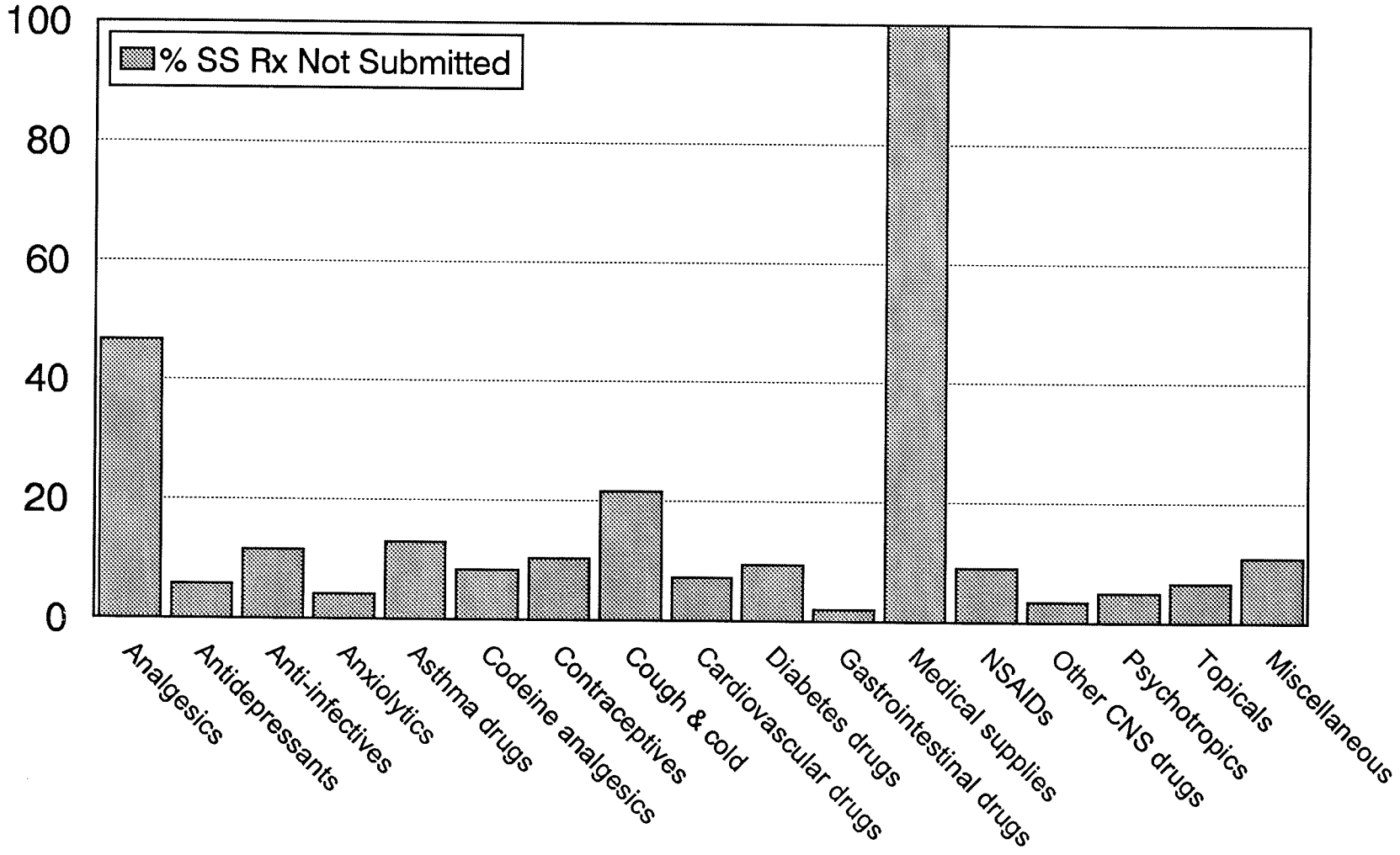
Prescriptions dispensed for Indian Affairs and Social Services recipients were classified by therapeutic class, adopted from the pharmacologic-therapeutic categories of the American Hospital Formulary Service. The frequency distribution of prescriptions dispensed by drug class revealed differences in the prescription of some drug classes between treaty status Indians and social assistance recipients. (Figure 4) Antidepressants,

Figure 4. Distribution of Indian Affairs (IA) and Social Services (SS) Prescriptions (Rx) Dispensed by Drug Class



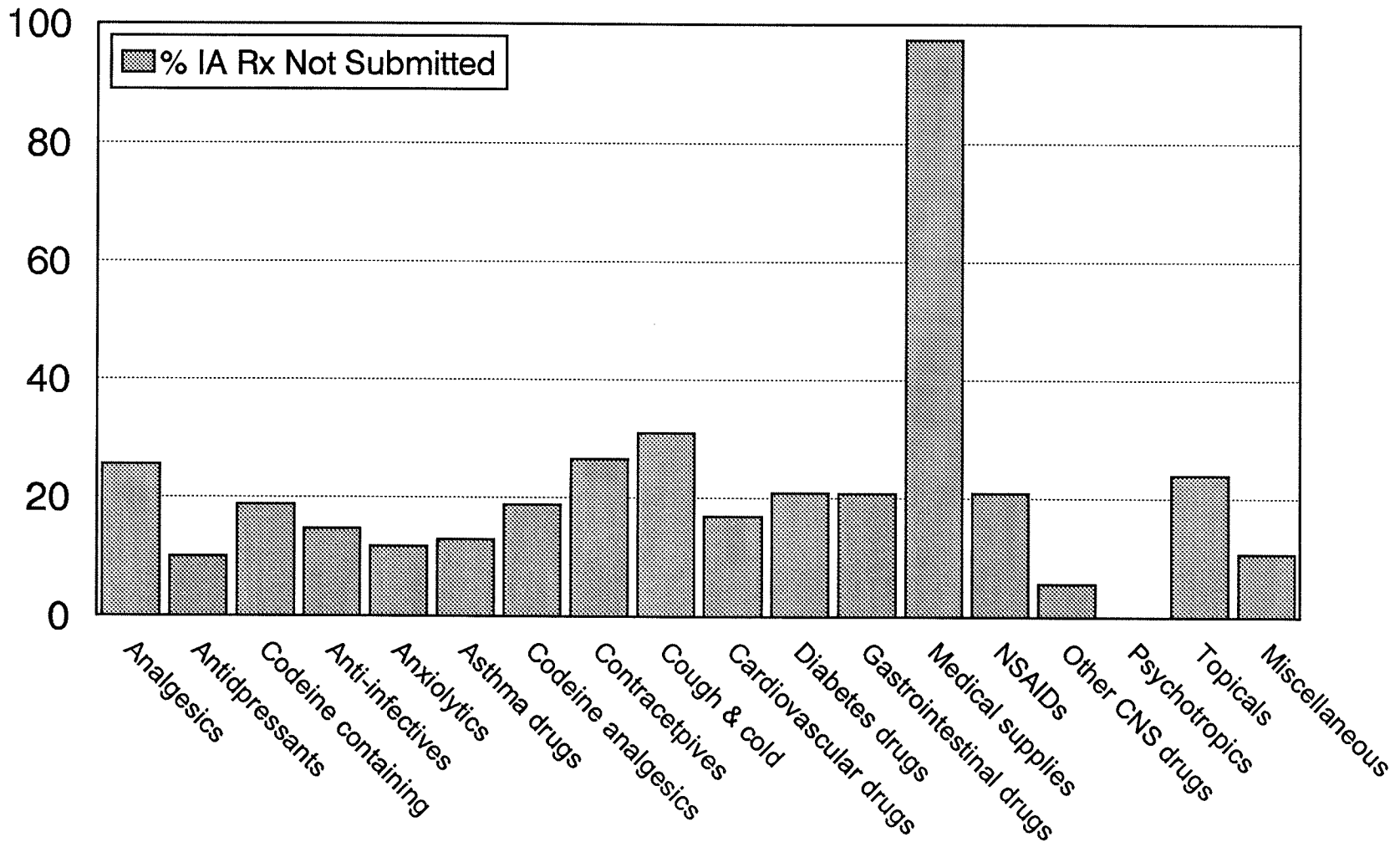

NSAIDs= non-steroidal anti-inflammatory drugs, CNS= central nervous system

Figure 5. The Proportion of Social Services (SS) Prescriptions (Rx) NOT Submitted by Drug Class




NSAIDs= non-steroidal anti-inflammatory drugs, CNS= central nervous system

Figure 6. The Proportion of Indian Affairs (IA) Prescriptions (Rx) NOT Submitted by Drug Class




NSAIDs= non-steroidal anti-inflammatory drugs, CNS= central nervous system

anxiolytics and psychotropic drugs were dispensed more often for Social Services than Indian Affairs recipients, but non-codeine analgesics, cough and cold preparations and medical supplies such as bandages, were dispensed more often for Indian Affairs recipients.

The completeness of the DPIN prescription database for individual drug classes was described in terms of the proportion of prescriptions *not* submitted. Differences in the proportion of prescriptions not submitted between drug classes of prescriptions dispensed were not significant. A greater proportion of medical supplies, and cough and cold preparations were not submitted to DPIN, than of all the other drug classes. (see Figures 5, 6) This was observed for both Indian Affairs and Social Services recipients. In addition, in Social Services recipients, a greater proportion of non-codeine containing analgesics (46.6%) were not submitted to DPIN, than of all the other drug classes (8.7%).

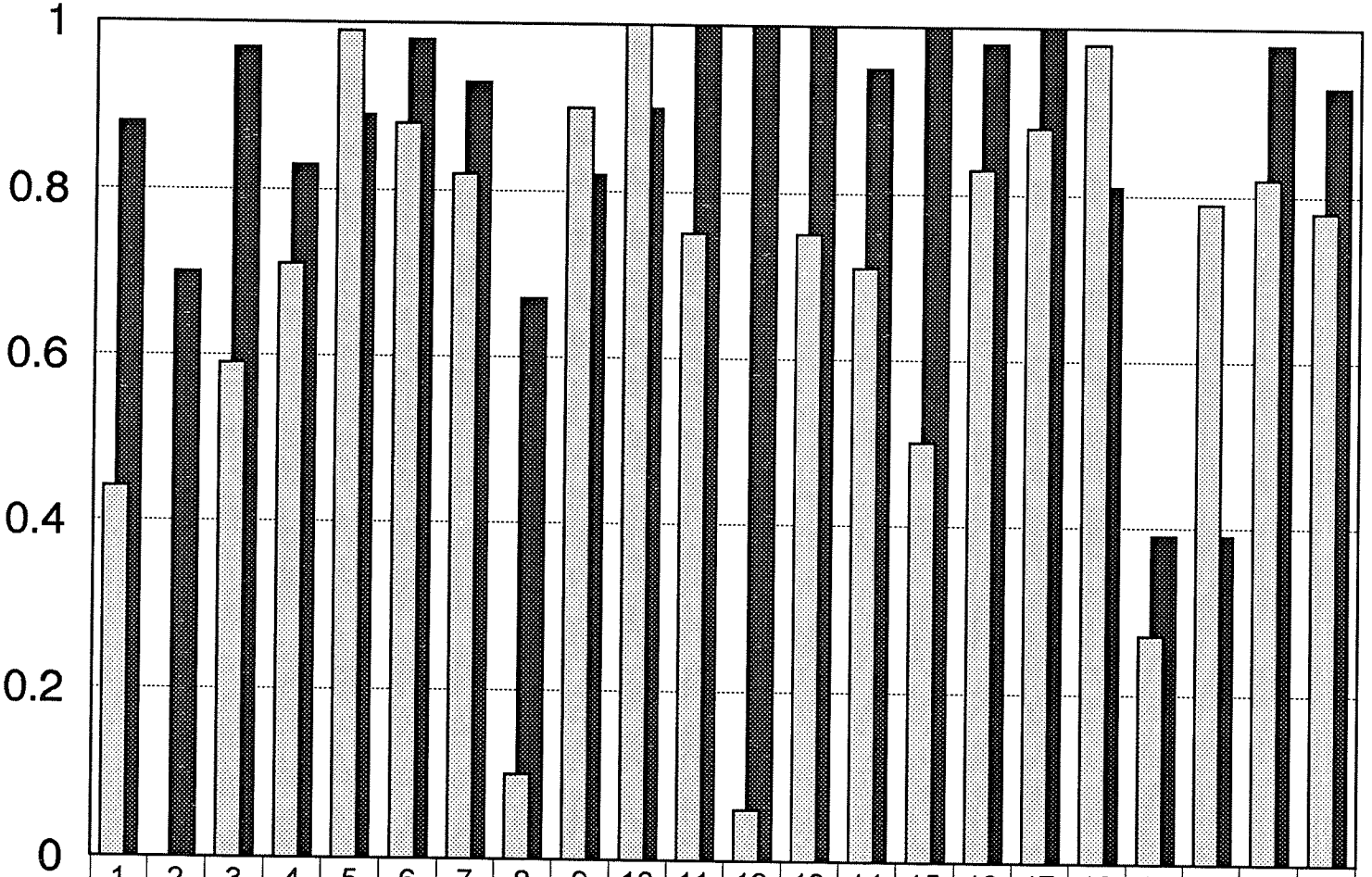
### 6.5 Difference in the Completeness of the DPIN Database Among Individual Pharmacies

The distribution of the proportion of Indian Affairs and Social Services prescriptions submitted to DPIN by individual pharmacies was examined to assess the variability in prescription submission behaviour among individual pharmacies. The proportion of Social Services prescriptions submitted to DPIN by individual pharmacies ranged from 0 to 100%, with a mean of 87%. However, 50% of pharmacies submitted greater than 95% of

Social Services prescriptions to DPIN. The proportion of Indian Affairs prescriptions submitted to DPIN also ranged from 0 to 100%; six pharmacies did not dispense any Indian Affairs prescriptions during the two study days. However, the mean proportion of prescriptions submitted was 78%, and the median was 90%. For both Indian Affairs and Social Services prescriptions, pharmacies most commonly submitted 100% of prescriptions.

In addition, a comparison of the proportion of Indian Affairs and Social Services prescriptions submitted within individual pharmacies revealed differences in submission. In 22 pharmacies, a greater than 10% difference in submission of prescriptions for these two populations was observed. The majority of pharmacies submitted a lower proportion of Indian Affairs than Social Services prescriptions. In some pharmacies there existed as much as a 70% difference in the proportions submitted. (see Figure 7) The discrepancy in prescription submission within pharmacies for Indian Affairs and Social Services recipients suggested that different factors may affect the submission of prescriptions for these populations. Therefore, separate analyses were conducted for Indian Affairs and Social Services prescriptions.

Figure 7. Differences Between the Proportion of Indian Affairs (IA) and Social Services (SS) Prescriptions (Rx) Submitted in Individual Pharmacies




| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IA Rx Submitted | 0.44 | 0 | 0.59 | 0.71 | 0.99 | 0.88 | 0.82 | 0.1 | 0.9 | 1 | 0.75 | 0.06 | 0.75 | 0.71 | 0.5 | 0.83 | 0.88 | 0.98 | 0.27 | 0.79 | 0.82 | 0.78 |
| SA Rx Submitted | 0.88 | 0.7 | 0.97 | 0.83 | 0.89 | 0.98 | 0.93 | 0.67 | 0.82 | 0.9 | 1 | 1 | 1 | 0.95 | 1 | 0.98 | 1 | 0.81 | 0.39 | 0.39 | 0.98 | 0.93 |

In all other pharmacies (n=36), the difference between the proportion of Indian Affairs and Social Services prescriptions submitted was < 10%

## 6.6 Accuracy of the Prescription Data Submitted to DPIN

The original prescriptions for 8,012 Pharmacare claims submitted to DPIN over the 2 study days by 58 pharmacies were physically reviewed by Manitoba Health staff. Original prescriptions were identified by the prescription number of the Pharmacare DPIN claim, and a comparison was made between the original prescription and the DPIN claim with respect to the drug name, quantity dispensed and number of days supply (quantity divided by frequency of use). The drug name, quantity and number of days supply on the DPIN Pharmacare datafile matched the drug name, quantity and number of days supply recorded on the original prescription for 91.9 % of Pharmacare DPIN prescription claims.

# Chapter Seven.

## The Voluntary Submission of Prescriptions and Pharmacy Neighbourhood

## 7.1 Validation of Pharmacy Neighbourhood Strata

Prior to testing Hypothesis II, it was important to determine whether Indian Affairs and Social Services recipient neighbourhoods, created by using neighbourhood income and treaty Indian status as markers, represented the predominant clientele of the pharmacies located in those neighbourhoods. To do this, the number of Indian Affairs or Social Services prescriptions was compared to the number of Pharmacare prescriptions dispensed in each neighbourhood strata. An Indian Affairs or Social Services recipient neighbourhood was considered a valid descriptor of the predominant pharmacy clientele if the likelihood of an Indian Affairs or Social Services prescription being dispensed in those neighbourhoods was minimally twice that in Pharmacare neighbourhoods.

The likelihood of Indian Affairs prescriptions being dispensed in Indian Affairs neighbourhood strata was approximately 5 times the likelihood of Indian Affairs prescriptions being dispensed in Pharmacare strata. However, the dispensing of Social Services prescriptions was almost as likely in Pharmacare neighbourhood strata as in Social Services strata. When the Indian Affairs and Social Services neighbourhood strata were combined, the likelihood of Indian Affairs or Social Services prescriptions being dispensed in those strata was approximately twice that of the same prescriptions being dispensed in Pharmacare strata. (see Table 6)

Table 6. The Likelihood of Indian Affairs/Social Services Prescriptions Dispensed in Pharmacy Neighbourhood Strata

| No. of Prescriptions | Strata | | Strata | | Odds Ratio |
|---|---|---|---|---|---|
| | Indian Affairs | | Pharmacare | | |
| Indian Affairs Pharmacare* | 1230<br>1795 | (40.6%) | 417<br>2887 | (12.6%) | 4.7<br>(95%CI:4.2-5.4) |
| | Social Services | | Pharmacare | | |
| Social Services Pharmacare* | 639<br>2936 | (17.9%) | 455<br>2887 | (13.6%) | 1.4<br>(95%CI:1.2-1.6) |
| | Indian Affairs + Social Services | | Pharmacare | | |
| Indian Affairs Pharmacare* | 1779<br>4731 | (27.3%) | 417<br>2887 | (12.6%) | 2.6<br>(95%CI:2.3-2.9) |
| | Indian Affairs + Social Services | | Pharmacare | | |
| Social Services Pharmacare* | 1424<br>4731 | (23.1%) | 455<br>2887 | (13.6%) | 1.9<br>(95%CI:1.7-2.2) |

* estimate of the number of Pharmacare prescriptions dispensed in pharmacies because data only available for the number of Pharmacare prescriptions submitted to DPIN

Closer examination of the proportion of Indian Affairs, Social Services and Pharmacare prescriptions dispensed in pharmacies stratified by pharmacy neighbourhood showed some misclassification of pharmacies. (see Appendix VI) In four Indian Affairs neighbourhood pharmacies, > 15% of these prescriptions were Social Services prescriptions, while in 4 Social Services neighbourhood pharmacies > 30% were Indian Affairs prescriptions. Combining the Indian Affairs and Social Services neighbourhood strata corrected this misclassification, but in 9 pharmacies in the combined strata > 84% of these prescriptions were Pharmacare prescriptions. Moreover, in 9 Pharmacare pharmacies, > 14% of these prescriptions were Indian Affairs or Social Services prescriptions.

## 7.2 Differences in Submission of Indian Affairs/Social Services Prescriptions by Pharmacy Neighbourhood:Testing Hypothesis II

*"The proportion of Indian Affairs and Social Services prescriptions submitted to DPIN is greater in pharmacies located in Pharmacare recipient neighbourhoods, than in pharmacies located in Indian Affairs and Social Services recipient neighbourhoods."*

The comparison of prescriptions submitted to DPIN among pharmacy neighbourhoods, as a proxy measure of their clientele, was made between Pharmacare recipient neighbourhoods, and combined Indian Affairs and Social Services recipient neighbourhoods, to avoid bias due to misclassification of pharmacy neighbourhoods. In addition, hospital-based pharmacies were assigned to one of the three pharmacy neighbourhoods based on the proportions of prescriptions dispensed for Indian Affairs, Social Services and Pharmacare recipients.(see Appendix VI) As hypothesized, Social Services prescriptions were submitted to a significantly greater extent in Pharmacare neighbourhoods (93%) than in Indian Affairs/Social Services neighbourhoods(89.2%). However, Indian Affairs prescriptions were submitted to a significantly greater extent in Indian Affairs/Social Services neighbourhoods (81.6%) than in Pharmacare neighbourhoods (71.5%).

Table 7. The Submission of Indian Affairs/Social Services Prescriptions in Different Pharmacy Neighbourhoods

| Proportion Submitted | Indian Affairs/Social Services Strata | Pharmacare Strata |
|---|---|---|
| Indian Affairs prescriptions | 81.6% (n=1779) | 71.5%, $X^2$=21, $p<0.001$ (n=417) |
| Social Services prescriptions | 89.2% (n=1424) | 93.0%, $X^2$=5.5, $p<0.019$ (n=455) |

The 9 misclassified pharmacies in the combined Indian Affairs and Social Services neighbourhood strata, and the 9 misclassified pharmacies in the Pharmacare neighbourhood strata were re-classified to assess the effects of misclassification on the results of testing Hypothesis II. The re-classification did not alter the results of testing Hypothesis II in Social Services prescriptions. However, the difference between the submission of Indian Affairs prescriptions in Indian Affairs/Social Services and Pharmacare neighbourhoods had changed direction. The submission of Indian Affairs prescriptions was now higher in Pharmacare neighbourhoods, than the combined Indian Affairs/Social Services neighbourhoods, as originally hypothesized. The significance of this association was border-line, but the substantial decrease in the number of Indian Affairs prescriptions in Pharmacare neighbourhoods following re-classification may have under-powered the comparison.

Table 8. The Submission of Indian Affairs/Social Services Prescriptions in Different Pharmacy Neighbourhoods Following Re-classification of Pharmacies

| Proportion Submitted | Indian Affairs/Social Services Strata | Pharmacare Strata |
|---|---|---|
| Indian Affairs prescriptions | 79.2% (n=2002) | 84.5%, $X^2$=3.1,p<0.079 (n=194) |
| Social Services prescriptions | 89.2% (n=1417) | 93.0%, $X^2$=5.3,p<0.022 (n=462) |

# Chapter Eight.

## The Voluntary Submission of Prescriptions and Pharmacy Type

Hypothesis III is tested in this chapter. In addition, study pharmacies are described and compared to the target population of pharmacies for the purposes of generalizing study results.

## 8.1 Description of Study Pharmacies

Sixty percent of study pharmacies were either independent or urban pharmacies, 40% were rural pharmacies and 30% were chain pharmacies. These proportions were not significantly different from those found in the target population.(see Table 9) However, due to the small number of hospital-based pharmacies in the target population, all were selected for the study sample, leading to a significantly higher proportion in the study sample. By study design, one third of pharmacies were located in each of the sociodemographic neighbourhoods. This resulted in the over-sampling of pharmacies in Indian Affairs neighbourhoods and under-sampling of those in Pharmacare neighbourhoods.

Study pharmacies were most often free standing buildings, but there was equal representation from those located in clinics, malls, grocery stores and hospitals. They were open on average, 10 hours a day, during which time the pharmacy was staffed by 2 pharmacists and 1 technician. The average number of prescriptions dispensed on a daily basis by the study pharmacies was 126 (range: 18 - 407), or 5.5 prescriptions per pharmacist-hour (range:1 - 15).

Table 9. The Characteristics of Pharmacies in the Study Sample

| Characteristic | Study Sample (n=58) | | Study Population (n=228) | | Significance |
|---|---|---|---|---|---|
| Location of Pharmacy | | | | | |
| rural area | 22 | (37.9%) | 75 | (32.9%) | $X^2$=0.52, NS |
| urban area | 36 | (62.1%) | 153 | (67.1%) | |
| street | 37/57 | (63.8%) | NA | | |
| clinic | 6/57 | (10.5%) | NA | | |
| mall | 4/57 | (7.0%) | NA | | |
| grocery | 5/57 | (8.8%) | NA | | |
| hospital | 5/57 | (8.8%) | NA | | |
| IA strata | 20 | (34.5%) | 36 | (15.8%) | $X^2$=10, p<0.005 |
| SS strata | 19 | (32.7%) | 72 | (31.6%) | $X^2$=0.03, NS |
| PC strata | 19 | (32.7%) | 120 | (52.6%) | $X^2$=7.3, p<0.01 |
| Type of Pharmacy Ownership | | | | | |
| independent | 36 | (62.1%) | 150 | (65.8%) | $X^2$=0.28, NS |
| chain | 17 | (29.3%) | 73 | (32%) | $X^2$=0.16, NS |
| hospital | 5 | (8.6%) | 5 | (2.2%) | $X^2$=8.9, p<0.005 |
| Mean Prescription (Rx) Workload | | | | | |
| mean service hours | 10.5 hr/day | | NA | | |
| mean # pharmacist | 1.8/day | | NA | | |
| mean # technician | 1/day | | NA | | |
| mean # Rx/day | 126.5, SD=83 | | NA | | |
| mean # Rx/pharmacist-hr | 5.5, SD=3 | | NA | | |

NA=data not available, IA=Indian Affairs, SS=Social Services, PC=Pharmacare

## 8.2 Differences in Submission of Indian Affairs/Social Services Prescriptions by Pharmacy Type:Testing Hypothesis III

*"Rural pharmacies, independent pharmacies and pharmacies with lower prescription workloads submit a higher proportion of Indian Affairs and Social Services prescriptions to DPIN than their urban, chain and higher prescription workload counterparts."*

Contrary to the proposed hypotheses, a significantly higher proportion of Indian Affairs prescriptions were submitted to DPIN by urban than rural pharmacies, and by chain than independent or hospital-based pharmacies. However, as hypothesized, Pharmacies with a lower prescription workload, defined as a workload less than the average workload of 5.5 prescriptions per pharmacist-hour, submitted a significantly greater proportion of Indian Affairs prescriptions, than did pharmacies with a higher prescription workload. (Table 10) The same relationships were seen with the submission of Social Services prescriptions, with the exception that there was no significant difference in the submission of prescriptions between chain and hospital-based pharmacies. Generally, the proportion of Social Services prescriptions submitted to DPIN was higher than the proportion of Indian Affairs prescriptions submitted by all types of pharmacies. However, chain pharmacies submitted a higher proportion of Indian Affairs, than Social Services prescriptions ($X^2$=6.5, $p<0.025$), although for both types of prescriptions the proportion submitted was very high.

Table 10. The Submission of Indian Affairs/Social Services Prescriptions by Type of Pharmacy

| Proportion Submitted* | Rural Area | Urban Area |
|---|---|---|
| Indian Affairs prescriptions | 74.3% (n=769) | 84.9%, $X^2$=34, p<0.001 (n=1169) |
| Social Services prescriptions | 85.4% (n=254) | 90.7%, $X^2$=6.7, p<0.01 (n=1457) |

| Type of Pharmacy | Chain | Independent** | Hospital** |
|---|---|---|---|
| Indian Affairs prescriptions | 97.2% (n=579) | 73.7%,$X^2$=145,p<0.001 (n=1359) | 72.1%,$X^2$=120,p<0.001 (n=258) |
| Social Services prescriptions | 94.3% (n=663) | 87.2%,$X^2$=22,p<0.001 (n=1048) | 91.7%,$X^2$=1.5,NS (n=168) |

| Pharmacy Workload*** | High (>5.5) | Low (< 5.5) |
|---|---|---|
| Indian Affairs prescriptions | 75.8% (n=1182) | 85.2%, $X^2$=23, p<0.001 (n=676) |
| Social Services prescriptions | 88.4% (n=683) | 92.8%, $X^2$=10, p<0.002 (n=1075) |

* hospital pharmacies excluded, **compared with chain pharmacies, *** prescriptions per pharmacist-hour

# Chapter Nine.

## The Voluntary Submission of Prescriptions and Pharmacist Characteristics

The results of testing Hypothesis IV are presented in this chapter, preceded by descriptive statistics of the study population of pharmacists.

## 9.2 Description of Study Pharmacists

Responses to the self-administered mailed questionnaire were obtained from 119 (93% response rate) out of 128 pharmacists who had dispensed prescriptions on the study days. One pharmacist had left the province, one pharmacist had refused to participate in the survey, and the remaining 7 pharmacists failed to return their surveys. Non-respondants worked in independent or chain pharmacies located in urban areas, most often in chain pharmacies located in Indian Affairs neighbourhoods. All of the non-responders worked in pharmacies which submitted $\geq$ 93 % of Social Services prescriptions, and 7 worked in pharmacies which submitted close to 100% of Indian Affairs prescriptions. The pharmacist who refused to participate in the study expressed strong reservations about the DPIN system in the survey follow-up, and submitted 59% of Indian Affairs prescriptions.

The majority of pharmacists were male and had graduated after the 1980's. These demographics were not significantly different from the Manitoba population of community pharmacists.(see Table 11) A minority of pharmacists (35%) had hospital pharmacy experience and two pharmacists had obtained MBA degrees. On average, pharmacists worked a 38 hour week and had 13 years of community experience. An equal number of staff pharmacists and managers were surveyed.

Table 11. The Characteristics of Pharmacists in the Study Sample

| Study Variable | Study Sample (n=118*) DPIN survey | Manitoba Population (n=647) (Pharmaceutical Association registry) |
|---|---|---|
| Gender | | |
| Female: | 50 (42.4%) | 279 (43.1%), $X^2$=0.023, NS |
| Male | 68 (57.6 %) | 368 (56.9%) |
| Year 1st licensed | | |
| Licensed < 80's | 50/117 (42.7%) | 307/646 (47.5%), $X^2$=0.91, NS |
| Licensed ≥ 80's | 67/117 (57.3%) | 339/646 (52.5%) |
| Post-graduate degree | | |
| MBA | 2 (1.7%) | NA |
| Hospital Experience | | |
| Yes | 41/117 (35%) | NA |
| Mean years | 5.7 ± 6.7 yrs | NA |
| Community Experience | | |
| Mean years | 13.2 ± 10.7 yrs | NA |
| Staff position | | |
| Staff pharmacist | 59/117 (51.3%) | NA |
| Manager | 58/117 (49.6%) | NA |
| Mean # hrs worked/wk | 38.8 ± 11.1 hrs/wk | |

* survey response rate was 119/128 (93%) but one pharmacist who worked in 2 pharmacies was surveyed twice

### 9.3 Pharmacist Perceptions of the DPIN System

Overall, 80% of pharmacists had agreed that the DPIN system had benefited their practice. An overwhelming majority of pharmacists (94%) also agreed that DUR was

important to their practice and that the DPIN had helped them identify drug-related problems for their clients (87%). Clients and physicians had been receptive to pharmacist use of DPIN for approximately 50% of pharmacists. However, pharmacists also identified the following problems with DPIN: difficulty in obtaining client Personal Health Identification Numbers or PHIN's (67%), DPIN drug warning codes not significant (58%), insufficient orientation to the DPIN system (35%), and interference with customer service (29%). The frequency distribution of pharmacist responses to individual survey questions regarding the DPIN system is presented in Appendix VII.

Sixty-five (55%) pharmacists provided additional written comments about DPIN in response to the single open-ended question on the survey. Most of the responses identified deficiencies in the DPIN system. The greatest number of responses, by far, were regarding the drug warnings displayed by DPIN, which pharmacists described as irrelevant, redundant and "useless." Specifically, pharmacists were critical of the fact that they were required to manually look up definitions of drug warning codes, to respond to the same drug warnings when prescriptions were refilled, to sieve through lines of irrelevant drug warnings, with the possibility of missing a significant warning, and to abort the prescription transaction every time they respond to a drug warning by entering an intervention code.

There were other criticisms of DPIN's functionality, including the inability to cancel a prescription on-line one week after it was dispensed, the slowness of the DPIN system

and the occurrence of DPIN system down time during work hours. Positive comments were directed at the DPIN support service provided through the DPIN Help Line. Pharmacists stated that DPIN Help Line staff were very helpful and that the service was vital; others recommended that more operators be hired and the hours of operation extended. Concern was expressed over the rumour that this support service was going to discontinued.

Pharmacists frequently also referred to the problem of obtaining PHINs from clients. Some clients, for example those that lived in the core of the city, often did not present with their PHINs and it was time consuming to obtain these PHINs. Sometimes the DPIN Help Desk could not even provide the PHIN. Moreover, there were many comments regarding the implementation of DPIN, mostly from pharmacists working in rural pharmacies, as expressed in the following quotes:

"When we first went live there was no manual from DPIN or the software vendor. The first 8 weeks were a complete fiasco."

"I feel like we have been led through a maze blind-folded. The lack of education provided is deplorable. I still feel uncertain about many aspects of the program."

"Government did a terrible job of explaining DPIN to the public. Alot of people, especially teenagers, seniors and aboriginals do not know what is going on, ie. the need for a PHIN number."

Some pharmacists referred to the lack of training for the DUR portion of DPIN. Moreover, it appeared that lack of education was an ongoing problem. DPIN updates were

not user friendly and many problems were encountered with the addition of on-line reimbursement for Manitoba Family Services prescriptions in September. No guidance had been provided with respect to confidentiality issues, for example what to do in situations when clients requests that their prescription not be submitted to DPIN or when physicians request client prescription information.

The impact of the DPIN system was also expressed in terms of its negative effects on the pharmacy clientele. DPIN was time consuming and adversely affected time spent with clients. While some pharmacists noted that on-line prescription reimbursement was appreciated by clients and that it removed the cost factor from client interactions, others felt it was time consuming to explain payment problems to the client and unpleasant to deal with angry customers regarding formulary changes. One pharmacist stated that "if DPIN issues other than DUR take me away from the customer, then DPIN is of no value to me." Moreover, DPIN was sometimes seen as an added cost if additional staff were hired because of the increased workload. Some pharmacists stated that they should be reimbursed for the extra time that they spend with DPIN.

One pharmacist remarked that the most significant benefit provided by DPIN was the establishment of a provincial database. However, some alluded to the fact that the database was not comprehensive; submission was not mandatory for all clients and nursing stations in northern Manitoba were not linked to DPIN. Concern was expressed by a few pharmacists that submission was not mandatory for the native population, who

were referred to as big abusers of benzodiazepines and Tylenol #3's. It was suggested that some pharmacists intentionally did not submit prescriptions for native peoples because refusal to fill a prescription subsequent to DPIN drug duplication warnings would lead to losses in clientele.

Finally, a few pharmacists questioned how many jobs had DPIN created, and if indeed, DPIN had saved money. One pharmacist stated: "overall the DPIN system has been nothing but a useless intrusion by the government to save more money. It wastes my time, but more importantly it wastes my patient's time. Perhaps more pharmacists can be consulted before anything else is added to the system."

## 9.4 Development of DPIN Perception Subscales

Survey questions relating to pharmacist perception of the DPIN system were designed to address pharmacist attitudes, beliefs and values which may potentially affect their voluntary submission of prescriptions to DPIN. In addition to asking pharmacists about DPIN's functionality, questions were posed to evaluate pharmacist views about drug utilization review (and hence to DPIN), their perception of the value attached to their services resulting from DPIN, and their perceptions of the environment in which they practised. The Cronbach alpha statistic for scored responses to questions regarding the DPIN system (n=21) was high (alpha=0.8), demonstrating a high internal consistency of

these questions. However, it was felt that rather than obtaining a total score for the whole survey, scores obtained from subgroups of questions which evaluated specific dimensions of pharmacist impressions of DPIN, would serve as better explanatory variables for pharmacist submission of prescriptions to DPIN. Four subscales were retrospectively proposed to represent these dimensions:

1) Professional - perceived importance of DPIN's DUR capabilities to professional responsibilities
2) Value - perceived value of DPIN to clients and physicians
3) Systems - evaluation of DPIN's functionality and
4) Environment - perception of the environment in which DPIN was used.

Questions were placed in the subscale of greatest content relevance (see Table 12). Question 3 was not included in any of the subscales because it was a general question on pharmacist impressions of DPIN. The placement of a question in a hypothesized subgroup was verified by testing each question's convergent and discriminant validity. The method consisted of determining whether each question in a hypothesized group was substantially correlated to the total score of other questions in the subgroup (item convergent validity criterion) and whether each question correlated significantly higher with its hypothesized subgroup than with other subgroups (item discriminant validity criterion).[59] Values for missing responses were imputed using the average score of questions belonging to the subscale in which the question was placed.

Table 12. The Correlation of Individual Questions with DPIN Perception Subscale Scores

| Question | Professional score | Value score | Systems score | Environment score |
|---|---|---|---|---|
| PROFESSIONAL SUBSCALE | | | | |
| [1] DUR is important | 0.618 * | 0.249 | -0.009 | 0.044 |
| [2] Expected benefit from DPIN | 0.375 | 0.092 | -0.062 | 0.203 |
| [8] Use Help Desk to obtain PHIN | 0.429 | 0.038 | -0.078 | -0.009 |
| [13] DPIN detects drug-related problems | 0.359 | 0.479 | 0.203 | 0.145 |
| VALUE SUBSCALE | | | | |
| [4] Clients value DPIN | 0.318 | 0.285 | 0.275 | 0.176 |
| [14] Improved MD relationship | 0.297 | 0.384 | 0.196 | 0.093 |
| [15] Interferes with customer service | 0.083 | 0.274 | 0.409 | 0.446 |
| [16d]Clients not receptive | 0.088 | 0.373 | 0.359 | 0.439 |
| [16e]MD not receptive | 0.188 | 0.370 | 0.257 | 0.190 |
| SYSTEMS SUBSCALE | | | | |
| [5] Insufficient DPIN training | -0.067 | 0.355 | 0.431 | 0.270 |
| [9] DPIN not user friendly | 0.187 | 0.421 | 0.564 | 0.432 |
| [10] DPIN codes not significant | -0.136 | 0.262 | 0.464 | 0.338 |
| [16b]DPIN not user friendly | 0.060 | 0.433 | 0.608 | 0.415 |
| ENVIRONMENT SUBSCALE | | | | |
| [7] PHINs frequently missing | 0.106 | 0.192 | 0.111 | 0.099 |
| [11] Too busy to use DPIN | 0.068 | 0.324 | 0.315 | 0.513 |
| [12] DPIN not relevant to clients | 0.263 | 0.241 | 0.144 | 0.285 |
| [16a]Hard to get PHINs | -0.016 | 0.307 | 0.441 | 0.259 |
| [16c]Too busy to use DPIN | -0.069 | 0.380 | 0.360 | 0.446 |
| [16f]Not reimbursed to use DPIN | -0.257 | 0.088 | 0.256 | 0.096 |

The scores of all questions which comprised the Systems subscale, and of most of the Professional subscale questions were highly correlated ($r \geq 0.4$) with the total score of the group in which they were placed, more so than with the total score of other subscales.(see Table 12) Question 13 was more highly correlated with the Value subscale, but was left in the Professional subscale because of the hierarchial nature of the correlation. It was postulated that pharmacists who responded to Question 13 by agreeing that DPIN helped them identify drug-related problems would perceive that this service was valued by clients. Two of the questions in the Value subscale were moderately correlated ($r \geq 0.3$) with the subscale, of which Question 15 was more highly correlated with the Systems or Environment subscales. Again this question was left in the original subscale because of the hierarchial nature of the correlation between pharmacist impressions that DPIN was not user friendly or required PHIN information which was difficult to obtain, and belief that DPIN interfered with customer service.

Two questions in the Environment subscale (question 7 and 16f) were not correlated ($r<0.1$) with the total score of that group, or of any other subscales and were eliminated. Of the remaining questions, Question 12 was weakly correlated with the subscale's total score, but was left in the group because it evaluated a theme identified in the pharmacist interview. Question 16a was more strongly correlated with the Systems subscale, but was also left because of the hierarchial nature of the correlation. It was conceivable that pharmacists who identified obtaining clients PHIN's as problematic in Question 16a, may think that DPIN is not user friendly because of the necessity to obtain PHIN's.

Scales were not pilot tested, but their validity and reliability in measuring the dimensions of pharmacist perceptions of DPIN were determined. The internal consistency or reliability of each subscale, as determined by the Cronbach alpha coefficient, was good (alpha $\geq$0.6), indicating that the subscales were reliable measures of the dimensions which they evaluated.(see Table 13) In fact, the alpha statistic for the Professional and Systems subscales was ideal ($\geq$0.7). The validity of using the subscales to measure specific dimensions of pharmacist perceptions of DPIN was assessed by determining the criterion validity of the subscale questions.[60] Question 3 was selected as the criterion or "gold standard" because it was a single global question regarding pharmacist impressions of the DPIN system and was not included in any of the subscales. It was also significantly correlated (r=0.2 to 0.63) with 12 other questions. Within the Professional, Value and Systems subscales, the scores of pharmacists which had a good overall impression of DPIN (Question 3 response = agree) were significantly higher than the scores of pharmacists which had a poor impression of DPIN (Question 3 response = disagree, or no opinion) (Kruskal-Wallis Test, p<0.0001-0.01). Environment subscale scores for pharmacists who had a good impression of DPIN were not significantly higher than those who had a poor impression.

A check of the internal reliability of the subscales, divided into 2 groups according to respondent impression of DPIN as good or poor, was conducted by determining the Cronbach alpha coefficient for each divided subscale. Similar alpha coefficient values were obtained for the divided Systems and Environment subscales, as for the whole

subscales.(see Table 13) The alpha statistic for the Professional-Good DPIN Impression subscale and for both Value subscales became poorer. It is plausible that although pharmacists liked the DPIN system overall, not all of them found the DUR component beneficial, resulting in inconsistencies in responses to questions in the Professional subscale. Inconsistencies in responses to the Value subscale questions may reflect poorer performance of this group when further divided into a smaller number of respondents.

Table 13. The Reliability of DPIN Perception Subscales

| Subscale | Alpha Coefficient | DPIN Impression Grouping | Median Score | Alpha Coefficient |
|---|---|---|---|---|
| Professional (maximum score=20) | 0.663 | GOOD (n=93) | 19 | 0.243 |
| | | POOR (n=23) | 16 | 0.701 |
| Value (maximum score=25) | 0.582 | GOOD (n=93) | 18 | 0.456 |
| | | POOR (n=23) | 13 | 0.341 |
| Systems (maximum score=20) | 0.726 | GOOD (n=93) | 13 | 0.702 |
| | | POOR (n=23) | 11 | 0.737 |
| Environment (maximum score=20) | 0.600 | GOOD (n=93) | 14 | 0.630 |
| | | POOR (n=23) | 12 | 0.516 |

*Summary*

Four subgroups of survey questions were retrospectively created to assess specific dimensions of pharmacist perceptions of the DPIN system. These formed the Professional, Value, Systems and Environment subscales, whose composition was verified by testing the convergent and discriminant validity of questions placed in the subgroups. Determination of the criterion validity and internal consistency of the created subscales indicated that they were reliable and valid measures of specific dimensions of pharmacist perceptions of DPIN. In other words, pharmacists who had good impressions of DPIN also thought that DPIN performed well technically, and that DPIN enabled them to offer a service important to their role as a pharmacist and valued by their clients. The converse was true of pharmacists who had poor impressions of DPIN. Although the Environment subscale was reliable, pharmacists evaluated their environment the same, regardless if they held good or poor impressions of DPIN. Thus, this subscale may not be related to pharmacist impressions of DPIN, but may represent the working environment of all pharmacists.

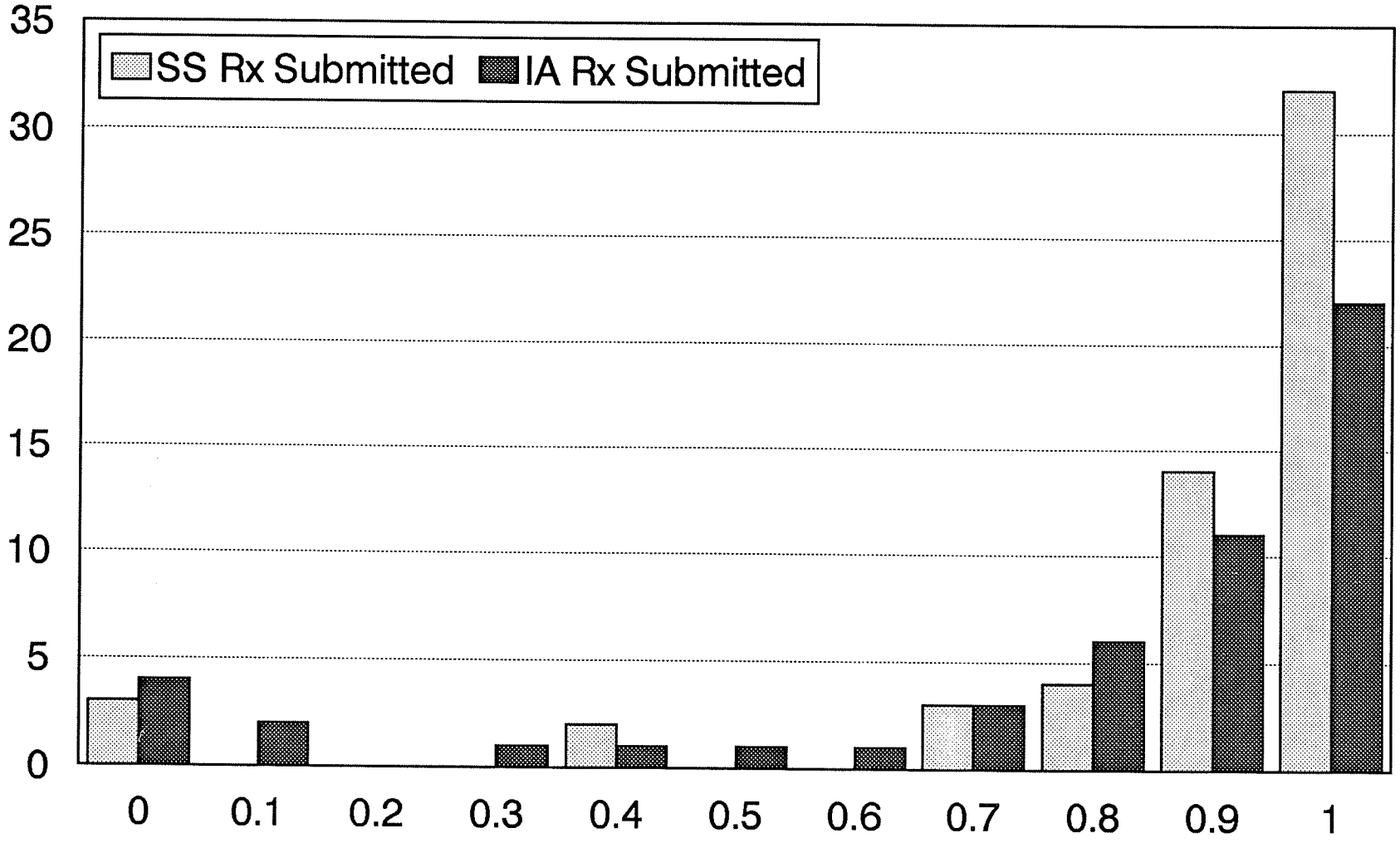
## 9.5 Differences in Submission of Indian Affairs/Social Services Prescriptions by Pharmacist Characteristics: Testing Hypothesis IV

*"Female gender, recent graduation, post-graduate education, hospital work experience and positive perceptions of the DPIN system are associated with a greater proportion of Indian Affairs and Social Services prescriptions submitted to DPIN."*

The proportion of Indian Affairs and Social Services prescriptions submitted to DPIN by all pharmacists working in each pharmacy sampled was determined; however, data was not available to determine the proportion of prescriptions submitted by individual pharmacists. In order to test the effects of pharmacist variables on the submission of prescriptions to DPIN, using a pharmacy and not a pharmacist-specific proportion submitted, categorization of pharmacies by the characteristics of their employees was required. For example, pharmacies would be defined as predominantly male or female, or employing pharmacists licensed after the 1980's or before. In addition to reducing the overall sample size to test Hypothesis IV, this process would have resulted in gross categorization of pharmacies and unbalanced comparisons.

In addition, the proportion of Indian Affairs (mean=0.78, median=0.9, mode=1) and Social Services (mean=0.87, median=0.96, mode=1) prescriptions submitted to DPIN by individual pharmacies followed a bimodal distribution which could not be transformed into a normal distribution, required for linear regression. (see Figure 8) However, the bimodal distribution was utilized to divide pharmacies into high or low prescription submitters. Pharmacies were defined as high submitters if the proportion of prescriptions

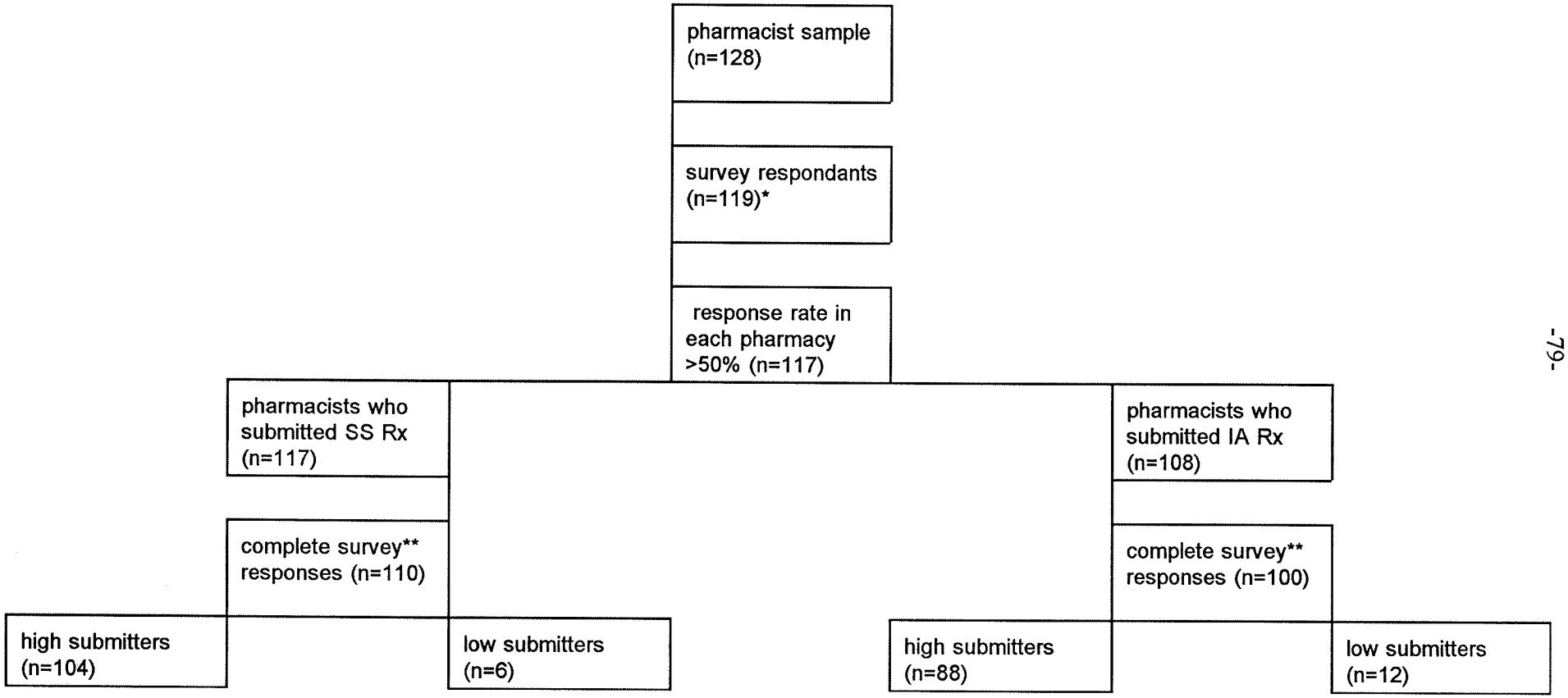
Figure 8. Frequency Distribution of the Proportion of Indian Affairs (IA) and Social Services (SS) Prescriptions (Rx) Submitted to DPIN



submitted to DPIN was $\geq 0.6$, and low submitters if the proportion submitted fell below 0.4. Individual pharmacists assumed the classification of the pharmacies in which they were working. This classification of pharmacists was justified by considering the number of pharmacists who submitted study prescriptions in each pharmacy and the actual proportions of prescriptions submitted. Low submitter pharmacies either did not submit any prescriptions to DPIN, or were staffed by only one pharmacist on the study days, in which case the proportion of prescriptions submitted was the actual proportion submitted by that pharmacist. The same arguments held true for high submitter pharmacies which were staffed by only one pharmacist or submitted all of their prescriptions to DPIN. In the remaining high submitter pharmacies, 11 out of 15 pharmacies submitted $\geq$ 80% of Indian Affairs prescriptions, and 23 out of 24 pharmacies submitted $\geq$ 80% of Social Services prescriptions dispensed. Because of the high rate of submission in these pharmacies, it was considered unlikely that individual pharmacists would submit less than 60% of prescriptions they dispensed, the lower boundary for the definition of a high prescription submitter. The possibility that pharmacists working in the 5 high submitter pharmacies which submitted less than 80% of prescriptions, themselves submitted less than 60% of prescriptions, remained.

Fourteen pharmacists who worked in nine pharmacies were defined as low submitters of Indian Affairs prescriptions, and seven pharmacist who worked in five pharmacies were designated low submitters of Social Services prescriptions. Pharmacists variables such as gender, year of first licensure, number of years of hospital experience, belief that prescription submission was mandatory and DPIN Perception subscores, described in

## Figure 9. Account of the Number of Observations in Bivariate and Mulitvariate Analyses




* One pharmacist counted twice because he worked in two different pharmacies, SS=Social Services, IA=Indian Affairs, Rx=prescriptions

** Pharmacists with incomplete survey responses were excluded from bivariate and multivariate analyses because of missing values for independent variables. Five pharmacists did not respond to the question regarding DPIN submission requirements, 2 pharmacists did not specify the year that they were first licensed, 1 pharmacist did not document the number of years of practice in any pharmacy setting. The number of pharmacists who were high or low submitters varied in the bivariate analysis depending on the variable analyzed. (see Tables 13,14)

Chapter 9, were compared for low and high Indian Affairs and Social Services prescription submitters. The post-graduate education variable was excluded from the analysis, as only 2 pharmacists had post-graduate business degrees (MBA), which was not considered relevant to the hypothesis. One pharmacist, defined as a low Indian Affairs submitter, who refused to participate in the survey, and an additional pharmacy (two pharmacists) with a <50 % survey response rate, were excluded. Thus, pharmacist data were available for 117 pharmacists, although the number of observations for each variable varied from 110 to 117 because of missing responses to survey questions (see Figure 9).

Low and high DPIN submitters differed in terms of the proportion of pharmacists who believed that submission of all prescriptions was mandatory.(see Table 14) Among high Social Services prescription submitters, 71% of pharmacists believed that submission was required, not quite significantly higher than in the low submission group (33%). A similar proportion of pharmacists believed that submission was required among high Indian Affairs prescription submitters, but again this was not quite significantly higher than in low submitters (46%). The border-line significance of these findings may have resulted from the loss of 5 observations due to pharmacist non-response to the question on DPIN requirements. High Indian Affairs prescription submitters had significantly higher DPIN Professional scores, than did low Indian Affairs prescription submitters.(see Table 15) In addition, the mean number of years of hospital experience was significantly higher in high Social Services prescription submitters, than in low submitters. Separate testing of Hypothesis IV for staff pharmacists and managers was undertaken, but the analyses were too under-powered (only 3 pharmacists were classified as low submitters) to yield interpretable results.

Table 14. Differences in Pharmacist Characteristics Between High and Low Submitters of Social Services Prescriptions

| Unit of Analysis = PHARMACIST | HIGH Submitters (≥0.6)* (n=110) | LOW Submitters (<0.6) (n=7) |
|---|---|---|
| Proportion who were female | 43.6% | 28.6%, NS |
| Proportion Licensed after 1980's | 58.7% (n=109) | 28.6%, NS (n=6) |
| (mean year 1st licensed) | 1981 ± 11 | 1974 ± 16, NS |
| Proportion with Hospital Experience | 34.9% (n=109) | 42.9%, NS (n=7) |
| (mean years) | 2.1 ± 5.0 | 0.5 ± 0.8, t=2.82, p<0.007 |
| Proportion who Believed Submission Mandatory | 70.8% (n=106) | 33.3%, F-E, p<0.075 (n=6) |
| Mean Workload Per Pharmacist-hr | 4.8 ± 2.6 | 4.1 ± 1.2, NS |
| Median DPIN** Professional Score | 18 | 18, NS |
| Median DPIN Value Score | 17 | 18, NS |
| Median DPIN Systems Score | 13 | 12, NS |
| Median DPIN Environment Score | 13 | 16, NS |

* Prescription submission for the pharmacy in which pharmacist is working

** Kruskal-Wallis non-parametric test ($X^2$ approximation) used to compare median scores

Student t test used to compare mean values and Fisher Exact (F-E) Test used in place of Chi-square test to compare proportions where the cell size was < 5.

Table 15. Differences in Pharmacist Characteristics Between High and Low Submitters of Indian Affairs Prescriptions

| Unit of Analysis = PHARMACIST | HIGH Submitters (≥0.6)* (n=94) | LOW Submitters (<0.6) (n=14) |
|---|---|---|
| Proportion who were female | 46.8% | 28.6%, NS |
| Proportion Licensed after 1980's | 59.1% (n=93) | 57.1%, NS (n=13) |
| (mean year 1st licensed) | 1981 ± 11 | 1979 ± 12, NS |
| Proportion with Hospital Experience | 31.2% (n=93) | 50.0%, NS (n=13) |
| (mean years) | 1.6 ± 4.5 | 1.8 ± 2.9, NS |
| Proportion who Believed Submission Mandatory | 71.1% (n=90) | 46.2%, $X^2$=3.25, p<0.07 (n=13) |
| Mean Workload Per Pharmacist-hr | 4.6 ± 2.4 | 5.8 ± 3.4, NS |
| Median DPIN** Professional Score | 18 | 17, $X^2$=4.21, p<0.04 |
| Median DPIN Value Score | 17 | 16.5, NS |
| Median DPIN Systems Score | 13 | 11.5, NS |
| Median DPIN Environment Score | 13 | 14, NS |

* Prescription submission for the pharmacy in which pharmacist is working
** Kruskal-Wallis non-parametric test ($X^2$ approximation) used to compare median scores
Student t test used to compare mean values and Fisher Exact (F-E) Test used in place of Chi-square test to compare proportions where the cell size was < 5.

# Chapter Ten.

## The Relationship Between Voluntary Submission of Prescriptions, and Pharmacist & Pharmacy Factors

## 10.1 Logistic Regression Analysis of the Submission of Indians Affairs/Social Services prescriptions and Pharmacist/Pharmacy Variables

Relationships between the submission of Indian Affairs and Social Services prescriptions to DPIN, and pharmacist and pharmacy variables were studied further using logistic regression analysis. The average prescription workload, year of first licensure, numbers of years of hospital experience, and DPIN perception scores were entered as continuous variables. The dependent variable, submission of Indian Affairs/Social Services prescriptions to DPIN, was a dichotomous variable, as were the following independent variables: pharmacy neighbourhood, pharmacy type, gender, DPIN submission requirements. Dichotomous variables also replaced the continuous variables of year of first licensure and number of years of hospital experience, if they improved the fit of the regression model. Reference groups for dichotomous variables were: low prescription submission, Indian Affairs/Social Services pharmacy neighbourhoods, hospital-based pharmacy, male gender, belief that prescription submission was not mandatory, licensure before the 1980's, and no previous hospital experience.

The adequacy of the multivariate model was assessed both in terms of the individual variables in the model and of the overall fit of the model.[61] Logistic regression analysis was conducted for the full model, containing all the variables. Then the forward selection procedure, retaining the variables significantly associated with prescription submission in the bivariate analysis, was utilized to select the best model. Initially, a p value of 0.5 was

used as a screening criterion for variable selection in order to provide as complete control of confounding as possible. The overall fit of the model was evaluated by the Hosmer and Lemeshow Goodness-of-Fit test, and the Somer's D statistic for concordance.[62,63] Following the fit of the model, the importance of each variable remaining in the model was verified.[61] The Wald statistic for each variable, which assesses its contribution to the model, was examined. The coefficients of variables were compared with those in the full model, containing all the variables. Of concern, were marked changes in the coefficients, indicating that excluded variables were important in providing needed adjustment of the effect of the variables which remained in the model. The standard errors for the variables were examined for evidence of over-fitting in the model. The forward selection process was repeated, modifying the p value for variable entry into the model.

Correlational matrices for independent variables were inspected to determine the presence of multi-collinearity (see Tables 16-18) As expected, there were substantial correlations ($r \geq 0.5$) between the 4 pharmacy type variables (rural-independent, urban-independent, chain and hospital-based pharmacy), and between the continuous and categorical forms of the year of first licensure and years of hospital experience. However, only one form of the latter variables was employed in the regression analysis, and the pharmacy type variable was condensed to a dichotomous variable (rural-independent pharmacy versus non-rural-independent pharmacy) because of the better fit of models which contained the binary over the categorized form of this variable. Substantial correlations were also found

Table 16. Correlational Matrix for Pharmacy Characteristics (n=117)

| | Pharmacare Strata (=1,other=0) | Rural-independent pharmacy(=1,other=0) | Urban-independent pharmacy(=1,other=0) | Chain Pharmacy (=1,other=0) | Hospital Pharmacy (=1,other=0) | Prescription workload |
|---|---|---|---|---|---|---|
| Pharmacare strata (=1,other=0) | 1 | | | | | |
| Rural-independent pharmacy(=1,other=0) | x | 1 | | | | |
| Urban-independent pharmacy(=1,other=0) | x | -0.315 | 1 | | | |
| Chain pharmacy (=1,other=0) | x | -0.468 | -0.468 | 1 | | |
| Hospital pharmacy (=1,other=0) | -0.182 (x) | -0.198 | -0.198 | -0.295 | 1 | |
| Prescription workload | x | 0.345 | x | -0.313 | -0.203 | 1 |

Table 17. Correlational Matrix for Pharmacist Characteristics (n=117)

| | Female gender=1 | Year first licensed | Licensed ≥ 80's=1 | Yrs hospital experience | Hospital experience=1 | Professional score | Value score | Systems score | Environment score | Submission mandatory=1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Gender (female=1) | 1 | | | | | | | | | |
| Year 1st licensed | x | 1 | | | | | | | | |
| Licensed after 80's=1 | x | 0.824 | 1 | | | | | | | |
| Yrs hospital experience | x (0.239) | -0.203 | -0.254 | 1 | | | | | | |
| Hospital experience=1 | x | x | -0.226 (x) | 0.564 | 1 | | | | | |
| Professional score | x | x | x | x | x | 1 | | | | |
| Value score | x | x | x | x | 0.184 (x) | 0.302 | 1 | | | |
| Systems score | x | x | x | x | x | x | 0.508 | 1 | | |
| Environment score | x | x | x | x | 0.204 (x) | x | x | 0.481 | 1 | |
| Submission mandatory=1 | x | x | x | x | x | x | x | x | x | 1 |

x=Pearson correlation coefficient not significant ($p<0.05$). Correlation coefficients provided for Social Services prescription submitters; similar correlations were observed with Indian Affairs submitters (n=108), except where indicated in brackets.

Table 18. Correlational Matrix for Pharmacist and Pharmacy Characteristics of Social Services Prescritpion Submitters (n=117)

| | Pharmacare Strata (=1,other=0) | Rural-independent pharmacy(=1,other=0) | Urban-independent pharmacy(=1,other=0) | Chain pharmacy (=1,other=0) | Hospital pharmacy (=1,other=0) | Prescription workload |
|---|---|---|---|---|---|---|
| Gender (female=1) | x | -0.201 | x | x | 0.244 | x |
| Year first licensed | x | x | -0.222 | 0.189 (x) | x | x |
| Licensed after 80s=1 | x | x | -0.241 | x | x | x |
| Yrs hospital experience | x | x | x | -0.264 | 0.433 | x |
| Hospital experience=1 | x | 0.257 | x | -0.28 | 0.309 | x |
| Professional score | x | x | 0.183 | x | -0.29 | x |
| Value score score | x | x | x | x | x | x |
| Systems score | x | x | 0.176 (x) | x | x | x |
| Environment score | x | x | x | x | x | x |
| Submission mandatory=1 | 0.247 | x (-0.201) | x | x | x | x |

x=Pearson correlation coefficient not significant ($p<0.05$). Correlation coefficients provided for Social Services prescription submitters;similar correlations were observed for Indian Affairs submitters (n=108), except where indicated in brackets

among some of the DPIN perception score variables, but these were entered into the models and left to the forward selection process. Aside from these variables, the correlation matrices showed no evidence of collinearity among independent variables.

***Model for the Submission of Social Services Prescriptions by Pharmacists***

The Hosmer-Lemeshow Goodness-of-Fit statistic for the full model containing all the variables, indicated that the model was a good fit for the submission of Social Services prescriptions.(see Table 19) Similar to bivariate analysis, the submission of prescriptions was significantly lower in rural-independent pharmacies than in other pharmacies, and almost significantly higher among pharmacists who believed that submission was mandatory or who had more years of hospital experience. However, after statistically adjusting for other variables, the association with pharmacy neighbourhood and workload was no longer present.

A better fitting model (see Somer's D statistic in Table 19) was obtained by excluding the chain pharmacy, Professional score and gender variables, which had non-significant Wald statistics and/or were highly correlated with other variables. The pharmacy neighbourhood, pharmacy type, workload and belief that submission was mandatory variables were retained in this model. Associations between the independent variables and the dependent variable remained unchanged from the full model, with the exception that the association with belief that submission was mandatory was closer to a p value of 0.05.

Table 19. Logistic Regression for the Submission of Social Services Prescriptions by All Pharmacists: Comparison of the Full and Best Fit Models

| Variable | FULL MODEL β coefficient | Standard Error | $Pr>X^2$ | BEST FIT MODEL β coefficient | Standard Error | $Pr>X^2$ |
|---|---|---|---|---|---|---|
| Intercept | 7.0055 | 5.3718 | 0.1922 | 10.1504 | 4.8919 | 0.0380 |
| Pharmacy neighbourhood | -1.8175 | 1.7528 | 0.2998 | -1.4574 | 1.3316 | 0.2738 |
| Rural-indep pharmacy | -4.0574 | 1.8505 | 0.0283 | -3.9691 | 1.6829 | 0.0183 |
| Workload | 0.4389 | 0.3920 | 0.2629 | 0.2815 | 0.3510 | 0.4226 |
| Submission mandatory | 3.3126 | 1.8055 | 0.0666 | 3.0992 | 1.6237 | 0.0563 |
| Gender | -0.1952 | 1.4821 | 0.8952 | Excluded | | |
| Licensed after 80's | 0.9054 | 1.3931 | 0.5157 | 0.7681 | 1.3457 | 0.5682 |
| Yrs hospital experience | 1.3375 | 0.7737 | 0.0839 | 1.3732 | 0.7602 | 0.0709 |
| Professional score | 0.2826 | 0.3114 | 0.3642 | Excluded | | |
| Value score | -0.3877 | 0.2839 | 0.1721 | -0.2785 | 0.2192 | 0.2038 |
| Systems score | 0.1877 | 0.2183 | 0.3899 | 0.1891 | 0.1991 | 0.3422 |
| Environment score | -0.4804 | 0.4003 | 0.2301 | -0.4567 | 0.3521 | 0.1946 |
| Hosmer-Lemeshow Goodness-of-fit | 0.9051, 7 df ($p<0.9962$) | | | 1.7376, 7 df ($p<0.9729$) | | |
| Somer's D statistic | 0.901 | | | 0.913 | | |

* Pr= p value for the Wald chi-square statistic, with 1 degree of freedom

Expressed in terms of the likelihood of submission of Social Services prescriptions to DPIN, independent of other pharmacist and pharmacy variables, high prescription submission was only 2 out of 100 times as likely in pharmacists working in rural-independent pharmacies, than in other types of pharmacies.(see Table 21) High prescriptions submitters were 22 times more likely to be pharmacists who believed that submission was mandatory, than those that did not, and 4 times more likely to be pharmacists with more years of hospital experience.

***Model for the Submission of Indian Affairs Prescriptions by Pharmacists***

The Hosmer-Lemeshow Goodness-of-Fit for the full model containing all the variables, indicated that the model was also a good fit for the submission of Indian Affairs prescriptions.(see Table 20) Similar to bivariate analysis, the submission of prescriptions was significantly lower in rural-independent pharmacies than in other pharmacies, and almost significantly higher among pharmacists with higher Professional scores. After statistically adjusting for other variables, the association with pharmacy neighbourhood, workload and belief that submission was required had disappeared, but a new association had emerged. A higher Systems score was significantly associated with high prescription submission.

Retaining the pharmacy neighbourhood, pharmacy type, workload and belief that submission was mandatory variables, and excluding the chain pharmacy, Value score and

Table 20. Logistic Regression for the Submission of Indian Affairs Prescriptions by All Pharmacists: Comparison of the Full and Best Fit Models

| Variable | FULL MODEL β coefficient | Standard Error | $Pr>X^2$ | BEST FIT MODEL β coefficient | Standard Error | $Pr>X^2$ |
|---|---|---|---|---|---|---|
| Intercept | 0.2418 | 4.2632 | 0.0032 | 0.1658 | 4.2584 | 0.0015 |
| Pharmacy neighbourhood | -0.9733 | 0.9135 | 0.2867 | -0.9583 | 0.8901 | 0.2817 |
| Rural-indep pharmacy | -2.7586 | 1.24 | 0.0261 | -2.8563 | 1.0189 | 0.0051 |
| Chain pharmacy | 0.3282 | 1.1883 | 0.7824 | Excluded | | |
| Workload | 0.0189 | 0.1569 | 0.9040 | 0.00673 | 0.1545 | 0.9653 |
| Submission mandatory | 0.6774 | 0.8945 | 0.4489 | 0.6021 | 0.8717 | 0.4898 |
| Gender | 0.0221 | 0.8925 | 0.9803 | Excluded | | |
| Year first licensed | -0.0178 | 0.0409 | 0.6639 | -0.0138 | 0.0393 | 0.7257 |
| Yrs hospital experience | -0.0836 | 0.0916 | 0.3612 | -0.0850 | 0.0807 | 0.2924 |
| Professional score | 0.2331 | 0.1291 | 0.0709 | 0.2557 | 0.1240 | 0.0392 |
| Value score | 0.0808 | 0.1538 | 0.5993 | Excluded | | |
| Systems score | 0.2366 | 0.1226 | 0.0536 | 0.2596 | 0.1147 | 0.0237 |
| Environment score | -0.2991 | 0.1874 | 0.1106 | -0.2471 | 0.1519 | 0.1039 |
| Hosmer-Lemeshow Goodness-of-fit | 6.4412, 8 df (p<0.5979) | | | 5.8334, 8 df (p<0.6659) | | |
| Somer's D statistic | 0.745 | | | 0.740 | | |

* Pr= p value for the Wald chi-square statistic, with 1 degree of freedom

gender variables, which had high p values and/or were highly correlated with other variables, yielded a good-fitting model, with a similar Somer's D statistic.(see Table 20) Associations between the independent variables and the dependent variable remained unchanged, with the exception that the association with the Professional score was now statistically significant.

Expressed in terms of the likelihood of the submission of Indian Affairs prescriptions to DPIN, independent of other pharmacist and pharmacy variables, high submission was only 6 out of 100 times as frequent among pharmacists working in rural-independent pharmacies, than in other types of pharmacies.(see Table 21) High prescription submitters were 1.3 times more likely to be pharmacists with higher, than lower Professional and Systems scores.

# Table 21. Multivariate Odds Ratios for High DPIN Prescription Submission by Pharmacist and Pharmacy Characteristics

| Study Variables (n=100) | Likelihood of IA Submission (Odds Ratios & CI) | Study Variables (n=110) | Likelihood of SS Submission (Odds Ratios & CI) |
|---|---|---|---|
| Rural - Independent pharmacy (p<0.005) | 0.06 (0.008-0.423) | Rural - Independent pharmacy (p<0.02) | 0.02 (0.001-0.51) |
| Systems score (p<0.02) | 1.30 (1.04-1.62) | Belief that submission mandatory (p<0.06) | 22.18 (0.92-535) |
| Professional score (p<0.04) | 1.29 (1.01-1.65) | Hospital experience (p<0.07) | 3.95 (0.89-17.52) |
| Controlling Variables | | Controlling Variables | |
| Pharmacy neighbourhood, workload, year 1st licensed, years of hospital experience, belief that submission mandatory, Environment score | | Pharmacy neighbourhood, workload, licensed after 80's, Environment score, Value score, Systems score | |

See Figure 9 for the number of observations included. Workload values for 4 pharmacies were imputed from strata averages.

# Chapter Eleven.

## Conclusions

This study has examined the validity and reliability of DPIN, the new prescription database in Manitoba, as well as several aspects which potentially affect the database's validity. The results of the analyses conducted will be discussed from a number of perspectives. Firstly, the validity and reliability of the DPIN database will be compared to that of other prescription databases. In the following section, the results from tests of Hypothesis II, III and IV will be interpreted to summarize pharmacist and pharmacy factors associated with the submission of prescriptions to DPIN. Next, limitations in the study design and the generalizability of findings will be considered. Lastly, the implications of study findings regarding the future use of DPIN in pharmacoepidemiologic studies and prospective drug utilization review will be addressed. Attempts will be made to explore the public health implications of the validity of DPIN and its use in detecting drug-related problems in the Manitoba population.

## 11.1 Validity of the DPIN Database

This study has demonstrated that the DPIN database contains 90% of prescriptions dispensed in Manitoba community pharmacies. The proportion of Pharmacare prescriptions found in the DPIN database (93%) was similar to the 94% reported for the Medicaid prescription claims database.[8] However, the DPIN database has differential validity in describing prescriptions dispensed for Indian Affairs and Social Services recipients, for whom prescription submission is not linked to reimbursement. The

proportions of prescriptions submitted to DPIN was significantly lower for Indian Affairs (79.7%) and Social Services (90.1%) prescriptions. The study had sufficient power ($\alpha$=0.05, one-sided, $\beta$=0.05) to detect this difference. The 3% difference in the submission of Social Services and Pharmacare prescriptions may not be relevant, but the 10% difference between the proportions for Indian Affairs and Pharmacare recipients indicates that the DPIN database under-represents prescriptions dispensed for treaty status Indians. It should be noted however, that even at 80% capture of prescriptions dispensed for treaty status Indians, the DPIN database contains prescription information on a population excluded by other databases, such as the Saskatchewan prescription database.[22]

With the exception of medical supplies, and non-prescription drugs such as non-codeine containing analgesics and cough and cold preparations, the proportion of prescriptions submitted did not differ across drug classes in theDPIN database. These results are similar to the > 90% completeness reported for various drug classes in the Group Health Cooperative of Puget Sound prescription database.[15] Despite the view held by some of the pharmacists surveyed that prescriptions for codeine-containing analgesics and benzodiazepines for treaty status Indians are not submitted by certain pharmacies, the submission of these drug classes was not lower than the submission of drugs in other drug classes.

The reliability of Pharmacare prescription data in DPIN was high. Ninety-two (92%) of Pharmacare prescriptions claims matched the original prescription with respect to the drug

name and strength, days supply and quantity. The same accuracy of prescription data has been reported for the RAMQ database where 94% of prescriptions in the database matched original prescriptions with respect to the drug name and prescriber.[17] The results are also compatible with the 9.5% error rate in computer entry of prescription data detected in a random sample of prescriptions dispensed in 2 pharmacies in the United States.[64] Missing/incorrect directions for use accounted for the majority of prescription errors. Unfortunately, data access restrictions in this study precluded the evaluation of original prescription data for the purposes of identifying the reasons for the discrepancies between original prescription and DPIN data .

## 11.2 Factors which may Affect the Validity of DPIN in Describing Indian Affairs/Social Services Prescriptions

The completeness of the DPIN prescripton database for Indian Affairs and Social Services recipients was found to be associated with specific pharmacist and pharmacy factors in multivariate models which included most of the factors measured in the study. The likelihood of high submission ($\geq$ 60%) of Indian Affairs and Social Services prescriptions was practically non-existant (OR: 0.02-0.06) in pharmacists who worked in rural independent pharmacies. High submission of Social Services prescriptions was 4 times more likely in pharmacists with previous hospital experience, and dramatically more likely (OR:22) among pharmacists who believed that submission was mandatory. Pharmacists

who submitted more than 60% of Indian Affairs prescriptions were 1.5 more likely to believe that drug utilization review was important or that DPIN functioned well.

***Pharmacy Environment Factors***

The finding that, independent of other situational or pharmacist factors, submission of Indian Affairs and Social Services prescriptions by rural independent pharmacies was significantly lower, was noteworthy. It contrasts the findings of others which show that independent pharmacies provide more professional services, than their chain pharmacy counterparts.[34,35] In addition, one might have expected this association to disappear in multivariate analyses where variation in pharmacy workload was adjusted, because prescription workload was found to be higher in rural independent pharmacies. A possible explanation for this finding is that the training of rural independent pharmacists on the DPIN system was not comprehensive. There was some support for this explanation in the study results. A low DPIN Systems score, which included a question with respect to training on the DPIN system, was predictive of low submission of Indian Affairs prescriptions, but this was independent of the type of pharmacy. A low DPIN Systems score was moderately correlated with the status of being an rural independent pharmacy for submitters of Social Services prescriptions. Probably the most revealing evidence, was that the majority of written comments about lack of training were made by rural pharmacists.

Similar to pharmacist reports that participation in prospective drug utilization review is time-consuming,[39] pharmacists in this study identified pharmacy workload as a barrier to the use of DPIN. Indeed, bivariate analysis showed that prescription submission was lower in high, rather than low prescription workload pharmacies. However, when other pharmacist and pharmacy variables were adjusted for in multivariate analyses, prescription workload was no longer significantly associated with prescription submission. In addition, the Environment score, which included a measure of pharmacist impressions of prescription workload, was not associated with prescription submission. Therefore, despite pharmacist impressions that DPIN was time-consuming, other factors were ultimately more important in predicting prescription submission. In this study, the other factors were related to working in a rural independent pharmacy.

Difficulty in obtaining client Personal Health Identification Numbers (PHIN's) was also recognized as a barrier to the use of DPIN by surveyed pharmacists; some pharmacists noted that it was especially difficult to obtain PHIN's from aboriginals and persons living in the core of the Winnipeg. Difficulty in obtaining client PHIN's was the basis for the hypothesis that prescription submission would be lower in pharmacies whose clientele was predominantly treaty status Indians and social assistance recipients. In bivariate analyses, this hypothesis was confirmed for the submission of Social Services prescriptions, and of Indian Affairs prescriptions, following re-classification of pharmacies. As with prescription workload, the pharmacy neighbourhood variable was no longer significant in multivariate analyses. This suggests that other pharmacy and pharmacist factors were responsible for

the association between prescription submission and pharmacy neighbourhood, and independent of these factors pharmacy neighbourhood was not important. Increased submission of prescriptions in Pharmacare neighbourhood pharmacies may be explained by the association between belief that submission was mandatory and Pharmacare neighbourhood, or by other factors which were not measured in this study.

Two questions addressing the issue of missing client PHINs were included in the questionnaire, but only one of these questions was retained in the DPIN Environment score because of its poor correlation with any of the DPIN perception subscales. No association was found between the Environment score and prescription submission, but the Environment score may have been a poor measure of the difficulty in obtaining PHIN's. On the other hand, the Systems score may have provided a measure of the difficulty in obtaining client PHIN's, as many pharmacists referred to the lack of "training" of the public on the DPIN system. Low submission of Indian Affairs, but not Social Services prescriptions, was more likely in pharmacists with a low Systems score.

***Pharmacist Factors***

Sixty-eight percent of pharmacists believed that submission of all prescriptions to DPIN was mandatory. This was not surprising as pharmacists were given the impression that submission was mandatory by statements which appeared in the DPIN instruction manual, even though the submission of non-Pharmacare prescriptions had not been legislated prior

to this study. Pharmacists were informed in the DPIN instruction manual that "every prescription dispensed by a pharmacy for a Manitoba resident must be recorded in DPIN," and that the Pharmaceutical Act was being amended to include this legislation.[7] In addition, some pharmacies had internal policies regarding the mandatory submission of all prescriptions. Belief that submission was mandatory was indeed associated with higher prescription submission. However, this belief remained a significant predictor for the submission of Social Services prescriptions in multivariate analyses, but not for Indian Affairs prescriptions. An interpretation of this difference could be that, although pharmacists believed that submission was mandatory for Indian Affairs prescriptions, situational factors such as difficulty in obtaining client PHIN's prevented them from submitting prescriptions.

Very few pharmacist characteristics were associated with prescription submission. Because drug utilization review is commonly practised in the hospital pharmacy setting and because there has been an increased emphasis on drug utilization review in pharmacy undergraduate education since the 1980's,[25,57] an association between prescription submission and year of first licensure or hospital work experience was anticipated. Both of these variables were retained in the multivariate models, but independent of other pharmacist and pharmacy factors, hospital work experience was a predictor of the submission of Social Services, but not Indian Affairs prescriptions. More recent graduation was not a significant variable in either of the analytic models. These findings suggest that the work environment may be a more important predictor of pharmacist

behaviour. It may be also that the DPIN Professional score was a more direct measure of pharmacist attitudes towards drug utilization review. Higher submission of Indian Affairs prescriptions was more likely in pharmacists with a higher DPIN professional score. Other studies have also reported that recent licensure did not remain a significant predictor of pharmacist behaviour, after the work setting and pharmacist beliefs had been controlled in regression analyses.[35] A final explanation of the lack of association between prescription submission and pharmacist characteristics, found by others to be predictive of pharmacy professional behaviour,[35] is that the submission of prescriptions to DPIN is an activity which is quite different from other pharmacist activities, such as patient counselling.

The demonstration of an association between pharmacist perceptions of DPIN and prescription submission underlies the importance of measuring pharmacist attitudes. Other studies have also shown that pharmacist perceptions were important predictors of pharmacist professional behaviour in multivariate analysis which included pharmacist demographic or pharmacy environment variables.[35,40] The recent Canadian Community Pharmacist Intervention Study (CPIS) attributed the small proportion of variation in pharmacist intervention rates explained by situational factors to the fact that pharmacist attitudes were not measured. This was considered good news for the authors of the CPIS study which viewed pharmacist attitudes as more amendable to change.[65] The results of this study can be similarly viewed. The pharmacy clientele or type of pharmacy ownership may be difficult to change, but pharmacist attitudes towards drug utilization review or how the DPIN system works can be modified.

## 11.3 Study Limitations and Methodologic Issues

### *Assessment of Selection Bias*

Survey non-response is a potential source of selection bias. Although the survey response rate was very high, non-responders were mainly pharmacists who worked in pharmacies located in urban Indian Affairs neighbourhoods and might have had quite different perceptions of the DPIN system. The association between pharmacist characteristics and/or perceptions of DPIN, and prescription submission would only be biased if non-response was related to both the dependent and independent variable.[66] That is, it would be biased if non-responders were less likely to submit prescriptions, and more likely to have high DPIN perception scores or to believe that submission was mandatory, or less likely to work in rural independent pharmacies, and vice versa. All of the non-responders worked in urban pharmacies, and 8 out of 9 of these pharmacists worked in pharmacies which submitted a high proportion of prescriptions. This suggests that including these individuals in the study would have not changed the findings, and would have strengthened the relationship between low prescription submission and working in a rural independent pharmacy.

The one non-responder who did in fact, submit a low proportion of Indian Affairs prescriptions, also had reservations about the DPIN system. Again, including this individual in the study would have contributed to the association between poor DPIN

perceptions and low prescription submission. No conclusion can be made with respect to the perceptions of the DPIN system of the other non-responders who worked in pharmacies which submitted a high proportion of prescriptions. If these non-respondents did have poor perceptions of the DPIN, their inclusion with 100 other high prescriptions submitters would likely not have changed study findings. Therefore, non-response did not bias the association between low prescription submission and working in a rural independent pharmacy, and likely did not contribute to bias in the associations with pharmacist perceptions of DPIN.

***Assessment of Information Bias: Measuring the Dependent Variable***

A major limitation of this study is that the number of Pharmacare prescriptions dispensed in pharmacies could not be enumerated to provide a precise measure of the proportion of Pharmacare prescriptions submitted to DPIN. Consequently, an estimate of this proportion was obtained from data on the total number of prescriptions and the number of other types of prescriptions dispensed. Although a sensitivity analysis was conducted to establish a range of proportions, this proportion may have been further under-estimated, in which case the difference in proportions of prescriptions submitted for Social Services and Pharmacare recipients would have been greater, or over-estimated, with the possibility that the submission of Pharmacare prescriptions was no different from that of Indian Affairs prescriptions.

The proportion of Indian Affairs and Social Services prescriptions, and the overall proportion of prescriptions submitted to DPIN, was based on the actual number of prescriptions dispensed and submitted to DPIN. In order to do so, it was necessary to collect prescription data from 3 different sources: the DPIN prescription database, Indian Affairs and Social Services prescription claims, and pharmacy computer records. The prescription number issued by the pharmacy computer system at the time of dispensing was used to link prescription data in the DPIN database to prescription data from Indian Affairs/Social Services claims or Pharmacare original prescriptions. Thus, there existed 3 possible sources of error in the determination of the proportion of prescriptions submitted to DPIN.

Firstly, the capture of Social Services prescription claims during the abstraction process may have been incomplete. Unlike Indian Affairs and Pharmacare prescription claims, Social Services prescription claims were submitted manually by pharmacies to Manitoba Family Services and Winnipeg Social Services as computer print-outs of prescriptions dispensed for persons eligible for coverage by these drug benefit plans. It was hypothesized that all prescriptions claims for Social Services recipients would be submitted to the drug benefit programs because reimbursement for these prescriptions was 100%. However, because submitted claims were filed manually by Manitoba Family Services and Winnipeg Social Services, there existed the possibility that misfiled claims were omitted during data abstraction, with the potential of under-estimating the proportion of Social Services prescriptions submitted.

Secondly, prescription mismatch may have occurred as a result of differences between the format of the pharmacy-issued and DPIN prescription number. The prescription number data field in the DPIN database captures 9 digits of a pharmacy computer-issued prescription number.[7] In some pharmacy computer systems this resulted in the automatic addition of leading zeros or leading '001's to prescription numbers which were less than 9 digits in length. In addition, some pharmacies issued new prescription numbers for repeat prescriptions, while others retained the original prescription number. Both original and new prescription numbers were found in the DPIN database. In an attempt to ensure that the format of prescription numbers for individual pharmacies was the same from all data sources, prescription numbers from all sources were manually reviewed and changes in the format made prior to the comparison of prescription numbers. Comparisons were made with both the original and new prescription number documented in DPIN. Despite all these measures taken, it was still possible that prescription mismatch occurred, leading to under-estimation of the proportion of Indian Affairs and Social Services prescriptions submitted.

Thirdly, statistics reported by pharmacies for the total number of prescriptions dispensed could have also contributed to inaccuracies in the calculation of a estimate for the number of Pharmacare prescriptions submitted, as well as the estimate of all prescriptions submitted. These statistics were obtained from a manual count of the number of prescriptions dispensed, with the possibility of under-estimation due to misfiled prescriptions, or from pharmacy computer reports of the number of prescriptions

dispensed. The use of pharmacy computer reports may have resulted in over-estimation of the number of prescriptions dispensed in situations where prescriptions were dispensed on one day, but due to DPIN system problems were submitted to DPIN the following day.

The aforementioned study limitations have implications for testing Hypothesis I, but do not bias the associations between prescription submission and pharmacist/pharmacy variables because these were not tested across prescription drug benefit plan status. However, the classification of pharmacists as high or low prescription submitters of Social Services and Indian Affairs prescriptions, as described in Chapter 10, may have contributed to information bias. Setting the threshold for high prescription submission at 60% resulted in the correct classification of low prescription submitters, but it is possible that some pharmacists were misclassified as high submitters. This could have biased the association away from the null, in favour of current findings, when in fact there were no differences in pharmacist/pharmacy factors between high and low submitters.

In other words, the present study's method of defining pharmacists as low or high prescription submitters was specific, but not sensitive in classifiying low prescription submitters, and sensitive, but not specific in classifiying high prescription submitters. This was justified on the basis that it was important to accurately characterize low prescription submitters for the purpose of identifying factors which could be modified to improve prescription submission. However, insights can be gained from replicating the multivariate analysis using different thresholds for high prescription submission.

**Assessment of Information Bias: Measuring Independent Variables**

Misclassification of some of the independent variables due to an inability to measure them directly may have also contributed to information bias. Data on the number of prescriptions dispensed in pharmacies for each type of drug benefit recipient did not exist *a priori*, and the sociodemographics of the pharmacy neighbourhood was used as a proxy measure of the pharmacy's clientele. This proxy measure was used to stratify pharmacies for the purposes of sampling pharmacies according to their clientele. Some mis-representation of pharmacy clientele resulted when pharmacy neighbourhoods were defined by the sociodemographics of Forward Sortation Areas (FSA). Using a neighbourhood income of < $30,000 may have over-represented the proportion of social assistance recipients residing in FSA's. The proportion of the population in FSA's who were treaty status Indians may have been under-estimated because the Manitoba Health Services Commission registry has not been updated to enumerate the increased number of treaty status Indian registrations which occurred following the 1985 Bill C-31 ammendment to the Indian Act.[67] In addition, misclassification may have occurred when individual 6-character postal areas in close proximity to a pharmacy were described by different sociodemographics, than the FSA in which they were located. For example, towns located in rural FSA areas with a large population of treaty status Indians, may themselves not contain a large population of treaty status Indians.

Characterization of pharmacy neighbourhoods, and thus of pharmacy clientele, could have been more accurate if it was based on pharmacy catchment areas determined for each pharmacy. This could have been achieved by calculating distances between pharmacy postal code areas and other postal code areas, and defining pharmacy catchment areas as all 6-character postal codes areas within a certain distance from the pharmacy.[68] However, without knowing the addresses of clients who visit pharmacies, pharmacy catchment areas will always misclassify pharmacy service neighbourhoods to some extent. For example, two of the five study pharmacies located in grocery stores which potentially service a larger area than the surrounding neighbourhoods, were misclassified. The fact that misclassification of pharmacy neighbourhoods did change the direction of the association between submission of Indian Affairs prescriptions and pharmacy neighbourhood, alerts the reader to the limitations of using Forward Sortation Areas to classify pharmacy clientele. Although pharmacy neighbourhood was not ultimately a predictor of the submission of prescriptions to DPIN, the misclassification had the potential to alter the results of the multivariate analysis.

## 11.4 Generalizability of Study Findings

### *Representativeness of Study Prescriptions*

Stratification and blocking of pharmacies by the sociodemographics of their neighbourhoods, ownership type and location ensured balanced comparisons of prescriptions dispensed. Nonetheless, this sampling design has ramifications for the generalizability of the study in terms of how representative the study sample was of prescriptions dispensed in Manitoba. Study pharmacies were representative of all Manitoba pharmacies with respect to ownership type and location. Although corrections were made for the over-sampling of Indian Affairs, and under-sampling of Pharmacare pharmacies, the proportion of Indian Affairs prescriptions was greater, and the proportion of Pharmacare prescriptions was lower in the study, than in the population. However, the accuracy of data used to determine the proportion of Indian Affairs, Social Service and Pharmacare prescriptions in the population can be questioned.

Annual statistics for the number of Indian Affairs, Social Services and Pharmacare prescription claims were provided by the individual drug benefit programs and summed to compute the population total. Statistics for the number of Pharmacare and Indian Affairs prescription claims were based on electronic prescription data, but statistics provided by the Manitoba Family Services and Winnipeg Social Services drug benefit programs were derived from manual claims. Thus, it is possible that the population of

Social Services prescription claims was under-estimated. Some support for the under-estimation of Social Services prescription claim totals is the fact that the proportion of Social Services claims in the study was greater than in the population, yet Social Services pharmacies were proportionately sampled. Correction for the under-estimate in the population number of Social Services prescription claims should yield a study sample representative of prescriptions dispensed in Manitoba. In fact, it can be argued that the study provided a more accurate estimate for the number of prescriptions claims that did statistics from the individual drug benefit plans.

***Representativeness of Study Pharmacists***

The sampling design would have also resulted in the selection of pharmacists stratified and blocked by the sociodemographics of pharmacy neighbourhoods, and pharmacy ownership type and location. Thus, the generalizability of study results also needs to be addressed in terms of how representative the study sample was of the population of Manitoba pharmacists. Study pharmacists were very similar to the population of Manitoba pharmacists with respect to gender and year of first licensure. The use of these characteristics in bivariate and multivariate analyses would ensure representation of all Manitoba pharmacists. On the basis of a high sampling fraction (0.18) and very high survey response rate in this study, it can be assumed that other pharmacist characteristics or perceptions of the DPIN system obtained from surveyed pharmacists are generalizable to all Manitoba pharmacists.

The effect of non-response on bias has already been discussed, and now its effect on generalizability will be considered. Although non-participant pharmacists worked in urban pharmacies, the association between prescription submission and pharmacy type was the same in non-respondents as in respondents. The association between low prescription submission and poor DPIN perceptions in one of the non-respondents was also similar to that found in study participants. No definite conclusions can be made for the remainder of non-respondents, but following previous arguments, study findings would not have been affected by any differences in DPIN perceptions of these non-responders. Thus, it appears that study findings can be applied to survey non-responders, as well.

***Generalizability to Drugs Taken by Manitobans***

Having concluded that study results are generalizable to all Manitoba pharmacists and the prescriptions they dispense, there are populations for which the validity and reliability of the DPIN prescription database is not applicable. Study results cannot be extrapolated to pharmacies which dispense very few Pharmacare prescriptions, as these were excluded from the study sample. Study results are also not generalizable to prescriptions dispensed in institutions not linked to DPIN such as nursing stations in northern Manitoba, or dispensing physicians. Nor is the proportion of prescriptions submitted to DPIN for treaty status Indians representative of prescriptions submitted for non-treaty status Indians or the Metis, who may be receiving Social Services, Pharmacare or other prescription benefits.

Most importantly, this study does not represent the validity and reliability of the DPIN prescription database in measuring drugs actually taken by Manitobans. One of the criticisms of the use of prescription databases is that they do not provide accurate information on the duration and timing of drug exposure.[69] Data obtained from home interviews have shown that only 73% of medications currently consumed by individuals matched pharmacy records of recently dispensed prescriptions with respect to the drug name, strength and directions for use.[70] The main reasons for the discrepancy were continuation of a previously discontinued drug, discontinuation of a drug with remaining refills, and alterations in the directions for use by the patient. When all prescriptions dispensed in the past 6 months were compared to a person's drug list, the match was nearly 100%.

The DPIN prescription database may be a more accurate source of information on cumulative use, or past drug use where the accuracy of self-reports of drug use is hampered by poor recall or recall bias.[15] A comparison of self-reported prescription drug exposure with prescription records in the GHC of Puget Sound database showed that agreement on any NSAID use was 60%, but fell to 15% for drug name and dose.[71] Recall accuracy for drug name decreased by half when the interval between the study interview and when the drug was last dispensed increased from recent use to greater than 7 years. Thus, the validity and reliability of the DPIN prescription database has direct relevance for the measurement of past drug exposure.

## 11.5 Implications of Findings

### *Future Pharmacoepidemiologic Research*

The use of an incomplete prescription database in pharmacoepidemiologic studies may lead to errors in the measurement of drug exposure. In descriptive studies, use of the DPIN prescription database may lead to an under-estimate of population drug exposure. In analytic studies, in which the relationship between drug exposure and disease is tested, the outcome of this measurement error will be a discrepancy between the relative risk and the true value of an association between drug exposure and disease. In the case of a non-differentially invalid prescription database which under-represents drug exposure in all populations, the point estimate will be biased downward or the relative risk will be biased toward the null, with the potential for bias increasing as the drug exposure becomes less prevalent.[72] It is also possible that non-differential under-reporting of drug exposure may bias the relative risk away from the null, or may cause the point estimate to change direction when drug exposure is polychotomous, ie never, some or frequent use of a drug.[73] A prescription database which had differential validity for drug exposure among different populations, as was documented for the DPIN database, may cause the point estimate to be biased upward or downward, or the relative risk to be biased toward or away from the null. However, if the degree of incompleteness of the prescription database, according to population and type of drug can be ascertained, then compensatory corrections can be made to the point estimate.[72] Thus, the assessment of the proportion

of prescriptions submitted to the DPIN database for the three populations studied will enable correction of the under-reporting of drug exposure in future descriptive pharmacoepidemiologic research.

***Impact on Public Health***

An incomplete prescription database also has public health implications. At the time of dispensing of a prescription, pharmacists cannot be assured that they are looking at a complete medication history. This has implications for the ability of pharmacists to identify drug-related problems in their clients.[27] Studies have shown that pharmacists have detected drug therapy problems in 5% of all prescriptions dispensed in the community.[27] The percentage of prescriptions associated with drug therapy problems may be magnified in the treaty status Indians who may be at higher risk for drug-related problems. That this population is at risk for drug-related problems is evident in the high mortality rates due to poisoning and overdose, which are 5 times the national average.[13] Many of the pharmacists surveyed had referred to the native population as "abusers" of benzodiazepines and codeine-containing analgesics. One of the benefits of the DPIN system is that it alerts pharmacists at the time of dispensing, to duplicate drugs dispensed by other pharmacies. It is reassuring to know that this study showed that codeine-containing analgesics and anxiolytics were submitted with equal frequency to DPIN as were other drug classes.

There is some evidence that the drug management of diseases in the native population may be inadequate. The mortality and morbidity ratios for diabetes mellitus, infectious diseases, respiratory disorders and mental illness in the aboriginal population are 2 to 4 times as high as in the general population.[13,14] *A striking finding in this study was that treaty status Indians are prescribed 2 to 3 times the number of medications than non-native persons.* This poly-pharmacy also places then at risk for drug-related problems. However, mis-management may also include under-prescribing, as suggested by study results of lower antidepressant prescribing among treaty status Indians than social assistance recipients, despite the high incidence of mental disorders in the former population.[13] The risk of drug-related problems in aboriginals will continue as the incidence of diseases which require chronic drug treatment, such as diabetes and its cardiovascular and renal complications, increases.[14,74] In addition, the increased incidence of infectious diseases, such as tuberculosis, will continue to require treatment with antibiotics, potentially with multiple drug regimens, if antibiotic resistance becomes a problem.[14] Non-compliance with these regimens, which can be monitored with the use of DPIN, has broad public health implications.

***Translation of Results into Policy***

Results of this research have definite policy implications with respect to improving the completeness of the database. In the interests of public health, complete submission of prescriptions to the DPIN system should be legislated, similar to mandatory reporting of

certain communicable diseases. The higher submission of prescriptions by pharmacists who believed that submission was mandatory supports this policy decision. Mandatory submission, legislated by the licensing body of pharmacists in Manitoba, would be time consuming and costly to enforce, as it would involve auditing at the pharmacy level. A more practical approach to mandatory submission is to link submission with financial reimbursement, as with Pharmacare prescriptions. Since the completion of this study, submission of Manitoba Family Services prescriptions has become mandatory for reimbursement purposes. The submission of Indian Affairs and Winnipeg Social Services prescriptions remains voluntary, as does the submission of prescriptions for other drug benefit programs.

Financial reimbursement for prescriptions submitted electronically will not however, ensure a complete prescription database, as drug benefit plans continue to de-list drugs from their formularies, and as more prescription drugs achieve over-the-counter status.[75,76] Some of this was evident in the high proportion of over-the-counter products not submitted to DPIN. In addition, with Pharmacare drug program changes to eligibility criteria and increases in client deductible which came into effect April 1996, it is conceivable that the submission of Pharmacare prescriptions to DPIN will decrease in the future.[77] Therefore, financial reimbursement should be tied with other incentives which encourage pharmacists to submit prescriptions to DPIN.

Incentives to encourage pharmacist submission of prescriptions to DPIN should identify with factors associated with prescription submission in this study. Prescription submission was more likely in pharmacists with higher Professional scores, that is, in pharmacists who recognized the importance of the drug utilization review to their professional practice. Here we see a big role for pharmacy educators in shaping the practice of future pharmacists. Instruction on drug utilization review should be part of the pharmacy undergraduate curriculum and opportunities for participation in drug utilization reviews should be provided during on-site practical training of pharmacy students. The responsibility of pharmacy educators in promoting drug utilization review cannot be over stated. The end result of education will not only lead to increased submission of prescriptions to DPIN, but equally as important, to pharmacist use of DPIN prescription information for prospective drug utilization review.

Educating pharmacists to adopt drug utilization review into their practice will not improve the completeness of the DPIN database if the pharmacy work environment is not conducive to pharmacist participation in DPIN. It was apparent from the increased likelihood of prescription submission with a higher Systems score, which measured pharmacist impressions of DPIN functionality, as well as numerous written comments from pharmacists addressing the same issue, that a user friendly system, relevant to client needs, would enhance prescription submission. Included in this system should be a mechanism for obtaining client PHIN's which does not rely on clients presenting their PHIN's to the pharmacist. Pharmacist access to a computerized registry of client names

and PHIN's should be considered. Thus, implementation of any incentives would entail a multi-sectoral approach, involving administrators of the DPIN system, as well as pharmacy educators.

## 11.6 Conclusion

This study was undertaken to establish the validity and reliability of the DPIN prescription database in describing prescriptions dispensed in Manitoba. In addition, the study attempted to identify factors associated with the validity of DPIN in measuring prescriptions dispensed for treaty status Indians and social assistance recipients, for which submission to DPIN was not mandatory. The results have established that the validity and reliability of the DPIN prescription database for the mandatory submission of Pharmacare prescriptions is comparable to other established prescription databases. In addition, the DPIN database has equal validity for prescriptions dispensed for social assistance recipients. However, the DPIN database does not completely describe prescriptions dispensed for treaty status Indians.

These findings have important public health implications from two perspectives. The use of a prescription database which does not completely describe specific populations, in pharmacoepidemiologic studies will lead to biased results, with the potential for translation into public policy. Secondly, the use of DPIN's prospective drug utilization

review capabilities by pharmacists may lead to omissions in their ability to detect drug-related problems in a population which is already at risk for drug-related problems. Given the high costs of drug-related morbidity and mortality,[78] these consequences to the use of DPIN have a significant impact on the ability of the DPIN prescription database to improve the quality of pharmacotherapy and avert the costs of unnecessary health care utilization. At the same time, this study has identified factors which can potentially improve the completeness of the DPIN prescription database. Drug benefit plan administrators, pharmacy licensing bodies and pharmacy educators have a public responsibility to examine these factors in order to ensure the future quality of the DPIN prescription database.

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# Appendices

**Appendix I. Exclusion of Pharmacies with Fewer Than 2 Standard Deviations of the Mean Number of Pharmacare Prescriptions in Each Pharmacy Strata**

| Forward Sortation Area (FSA) | Pharmacy | Mean No. of Prescriptions/day | Log Mean No. of Prescriptions/day | Excluded from Sample |
|---|---|---|---|---|
| **Indian Affairs-Rural Independent Pharmacy Strata** | | | | |
| R0C | 1 | 39 | 1.5911 | |
| R0C | 2 | 43 | 1.6335 | |
| R0C | 3 | 18 | 1.2553 | |
| R0C | 4 | 17 | 1.2304 | |
| R0C | 5 | 19 | 1.2788 | |
| R0C | 6 | 18 | 1.2553 | |
| R0C | 7 | 30 | 1.4771 | |
| R0C | 8 | 7 | 0.8451 | |
| R0C | 9 | 7 | 0.8451 | |
| R0B | 10 | 3 | 0.4771 | EXCLUDED |
| R0C | 11 | 80 | 1.9031 | |
| R0C | 12 | 35 | 1.5441 | |
| R0C | 13 | 44 | 1.6435 | |
| Mean No. of Prescriptions | | 27.69 | 1.3061 | |
| Standard Deviation | | 20.13 | 0.3791 | |
| Minus 2 Standard Deviations | | | 0.5479 | |
| **Indian Affairs-Urban Independent Pharmacy Strata** | | | | |
| R2W | 1 | 7 | 0.8451 | |
| R3B | 2 | 7 | 0.8451 | |
| R2W | 3 | 4 | 0.6021 | |
| R3A | 4 | 6 | 0.7782 | |
| R3A | 5 | 0.4 | -0.3979 | EXCLUDED |
| R2W | 6 | 19 | 1.2788 | |
| R2W | 7 | 0.9 | -0.0458 | |
| R3B | 8 | 17 | 1.2304 | |
| R3A | 9 | 5 | 0.6990 | |
| R3B | 10 | 6 | 0.7782 | |
| R3A | 11 | 48 | 1.6812 | |
| R2W | 12 | 44 | 1.6435 | |
| R9A | 13 | 59 | 1.7709 | |
| R2W | 14 | 12 | 1.0792 | |
| R3B | 15 | 37 | 1.5682 | |
| R3B | 16 | 3 | 0.4771 | |
| R2W | 17 | 22 | 1.3424 | |
| Mean No. of Prescriptions | | 17.49 | 0.9515 | |
| Standard Deviation | | 17.81 | 0.5804 | |
| Minus 2 Standard Deviations | | | -0.1771 | |

**Indian Affairs-Urban Chain Pharmacy Strata**

| | | | |
|---|---|---|---|
| R0C | 1 | 53 | 1.7243 |
| R2W | 2 | 78 | 1.8921 |
| R2W | 3 | 152 | 2.1818 |
| R3B | 4 | 37 | 1.5682 |
| R9A | 5 | 35 | 1.5441 |
| Mean No. of Prescriptions | | 71 | 1.7821 |
| Standard Deviation | | 43.33 | 0.2356 |
| Minus 2 Standard Deviations | | | 0.3108 |

**Social Services-Rural Independent Pharmacy Strata**

| | | | |
|---|---|---|---|
| R0J | 1 | 68 | 1.8325 |
| R0L | 2 | 14 | 1.1461 |
| R0L | 3 | 33 | 1.5185 |
| R0J | 4 | 35 | 1.5441 |
| R0J | 5 | 53 | 1.7243 |
| R0L | 6 | 25 | 1.3979 |
| R0J | 7 | 37 | 1.5682 |
| R0J | 8 | 80 | 1.9031 |
| R0J | 9 | 29 | 1.4624 |
| R0J | 10 | 17 | 1.2305 |
| R0L | 11 | 58 | 1.7634 |
| R0L | 12 | 19 | 1.2788 |
| R0J | 13 | 19 | 1.2788 |
| R0J | 14 | 59 | 1.7709 |
| R0L | 15 | 45 | 1.6532 |
| R0L | 16 | 66 | 1.8195 |
| R6W | 17 | 49 | 1.6902 |
| R0L | 18 | 50 | 1.6990 |
| R0L | 19 | 16 | 1.2041 |
| Mean No. of Prescriptions | | 40.63 | 1.5519 |
| Standard Deviation | | 19.47 | 0.2315 |
| Minus 2 Standard Deviations | | | 1.0888 |

**Social Services-Urban Independent Pharmacy Strata**

| | | | | |
|---|---|---|---|---|
| R3C | 1 | 9 | 0.9542 | |
| R7A | 2 | 19 | 1.2788 | |
| R7A | 3 | 130 | 2.1139 | |
| R7N | 4 | 181 | 2.2577 | |
| R1A | 5 | 106 | 2.0253 | |
| R1A | 6 | 79 | 1.8976 | |
| R1A | 7 | 23 | 1.3617 | |
| R1N | 8 | 35 | 1.5441 | |
| R1N | 9 | 72 | 1.8573 | |
| R2C | 10 | 22 | 1.3424 | |
| R2L | 11 | 21 | 1.3222 | |
| R2H | 12 | 48 | 1.6812 | |
| R3G | 13 | 2 | 0.3010 | EXCLUDED |
| R3C | 14 | 13 | 1.1139 | |
| R7A | 15 | 98 | 1.9912 | |
| R2X | 16 | 30 | 1.4771 | |
| R3C | 17 | 1 | 0 | EXCLUDED |
| R2H | 18 | 3 | 0.4771 | |
| R2H | 19 | 36 | 1.5563 | |
| R7N | 20 | 25 | 1.3979 | |
| R1N | 21 | 17 | 1.2304 | |
| R3C | 22 | 7 | 0.8451 | |
| R3E | 23 | 32 | 1.5052 | |
| R3E | 24 | 25 | 1.3979 | |
| R3G | 25 | 20 | 1.3010 | |
| R3G | 26 | 7 | 0.8451 | |
| R3C | 27 | 55 | 1.7404 | |
| R3C | 28 | 56 | 1.7482 | |
| | | | | |
| Mean No. of Prescriptions | | 41.86 | 1.3773 | |
| Standard Deviation | | 42.21 | 0.5273 | |
| Minus 2 Standard Deviations | | | 0.3226 | |

**Social Services-Urban Chain Pharmacy Strata**

| | | | |
|---|---|---|---|
| R7A | 1 | 79 | 1.8976 |
| R2H | 2 | 131 | 2.1173 |
| R3E | 3 | 117 | 2.0682 |
| R1N | 4 | 78 | 1.8921 |
| R3G | 5 | 183 | 2.2625 |
| R7A | 6 | 125 | 2.0969 |
| R3L | 7 | 96 | 1.9823 |
| R7A | 8 | 50 | 1.6990 |

**Social Services-Urban Chain Pharmacy Strata cont'd**

| | | | | |
|---|---|---|---|---|
| R3C | 9 | 127 | 2.1038 | |
| R2H | 10 | 91 | 1.9590 | |
| R2G | 11 | 66 | 1.8195 | |
| R1N | 12 | 39 | 1.5911 | |
| R1N | 13 | 42 | 1.6232 | |
| R2H | 14 | 76 | 1.8808 | |
| R2G | 15 | 64 | 1.8062 | |
| R3C | 16 | 35 | 1.5441 | |
| R2G | 17 | 103 | 2.1028 | |
| R3C | 18 | 62 | 1.7924 | |
| R7A | 19 | 137 | 2.1367 | |
| R3G | 20 | 57 | 1.7559 | |
| R3C | 21 | 39 | 1.5911 | |
| R3L | 22 | 165 | 2.2175 | |
| R1A | 23 | 107 | 2.0294 | |
| R7A | 24 | 26 | 1.4150 | |
| R7N | 25 | 76 | 1.8808 | |
| R1N | 26 | 8 | 0.9031 | EXCLUDED |
| R7N | 27 | 4 | 0.6021 | |
| R7A | 28 | 18 | 1.2553 | |
| R2L | 29 | 5 | 0.6990 | |
| Mean No. of Prescriptions | | 76.07 | 1.7460 | |
| Standard Deviation | | 46.57 | 0.4173 | |
| Minus 2 Standard Deviations | | | 0.9259 | |

**Pharmacare-Rural Independent Pharmacy Strata**

| | | | |
|---|---|---|---|
| R0E | 1 | 103 | 2.0128 |
| R0M | 2 | 33 | 1.5185 |
| R0G | 3 | 80 | 1.9031 |
| R6M | 4 | 15 | 1.1761 |
| R0G | 5 | 24 | 1.3802 |
| R8A | 6 | 109 | 2.0374 |
| R0K | 7 | 31 | 1.4914 |
| R0M | 8 | 39 | 1.5911 |
| R0E | 9 | 46 | 1.6628 |
| R0K | 10 | 45 | 1.6532 |
| R0K | 11 | 76 | 1.8808 |
| R0G | 12 | 23 | 1.3617 |
| R8A | 13 | 36 | 1.5563 |
| R0K | 14 | 41 | 1.6128 |
| R0A | 15 | 15 | 1.1761 |

**Pharmacare-Rural Independent Pharmacy Strata cont'd**

| | | | | |
|---|---|---|---|---|
| R0E | 16 | 33 | 1.5185 | |
| R0A | 17 | 57 | 1.7559 | |
| R0M | 18 | 30 | 1.4771 | |
| R0K | 19 | 25 | 1.3979 | |
| R6M | 20 | 36 | 1.5563 | |
| R0M | 21 | 23 | 1.3617 | |
| R0M | 22 | 37 | 1.5682 | |
| R0A | 23 | 38 | 1.5798 | |
| R0G | 24 | 26 | 1.4150 | |
| R0E | 25 | 40 | 1.6021 | |
| R0G | 26 | 18 | 1.2553 | |
| R8A | 27 | 14 | 1.1461 | |
| R6M | 28 | 55 | 1.7404 | |
| R0A | 29 | 70 | 1.8451 | |
| R0A | 30 | 44 | 1.6435 | |
| R0G | 31 | 75 | 1.8751 | |
| R0G | 32 | 7 | 0.8451 | |
| R0A | 33 | 35 | 1.5441 | |
| R0G | 34 | 38 | 1.5798 | |
| R0E | 35 | 29 | 1.4624 | |
| R0K | 36 | 49 | 1.6902 | |
| R0G | 37 | 15 | 1.1761 | |
| R0K | 38 | 71 | 1.8513 | |
| R0G | 39 | 66 | 1.8195 | |
| R0G | 40 | 37 | 1.5682 | |
| R0E | 41 | 0.005 | -2.3010 | EXCLUDED |
| Mean No. of Prescriptions | | 41.07 | 1.4631 | |
| Standard Deviation | | 23.93 | 0.6445 | |
| Minus 2 Standard Deviations | | | 0.1741 | |

**Pharmacare-Urban Independent Pharmacy Strata**

| | | | | |
|---|---|---|---|---|
| R3N | 1 | 39 | 1.5911 | |
| R3K | 2 | 28 | 1.4472 | |
| R3J | 3 | 47 | 1.6721 | |
| R3J | 4 | 116 | 2.0645 | |
| R8N | 5 | 27 | 1.4314 | |
| R7B | 6 | 49 | 1.6902 | |
| R3J | 7 | 11 | 1.0414 | |
| R3N | 8 | 70 | 1.8451 | |
| R2J | 9 | 48 | 1.6812 | |
| R2K | 10 | 30 | 1.4771 | |

**Pharmacare-Urban Independent Pharmacy Strata cont'd**

| | | | | |
|---|---|---|---|---|
| R2K | 11 | 121 | 2.0828 | |
| R3T | 12 | 0.4 | -0.3979 | EXCLUDED |
| R2V | 13 | 61 | 1.7853 | |
| R3R | 14 | 37 | 1.5682 | |
| R3K | 15 | 200 | 2.3010 | |
| R2J | 16 | 76 | 1.8808 | |
| R2V | 17 | 13 | 1.1139 | |
| R3R | 18 | 47 | 1.6721 | |
| R2M | 19 | 39 | 1.5911 | |
| R2N | 20 | 57 | 1.7559 | |
| R3M | 21 | 29 | 1.4624 | |
| R3M | 22 | 70 | 1.8451 | |
| R2M | 23 | 58 | 1.7634 | |
| R2V | 24 | 33 | 1.5185 | |
| R3J | 25 | 60 | 1.7782 | |
| R2R | 26 | 17 | 1.2304 | |
| R2N | 27 | 14 | 1.1461 | |
| R3T | 28 | 32 | 1.5052 | |
| R3W | 29 | 28 | 1.4472 | |
| R2K | 30 | 69 | 1.8388 | |
| R2C | 31 | 122 | 2.0864 | |
| R3T | 32 | 78 | 1.8921 | |
| R3J | 33 | 25 | 1.3979 | |
| R2R | 34 | 21 | 1.3222 | |
| R3T | 35 | 21 | 1.3222 | |
| R2R | 36 | 4 | 0.6021 | EXCLUDED |
| R8N | 37 | 43 | 1.6335 | |
| R2V | 38 | 29 | 1.4624 | |
| R3K | 39 | 69 | 1.8388 | |
| Mean No. of Prescriptions | | 49.70 | 1.5484 | |
| Standard Deviation | | 38.04 | 0.4482 | |
| Minus 2 Standard Deviations | | | 0.6606 | |

**Pharmacare-Urban Chain Pharmacy Strata**

| | | | |
|---|---|---|---|
| R3H | 1 | 62 | 1.7924 |
| R2C | 2 | 149 | 2.1732 |
| R2M | 3 | 121 | 2.0828 |
| R2M | 4 | 151 | 2.1790 |
| R3T | 5 | 173 | 2.2380 |
| R2J | 6 | 202 | 2.3054 |
| R2V | 7 | 221 | 2.3444 |

**Pharmacare-Urban Chain Pharmacy Strata cont'd**

| | | | | |
|---|---|---|---|---|
| R3R | 8 | 192 | 2.2833 | |
| R2C | 9 | 164 | 2.2148 | |
| R2P | 10 | 270 | 2.4314 | |
| R3K | 11 | 173 | 2.2380 | |
| R3M | 12 | 166 | 2.2201 | |
| R2R | 13 | 164 | 2.2148 | |
| R2K | 14 | 130 | 2.1139 | |
| R0M | 15 | 41 | 1.6128 | |
| R0K | 16 | 34 | 1.5315 | |
| R0M | 17 | 61 | 1.7853 | |
| R2M | 18 | 100 | 2 | |
| R3T | 19 | 51 | 1.7076 | |
| R3J | 20 | 48 | 1.6812 | |
| R2Y | 21 | 54 | 1.7324 | |
| R3M | 22 | 51 | 1.7076 | |
| R2C | 23 | 82 | 1.9138 | |
| R0A | 24 | 160 | 2.2041 | |
| R3K | 25 | 97 | 1.9868 | |
| R3P | 26 | 108 | 2.0334 | |
| R3T | 27 | 67 | 1.8261 | |
| R2V | 28 | 118 | 2.0719 | |
| R3T | 29 | 188 | 2.2741 | |
| R3K | 30 | 126 | 2.1004 | |
| R8N | 31 | 22 | 1.3424 | |
| R8N | 32 | 84 | 1.9243 | |
| R2M | 33 | 213 | 2.3284 | |
| R2K | 34 | 291 | 2.4639 | |
| R3V | 35 | 224 | 2.3502 | |
| R3N | 36 | 198 | 2.2967 | |
| R8M | 37 | 3 | 0.4771 | EXCLUDED |
| R2C | 38 | 28 | 1.4471 | |
| R3M | 39 | 19 | 1.2788 | |
| R3K | 40 | 11 | 1.0414 | |
| R2V | 41 | 17 | 1.2304 | |
| R2M | 42 | 22 | 1.3424 | |
| R3T | 43 | 10 | 1 | |
| R2K | 44 | 5 | 0.6990 | EXCLUDED |
| Mean No. of Prescriptions | | 110.70 | 1.8687 | |
| Standard Deviation | | 77.00 | 0.4715 | |
| Minus 2 Standard Deviations | | | 0.8962 | |

**Appendix II- Sample Size Calculations for Study Hypotheses**

**a) determining the study population of prescriptions dispensed**

**Table 1. Estimate of the Number of Prescriptions Dispensed in Manitoba Per Year**

| Data Source | Data Time Period | Drug Benefit Insurer | Manitoba Population Prescriptions/year | Study Population* Prescriptions/year |
|---|---|---|---|---|
| Manitoba Health Insured Benefits | 94/07/18 - 94/12/31 | Pharmacare (PC) | 5,106,370 (77%) | 5,045,122 |
| Health Canada Medical Services | 94/04/01 - 94/12/31 | Indian Affairs (IA) | 851,388 (13%) | 841,160 |
| Manitoba Family Services | 93/04/01 - 94/03/31 | Provincial Social Services (PSS) | 519,412 (8%) | 513,165 |
| Manitoba Family Services | 94/04/01 - 94/03/31 | City Social Services (CSS) | 185,608 ( 3%) | 179,361 |
| **Total Number of Prescriptions Dispensed** | | | **6,662,773** | **6,578,808** |

*Study population of pharmacies = 1994 Manitoba population of pharmacies (252) - [pharmacies closed (5) + pharmacies servicing special populations (7) + pharmacies with < 2 standard deviations of the average number of prescriptions/day (12)] = 228 pharmacies

To obtain the number of prescriptions/year for the study population, the number of Pharmacare prescriptions for pharmacies excluded were subtracted from the total number of Pharmacare prescriptions (prescription statistics for individual pharmacy only available for Pharmacare prescriptions) and the other drug benefit prescriptions were reduced proportionately.

Assumptions required to determine the average number of Pharmacare, Indian Affairs and Social Services prescriptions dispensed per day:
1. Provinical and City Social Services prescriptions are dispensed in the 126 Winnipeg pharmacies, but only Provincial Social Services prescriptions are dispensed in the 102 pharmacies outside Winnipeg
2. The number of prescriptions (Rx) dispensed per day in Winnipeg (WPG) and non-Winnipeg pharmacies is equivalent
3. All pharmacies (phm) are open 7 days a week

Average number (#) Rx dispensed in non-WPG pharmacy = average # of Rx dispensed in WPG pharmacy

Thus,

$$\frac{\text{(\# of PC+IA+PSS Rx) - (\# of PC+IA+PSS Rx for WPG phm)}}{\text{\# of non-WPG phm}} = \frac{\text{(\# of PC+IA+PSS Rx for Wpg phm) + (\# of CSS Rx for Wpg)}}{\text{\# of WPG phm}}$$

$$\frac{(6{,}399{,}447 - x)}{102} = \frac{(x + 179{,}361)}{126}$$

x = 3,456,296 Pharmacare, Provincial Welfare, Indian Affairs prescriptions dispensed in WPG pharmacies

On average, (6,399,447-3,456,296)/102 x 365 = 79 Pharmacare, Social Services and Indian Affairs prescriptions dispensed/day in study population pharmacies

**b) determing the sample size for each hypothesis**

**Sample Size Justification for Hypothesis No. I: Is there a significant difference between the proportion of Pharmacare, Indian Affairs and Welfare prescriptions submitted to DPIN (UNIT of ANALYSIS = prescription)**

Ho: Proportion of Pharmacare prescriptions submitted (p PC) = proportion of Indian Affairs prescriptions submitted (p IA) = proportion of Social Services prescriptions submitted (p SS)

The mean proportion of prescriptions submitted for Pharmacare clients is estimated from Medicaid data (which requires Rx submission for reimbursement purposes) as 0.94,

Therefore, Ho: $p = p\,PC = p\,IA = p\,SS = 0.94$, $q = (1-p) = 0.06$

A 10% difference between the proportion of prescriptions submitted is considered significant, so p PC - p IA (or p W) = 0.10

Min # Rx per group (PC or IA or SS) $= \frac{2\,(\text{Power Index})^2(p)(q)}{(p\,PC - p\,SS)^2}$

Power Index = 1.64 (1 tailed, $\alpha$ =0.05) +1.64 (1 tailed, $\beta$ =0.05) = 3.28

$$= \frac{2\,(3.28)^2\,(0.94 \times 0.06)}{(0.10)^2}$$

$$= 122$$

Therefore, 122 prescriptions per drug insurer group are needed to detect a 10% difference between the proportion of prescriptions submitted to DPIN of each group. A sample of 6 pharmacies will yield 122 prescriptions per drug insurer group, as shown below.

| | **No. of Rx Per Pharmacy** | **No. of Pharmacies Required to Obtain 122 Rx per Group** |
|---|---|---|
| **Pharmacare** | 5,045,122/(365x228) = 61 | 122/(61x2**) = 1 |
| **Indian Affairs** | 841,160/(365x228) = 10 | 122/(10x2**) = 6 |
| **Social Services** | 481,832*/(365x126) = 11 | 122/(11x2**) = 6 |

* [(513,165+179,361)-x]/102 = (x + 179,361)/126 ; x = 302,471 or total SS Rx for WPG pharmacies = (302,471 + 179,361) = 481,832, as City SS Rx not evenly distributed among all pharmacies

** Prescriptions will be sampled over a 2 day period

**Sample Size Justification for Hypothesis No. II: Is there a significant difference between the proportion of Indian Affairs and Social Services prescriptions submitted by pharmacies located in Pharmacare, Indian Affairs and Social Services recipient neighbourhoods (UNIT of ANALYSIS = prescription)**

Ho: Proportion Indian Affairs and Social Services prescriptions submitted by "Pharmacare" pharmacies (p nPC) = proportion submitted by "Indian Affairs" pharmacies (p nIA) = proportion submitted by "Social Services" pharmacies (p nSS)

The mean proportion of prescriptions submitted for Indian Affairs and Social Services clients is estimated as 84% (10% lower than for Pharmacare clients)

Therefore, Ho: $p = p\ nPC = p\ nIA = p\ nSS = 0.84$, $q = (1-p) = 0.16$

A 10% difference between the proportion of non-Pharmacare prescriptions submitted is considered significant, so p nPC - p nIA (or p nSS) = 0.10

Min # Rx per group (nPC or nIA or nSS) $= \frac{2\ (\text{Power Index})^2(p)(q)}{(p\ nPC - p\ nIA)^2}$

$= \frac{2\ (3.28)^2\ (0.84 \times 0.16)}{(0.10)^2}$

$= 289$

Power Index = 1.64 (1 tailed, $\alpha$ =0.05) +1.64(1 tailed, $\beta$ =0.05) =3.28

| STRATA | Average # of Pharmacare Prescriptions Dispensed/day | Average # of IA and SS Prescriptions Dispensed/day * |
|---|---|---|
| **Pharmacare neighbourhhod** | 71 | 79-71 = 8 |
| **Social Services neighbourhood** | 58 | 79-58 = 21 |
| **Indian Affairs neighbourhood** | 31 | 79-31 = 48 |

* IA and SS Rx/day = Total Rx/day - Pharmacare Rx/day

Therefore require:

a) 289/(8 x 2) = 18 pharmacies in the Pharmacare neighbourhood strata
b) 289/(48 x 2) = 3 pharmacies in the Indian Affairs neighbourhood strata
c) 289/(21 x 2) = 7 pharmacies in the Social Services neighbourhood strata

Therefore, 289 Indian Affairs and Social Services prescriptions per pharmacy neighbourhood strata are needed to detect a 10% difference between the proportion of Indian Affairs/Social Services and Pharmacare prescriptions submitted to DPIN by pharmacies in different neighbourhoods. A sample of 3 x 8 = 54 pharmacies will yield 289 prescriptions per pharmacy neighbourhood strata..

**Sample Size Justification for Hypothesis No. III: Is there a difference in the proportion of Indian Affairs and Social Services prescriptions submitted to DPIN among different types of pharmacies or among pharmacies of differing prescription workloads (UNIT of ANALYSIS = pharmacy)**

The sample size is determined for the pharmacy type as this is the only statistic available for the study population pharmacies. There are 149 rural and urban independent pharmacies (n1), 74 chain pharmacies (n2) and 5 hospital-based pharmacies.

Ho: The proportion of Indian Affairs and Social Services prescriptions submitted by independent pharmacies (u1) = the proportion of Indian Affairs and Social Services prescriptions submitted by chain pharmacies (u2)

Assume that the mean proportion of prescriptions submitted by independent pharmacies, u1= 0.87, SD = 0.1 and the mean proportion submitted by chain pharmacies, u2 = 0.77, SD=0.15.

Therefore, $$\text{SD pooled} = \frac{(n1-1)(SD)^2 + (n2-1)(SD)^2}{n1 + n2 - 2}$$

$$= \frac{148(0.1)^2 + 73(0.15)^2}{221}$$

$$= 0.119$$

Min # phm per group $$= \frac{R+1\ (\text{Power Index} \times SD)^2}{R(u1-u2)}$$

$$= \frac{3\ (2.48 \times 0.119)^2}{2\ (0.87-0.77)}$$

$$= 13$$

Power Index = 1.64 (1 tailed, $\alpha$=0.05) per
+ 0.84 (1 tailed, $\beta$ =0.20)
= 2.48

R=2, as # independent = 2 x # chain phm

Therefore, require 13 pharmacies per pharmacy type to detect a 0.10 difference in the proportion of Indian Affairs and Social Services prescriptions submitted

**The sample size required to test Hypothesis No. IV cannot be determined as a sample frame is not available *apriori* for the pharmacists who dispensed the prescriptions selected for review. Hypothesis No. IV will be tested as an exploratory hypothesis.**

**APPENDIX III. Instructions for Auditors**

**PHARMACY NAME AND ADDRESS**_____
**PHARMACARE NUMBER** _____

**MARCH** **MARCH**

***AUDIT PROCEDURES***

1. You will need to see i) prescription files ii) narcotic prescription files and iii) a list of prescription numbers refilled for the dates for audit.

2. Every prescription should have a sticker attached which gives you the Rx number and the drug benefit plan abbreviation. (PC = Pharmacare)

3. Go through the prescription files checking off the information which corresponds to the DPIN printout. Write out the information which does not correspond.

4. You will need to look up the original prescription for repeat prescriptions. Locate the prescriptions found on the repeat list and go through the procedure in 3).

5. PLEASE NOTE: New and repeat prescriptions may not be identified by type of drug benefit plan. In this case, start with the DPIN printout to locate corresponding prescriptions numbers.

***COMPLETE THE FOLLOWING QUESTIONS FOR EACH PHARMACY AUDITED.***

**1. CHECK 1 OF THE FOLLOWING TO <u>BEST</u> CHARACTERIZE THE PHARMACY'S LOCATION**

[ ] In a department/grocery store
[ ] In an enclosed mall
[ ] In a medical building
[ ] In the community (including strip mall)
[ ] Other (please specify) _____

2. Complete the table for the days selected for audit. **<u>Count the total number of NEW prescriptions for each of the two days</u>** after you finish auditing the Pharmacare prescriptions. **<u>Count the total number of repeat prescription numbers</u>** which appear on the repeat list for the same days. The pharmacist on duty can be asked about the business hours and how many technicians normally work on a Monday, Wednesdays..

| DATE IN MARCH | BUSINESS HRS | TOTAL NUMBER OF <u>NEW</u> PRESCRIPTIONS | TOTAL NUMBER OF <u>REPEAT</u> PRESCRIPTIONS | NUMBER OF TECHNICIAN WORKING |
|---|---|---|---|---|
| | FROM<br>TO | | | |
| | FROM<br>TO | | | |

## Appendix IV. Pharmacist Perceptions of the DPIN System: An Exploratory Interview

The Drug Program Information Network (DPIN) is a newly established electronic, on-line, point-of-sale prescription claims network, linking all pharmacies in the province of Manitoba as of July 1994. The DPIN system was implemented with the aims of facilitating prescription drug benefit reimbursement, of facilitating community pharmacist detection of drug-related problems by providing access to comprehensive prescriptions records and of establishing a provincial prescription database for drug utilization review purposes. Pharmacists electronically submit prescriptions to the DPIN network at the time of dispensing, provided that a patient identifier (PHIN) number is available.

A definite link between access to patient medication records and the effectiveness of the pharmacist has been documented.[1] The benefits of the DPIN system to the pharmacist, the pharmacy profession and society seem obvious. Pharmacists have successfully participated in drug utilization review programs associated with the Medicaid prescription claims database.[2] However, acceptance of drug utilization review as a professional responsibility has not been universal. In a survey of pharmacists only 56% reported that mandatory prospective drug utilization review, where the pharmacist is required to screen for drug-related problems before dispensing prescriptions, was necessary for professional survival.[3] There is some indication that the DPIN system is not being used by all pharmacists in Manitoba. In fact, this made headlines in the Winnipeg Free Press when a drug abuser reported that he had obtained 97 prescriptions from 8 pharmacies over a 1 year period.[4]

Pharmacist professional behaviour has been studied to identify situational variables or pharmacist characteristics which influence behaviour. Sociodemographic factors such as gender, year of licensure, level of education, experience in a particular setting and prescription workload have been found to influence pharmacist professional behaviour.[5,6] Pharmacist attitudes towards and perceptions of public demand for a professional service have also correlated with the provision of the service.[7,8] In order to acquire an understanding of a new phenomenon in the pharmacists' world, the DPIN program, qualitative research methods were utilized to uncover issues surrounding pharmacist use of the program.

## Research Design

Concepts were borrowed from the grounded theory approach to develop a model which describes pharmacist use of the DPIN system. This model can only be inductively derived from a study of pharmacists which use the DPIN system. The objective of using the concepts from grounded theory was to provide a greater understanding of the factors which influence pharmacist use of the DPIN system and potentially can be modified to enhance it's use by pharmacists. An exploratory interview of a single key informant, a community pharmacist, was undertaken to collect data on pharmacist use of the DPIN system.

## The Researcher's Role

### *Negotiating Access to a Pharmacist*

Pharmacies in close proximity to the researcher's place of residence were contacted by phone to select a pharmacist, who would be interested in being interviewed on the DPIN program. The first pharmacist contacted stated that he was too busy to be interviewed. The next pharmacist contacted expressed that she would be glad to interviewed, but because they were short staffed, the interview would have to be scheduled the following week. The pharmacist suggested however, that other pharmacists may be better able to provide me with an account of the use of the DPIN system, as she herself did not use it. The interview date was set, but when I showed up for the interview the following week, the pharmacist had forgotten about it. She was very apologetic and rescheduled the interview to an afternoon two days later. At this time she suggested that a group of pharmacists may be better suited for my purposes, as pharmacist experience with the DPIN system varied among pharmacy settings. She called the next day to reschedule the interview to the following week when she could coordinate it with her supervisor, who had just returned from holidays and was interested in the interview. She would let me know when the supervisor would be contacting me on Monday. It was becoming apparent

to me that this "cat and mouse" game was more than a scheduling issue and perhaps was related to a concern about being interviewed on the DPIN system. When I dropped by the pharmacy on Monday in order to pursue an interview date, I was introduced to her supervisor, who would be able to "better answer my questions" about the DPIN system. Unfortunately the supervisor stated that she too busy to be interviewed that week. As my deadline was fast approaching, I appealed to the pharmacist to yet again schedule an interview. It was at this point that the pharmacist expressed that she was afraid of appearing negative about the DPIN system during the interview, but committed to a interview time two days later. When I called the day of the interview to confirm the interview, she informed me that her supervisor would be doing the interview, after all. I spoke with the supervisor very briefly on the phone, at which time she made it clear that "her time was very precious."

*Researcher Values, Biases and Familiarity with the Topic*

In addition to becoming very frustrated in organizing the interview, as a hospital pharmacist, I came into the interview with my own experiences and values regarding the practice of pharmacy. I had chosen hospital pharmacy over community pharmacy practice because it was more academic and not associated with the business aspects of pharmacy. I considered my hospital practice the ideal way to practice pharmacy, as I had access to comprehensive patient records and was very much a part of the health care team in making decisions about patient care. I recognized that lack of complete medication records and barriers to interacting with health care professionals, were difficulties which community pharmacists faced in fulfilling their role.

Because the DPIN system gave community pharmacists access to comprehensive medication profiles, I saw the DPIN system finally giving them the opportunity to practice pharmacy, as I had. Moreover, due to my involvement in formal drug utilization review programs in the hospital setting and as a graduate student of Community Health Sciences, I was aware of the benefits of prescription databases in studying drug use in the population. Therefore, my role was similar to that of a participant as an observer. While

this familiarity gave more depth to the interview, there definitely existed the potential for me to be critical of the practice of community pharmacists and view pharmacist nonparticipation in the DPIN system negatively. I also struggled with whether I should reveal my hospital pharmacy background to the informant, as I was afraid that she may perceive me as being judgemental about her community pharmacy practice. A last minute decision was made to reveal my background to the informant in order to facilitate the language of interaction in an interview which was going to be limited by time.

## Data Collection

### *Method*

A semi-structured interview, with a primary focus on the narrative account of a pharmacist's experience with the DPIN system, was planned. It included open-ended questions regarding the informant's pharmacy career, followed by directive questions on the use of the DPIN system. The questions, both descriptive and evaluative in nature, reflected concepts I had hoped to cover, such as the role of the pharmacist, and implementation, perceived benefits and difficulties of the DPIN system.

The interview was recorded by an audio cassette recorder and transcribed verbatim onto a word processor. Observational notes were made throughout the negotiating access stage and immediately after the interview.

### *The Interview Setting*

I arrived 15 minutes early and sat in the prescription waiting area across from the dispensary of the pharmacy. This chain pharmacy had a large front store section; the isles were clearly labelled and products were neatly arranged on the shelves. Pharmacists and technicians were speaking to clients across the counter of the dispensary, which had a separate medication counselling area. Behind me was a whole display of health education pamphlets. The manager was busy in the dispensary when I arrived. She spoke to a few

patients about their medications and responded to a phone call regarding a rash someone had gotten upon taking a prescription drug. I noted in particular her interaction with an older gentleman regarding his use of over-the-counter sleep aids. She empathized with his need to use sleeping aids, as his wife was very ill, but suggested that the limited use of prescription drugs might be more effective. As a fellow pharmacist, I was impressed with her professional behaviour and caring attitude. Half an hour later she was free to be interviewed and we went down to her office in the basement of the pharmacy.

*Maintaince of Ethical Safeguards*

The objectives for conducting the interview were described to the informant at the beginning of the interview. I assured her that both her and the store's anonymity would be preserved, and that the interview data would be held in confidence. The informant then gave me a verbal consent.

*Informant Profile*

The informant, who will be referred to as Pharma in the text, was a young, female manager of a chain pharmacy in the city core. She came from a family of pharmacists. She had initially obtained a Bachelors of Commerce degree in 1987, but when a management training position led her to decide that a business career wasn't for her, she decided to pursue a career in pharmacy. Although her pharmacy student experience was in hospital pharmacy, she decided to practise community pharmacy after she becoming very impressed with the operations of Chain X pharmacy, specifically the fact that their managers had started off as staff pharmacists. Upon graduating from the Faculty of Pharmacy in 1991 she obtained a staff pharmacist position in a community pharmacy. Within a 2 year period she moved from a staff pharmacist position into her current position, as manager of Chain X pharmacy, which had just taken over the practice of an independent pharmacy serving the community for 40 years.

*What Happened During the Interview*

Rapport was established with Pharma early in the interview following an exchange with respect to the challenges that both supervisors and students face in meeting deadlines. The interview began with open ended questions about her pharmacy career, then proceeded with more specific questions relating to the DPIN system. The interview ended with a philosophical question on the role of the pharmacist. I had spent 40 minutes with her, adhering to her time constraints.

## Data Analysis

The data analysis steps for grounded theory such as open, axial and selective coding were utilized in the development of a model which described pharmacist use of the DPIN system. The open coding process involved breaking the interview down into themes. Once this was achieved, axial coding was used to make connections in concepts within and between identified themes. Selective coding was then used to identify a main theme.

*Open Coding: Breaking the Interview Down into Themes*

The interview was transcribed and conceptual labels were attached to statements made. These individual concepts were "cut out", then grouped together to form themes. The concepts were regrouped numerous time as relationships between themes were discovered. The end result was the following main themes: Change in Pharma's world, recognition of the pharmacist role and DPIN program use. Themes such as DPIN use, were easy to identify because specific questions were directed at them. The theme "recognition of the pharmacist role" however, was unexpected.

*Axial Coding: Making Connections*

Axial coding was carried out on each theme using the framework proposed by Strauss and Corbin: phenomenon, dimensions, causal conditions, properties, context, strategies and

consequences. Initially it was difficult to apply this framework to abstract concepts, but the outcome was further refinement of themes and connections among themes. Each of these themes are discussed individually, including the axial coding performed.

I. Change in Pharma's World

Pharma had dealt with quite a bit of change during her career. She had switched from a business to pharmacy career, when experience in a management training position proved to be unsatisfactory. Her decision was based on her knowledge of pharmacy from her family and the relevance of pharmacy to her needs. Pharma was prepared for this change.

> "Yeah, so I thought by going into pharmacy I'd eventually be able to practise the business aspect of my education and also sort of fulfil that aspect of being with the public and helping them. Having a family of pharmacists, I know what satisfaction they have from their career, so I didn't go into it blind. I sort of knew what I was getting into."

Without any community pharmacy experience as a student, she "learned quickly on her feet" as a staff pharmacist and within a 2 year period she became a manager of a Chain X pharmacy. Again this change, and rapid change I might add, was relevant to her needs as a "commerce person." When asked whether she was happy with the career path she had chosen Pharma replied, "Yes, I am. Yes, I am."

Pharma's daily life continued to be filled with change. She spent her time both as manager in her office and as a pharmacist working in the dispensary; this permitted her to be "fresh" on the job. The dual role of the pharmacist in the dispensary was also apparent in her description of her responsibilities. Throughout the interview she stressed business aspects of pharmacy such as customer service, the importance of developing a relationship with the customer so that they would feel comfortable and keep coming back. At one point she stated that:

> "my job is to get the customers their prescriptions as fast and conveniently as possible"

Towards the end of the interview, when asked about the public health role of the pharmacist she referred to the pharmacist as,

> "providing information to people and sort of being their watchdog, their safety."

She also pointed out that in some pharmacies the business aspect of "pumping out" prescriptions overcame the pharmacist's role in providing information to the patient, but did not indicate that this was the case in her store. For Pharma, the dual pharmacist role as a business person and professional, had been reconciled.

Pharma liked the fact that things were always changing in pharmacy and you had to really keep up. She noted that the role of the pharmacist was changing and that pharmacists wanted it that way. She herself identified a need for change in pharmacy,

> "That's the whole problem with pharmacy is that we do things, but we don't necessarily document them in an organized fashion. And that's what we need to do in order to show a benefit to health care."

Thus, it appears that Pharma's life was filled with change, that she had successfully dealt with change, she liked change and she identified the need for change. There were times however, that Pharma did not like change. She referred to these times as,

> "That constitutes a bad day when somebody's taking it out on you, events that you have no control over"

The examples that she gave included price changes and a physician not calling in a prescription when he had told the patient that he would, but these events did not happen very often. The implementation of the DPIN system also caused change in Pharma's life. She had first heard "some buzz going around that this computer system was going to be up" in the summer of 1993. In reference to this time she said:

> "at first people were a little bit afraid of it because they didn't quite understand it"

When asked about the information that was provided by the administrators of the DPIN system prior to the implementation, Pharma's reply was that very little information had been provided to pharmacists. She herself had been familiar with a similar system in Saskatchewan, so was more aware of the potential benefits of the DPIN system. She however, later related these benefits to pharmacies with transient customers, and not her own pharmacy. Moreover, Pharma noted that she had gotten more information about the DPIN system through her employer, Chain X pharmacy, than from DPIN administrators.

Information on DPIN was provided to managers, but was related more to the timing of implementation, rather than how the system would work. That this was a period of rapid change over which pharmacists had no control was revealed in Pharma's words,

> "we kept hearing these dates and we weren't ready for them and the dates kept coming up and they seemed very early. And people weren't ready for them, so that then gets the stress level up. Because you don't understand what's goin' on, you're afraid at that point in time"

In order for the DPIN system to be implemented pharmacists needed compatible software programs. Pharmacists were concerned because they were not sure whether their computer programs would be modified early enough to enable them to become familiar with the program before implementation. Pharma's related this concern to the impact of pharmacist unfamiliarity with the DPIN system on customer service.

Moreover, in order for pharmacists to submit prescriptions to the DPIN system, they were required to input patient identifier numbers, known as PHIN numbers, into their computer system. To facilitate this, Pharma prepared her pharmacy by inputing customer PHIN numbers four months prior to DPIN going live. She expressed frustration in having to obtain all the customer PHIN numbers. Pharma was also concerned about future requirements related to the DPIN system.

> "That's my biggest concern because I know that what they're going to be looking for is pharmacist interventions. That's what they're going to be looking for, but it's not pharmacist friendly to indicate what interventions they're making."

Pharma's career switch and DPIN implementation are subthemes of change. We can compare these changes by looking at the axial coding of each type of change.

| **Causal Conditions** | **Phenomenon** |
|---|---|
| Switch from business to pharmacy career | Change |
| **Properties** | **Dimensions** |
| Initiated by Pharma | Cause: the individual |
| Well informed about pharmacy career beforehand | Preparedness for change: high |
| Occurred over a 4 year period | Pace:medium |
| Satisfies business and helping people needs | Type:relevant |

**Context of Change**
When change is initiated by the individual, who is prepared for the change that will meet personal needs, and does not occur rapidly

**Strategies for Change Management**
The person flows with the change.

**Intervening Conditions**
Family approval

**Consequences**
Change is carried out, Pharma likes her career as a pharmacist and expresses no regrets afterwards, welcomes change as evident in her expression "fresh on the job"

| **Causal Conditions** | **Phenomenon** |
|---|---|
| Implementation of DPIN system | Change |
| **Properties** | **Dimensions** |
| Initiated by DPIN administrators | Cause: someone else |
| Little information given to pharmacists | Preparedness for change: low |
| Required compatible software, PHIN number | Conditional requirements |
| Relevant to pharmacies with transient clients | Type: ? relevance |
| Implemented over less than one year | Pace: rapid |

**Context of Change**
When change is rapid and caused by someone else, with little information given to those whom the change will affect and is dependent on requirements being met

**Strategies for Change Management**
Pharmacists prepare by obtaining information on DPIN from other sources and inputing PHIN numbers ahead of time
Pharmacists attempt to meet conditional requirements

**Intervening Conditions**
Compatible software is not ready, customers forget PHIN numbers

**Consequences**
Change is carried out but,
Pharmacists are afraid of the change (DPIN) and its future implications
Pharmacists become frustrated and stressed trying to meet the requirements for change
Pharmacists do not "buy into" the DPIN program

We see that the dimensions of change associated with the DPIN implementation are different from those connected with the change in Pharma's career. According to Pharma, it was a change imposed upon pharmacists during a short term period, with very little information given to pharmacists, and of questionable relevance to her some pharmacies. Pharma attempted to manage this change, as she had done in her personal life, by obtaining more information and preparing herself by inputing PHIN numbers ahead of time. Even so, she associated the implementation with frustration and stress. One can speculate that the fear, frustration and stress of pharmacists who took no action to become prepared, would have been compounded. The end result was not only a negative experience with the DPIN system, but also decreased "buy into" the program, which is brought out later in the interview.

II. Recognition of the Pharmacist Role

In my search for a model which describes pharmacist use of the DPIN system, an unexpected theme emerged from the transcripts. It is illustrated in Pharma's description of how prescriptions are submitted to the DPIN system.

> "Yeah, But I got a letter from them (DPIN) last week saying well that's not their job. But I would say that now, we maybe phone them, maybe 2-3 times a day, which is probably an extreme. But you know the number is greatly reduced, so we do it, we call them if one: the person doesn't have it on them or two: if they can't phone home for it, let's say they'll be phoning to their 92 year old aunt. Forget it. You're looking 'cause my job is to get them their prescription as fast and conveniently as possible. And if they're coming in to see me, more than likely they're sick. They don't need the hassle, it's easier for me to phone DPIN and less hassle for them. You know, so that's what I do, but got a letter saying well that's not the service that we're supposed to be providing and....We'll just, we'll just keep on doing it.....Because they said it's not their job, but they should realize that it's not like we don't ask the person for their number. We do whatever we can to get the number before we call them. It is a back up, but it's not a service that I could see that would ever go away. I can't imagine pharmacists abusing because, let's face it, we've basically have been very cooperative in going with the system and all the pharmacists have taken all the flack for everything that's happened with DPIN and Pharmacare and trying to. Like if I got a buck for everytime that I explained t'a customer about Pharmacare I'd be a very rich women. I'd be a very rich women and we have all done it for zero, squat, nill, nada. So I think that we've been doing them big favours, big favours. Gary should actually be paying me the dollar per person, I think."

I was struck by the vehemency of these statements, triggered by the letter received from DPIN, which she referred to twice during the excerpt. Pharma was angry that DPIN administrators were discouraging the use of the Help Line to obtain PHIN numbers, even though the frequency of calls had been reduced and pharmacists had not been abusing the service. However, her anger seemed to go beyond the implications of the letter; after all, she was going to continue to use the Help Line anyways. It seemed to be fuelled by a perception of lack of recognition of her role in the operation of the DPIN system. She had done her part during the implementation phase, as described by the lengths to which she went to obtain the PHIN number and explain the DPIN system to customers. Her statement "they should realize" suggests that DPIN administrators hadn't realized pharmacist efforts in making the system work. Moreover, it was she, and not DPIN administrators, who had gotten "flack" from customers while trying to make the system work. She eventually linked this lack of recognition to government in her statement "Gary" (Filman) should be paying pharmacists directly for their involvement in the DPIN system. Pharma's use of 4 different words for nothing emphasized the extent of the lack of recognition of the pharmacist role.

After reading this excerpt, I traced back through the transcript to identify other instances where Pharma sought recognition of her role. There were many. Pharma had sought approval from her family, her customers and the doctors she worked with. When deciding to go back to school to obtain her pharmacy degree she laughingly said that she had been worried that her whole family and her Dad in particular, were going to think that she was crazy. Since that time she has won their approval.

> "Although my father thought I was crazy, he's very proud of what I've accomplished."

In her practice she gave examples of when clients had called her directly following a drug reaction instead of the physician, as a reflection of their confidence in her.

> "and she phones me before she phones the doctor. You know, not saying that's the really best thing to do, but to think that they hold you in that confidence."

She noted that the physicians she interacted with were receptive to information she provided as a pharmacist, especially information which was available as a result of the DPIN system.

It appears that Pharma had been successful in achieving recognition in the past. Her first mention of lack of recognition was related to the implementation of the DPIN system, but afterwards she revealed that the public took the pharmacist role for granted. When asked about public health role of the pharmacist, she replied:

> "It amazes me that people view our role differently and we do our job because it's satisfying and we care about people, and we want to make a difference. But just like a doctor, just like a lawyer, just like a nurse, we have to be reimbursed for it, but people see pharmacy in a different light, that we should be doing it for free. And, that's not just how the world works. And if I could do it for free, I would do it for free, but I have bills to pay, I have a mortgage to pay, I have employees to pay."

The theory of recognition of the pharmacist role is brought out in the following axial coding.

| | |
|---|---|
| **Causal condition** | **Phenomenon** |
| Pharmacist have done it for nothing | Recognition |
| **Properties** | **Dimensions** |
| Customers giving pharmacists flack | Criticism |
| Public expecting phm to work free | No financial reimbursement |
| Discontinue DPIN Help Line | Lack of support |
| **Context** | |
| When pharmacists are criticized, not reimbursed and given no support | |
| **Strategies** | |
| Demand support, express anger | |
| **Consequences** | |
| Pharmacist feel that role not recognized | |

III. DPIN Program Use

Pharma identified the *potential* benefits of the DPIN system as providing the pharmacist with more information about prescriptions dispensed in other pharmacies, and giving the pharmacist a better idea of a person's medication history. These benefits coincided with her view of the pharmacist as a provider of information, in response to societal demand for more information. However, Pharma related the benefits of the DPIN system to other pharmacies, who had transient clientele, rather than her own, where her customers got all their prescriptions. According to her individuals who got their prescriptions at many pharmacies

> "don't see the importance of....getting a profile at one store and having that one person sort of keep track of what they're own"

This statement could be interpreted to mean that if people obtained their prescriptions at one pharmacy, the DPIN system would not be necessary. She listed other potential benefits such as the ability to identify clients who are double doctoring and thus, abusing the health care system. This benefit seem to be realized because she noted that physicians would call pharmacist to verify abusers. In the rank order exercise, she ranked professional benefits of the DPIN system for the pharmacist above financial benefits. Although Pharma did not identify the "global" benefit of the DPIN prescription database which enables the study of drug use problems in the population, she ranked drug utilization review in between professional and financial benefits. Drug utilization review was ranked last as a benefit to the customer.

Pharma's efforts to obtain the patient PHIN number showed her commitment to making the DPIN system work. But did she actually use the information that was made available by DPIN? Her staff pharmacist had told me outright that she did not use the DPIN system because she was too busy patient counselling (at 300 prescription per day) and that it was not user friendly. In fact, it was the technician who inputed prescriptions into the computer. When asked whether the DPIN system has affected her practice, Pharma was slow to respond. She stated that the DPIN system increased pharmacists awareness of patients receding prescriptions elsewhere and that physicians were receptive to the

information, especially when trying to verify abusers. She also revealed, that the type of information that the DPIN system provided, in the form of codes which alerted pharmacists of problems, was not user friendly. It involved the pharmacist looking up the code to determine its meaning. The Chain X Drug Monitoring system, which alerted pharmacists in the form of statements, was relied upon more often. She made the general statement that sometimes interaction codes were not that relevant. She did not however, mention that the pharmacists were too busy to use DPIN. She acknowledged that the technician used the DPIN system more often, but that they would inform the pharmacist when a drug alert code appeared.

The researcher believes that Pharma's true feelings about the DPIN system come out in her statement "doing them (DPIN) big favours" and "we have done it all for zero, squat, nill, nada." Irregardless of any statement made, the benefits of the DPIN system had not been realized. The researcher was struck by the fact that she hadn't taken "ownership" of the DPIN system, that she wasn't doing herself a big favour. Her final words that DPIN *will eventually* benefit pharmacy seem weak in comparison.

**Selective Coding: Selection of a Core Theme**

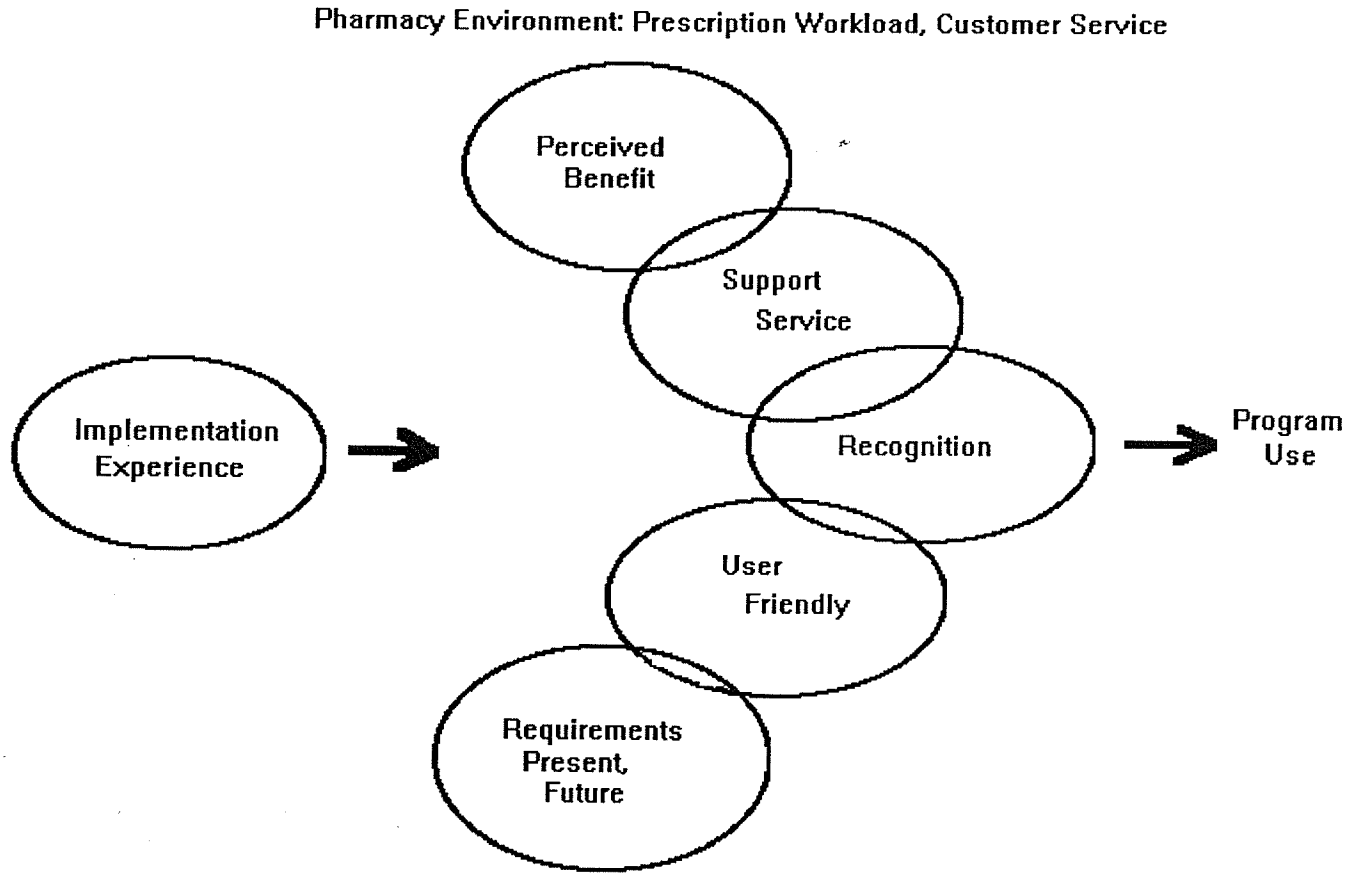
The researcher was able to develop a model describing pharmacist use of the DPIN program, fulfilling the main objective of the interview. The implementation experience and pharmacist recognition from the other two themes were added as factors which influence pharmacist use.

**Figure 1. Model and Taxonomy for Pharmacist Use of the DPIN System**

Implementation Experience
*feelings evoked
*use "buy in"

| Requirements | Perceived benefit | Ease of Use | Support Services | Recognition |
|---|---|---|---|---|
| *PHIN number | *relevance to clients | *drug codes | *DPIN Help Line | *clients |
| *future | *usefulness | | | *DPIN |

PROGRAM USE



**Research Issues**

The researcher is not sure whether the interview really reflected Pharma's views on the DPIN system. Although hesitant in her response about the impact of DPIN on her practice, she didn't come out with a direct statement that she didn't use the DPIN system, as her staff pharmacist had. Moreover, there were times in the interview when she backed down on negative statements made, as illustrated in the following statement. Was she attempting to correct herself or was she afraid of making value judgements?

> "we've doing them big favours, big favours. Gary should actually be paying me the dollar per person, I think. But, like you know, on the phone they've always been often very cooperative.."

The interview presents Pharma's unique views of the DPIN system. Although she identified with "pharmacists" in her responses, the interview cannot be used to describe other pharmacist opinions about the DPIN system. Perceptions will vary among pharmacists who have different experiences with the system, as stated by the staff pharmacist herself. Even in the same setting, pharmacists will have different views of the DPIN system, as illustrated by the differences between Pharma and her staff pharmacist. Perceptions of the DPIN system will also change with time. The researcher does believe however, that the model which describes pharmacist use of the DPIN system can be applied to other pharmacists.

**Future Applications**

This exploratory interview has laid the groundwork for further interviews of pharmacists which are needed to find convergence among pharmacist perceptions in the development of grounded theory on pharmacist use of the DPIN system. Data from the interview will help refine existing questions and will contribute to new questions which reflect themes

discovered. For example, it will be useful to include questions relating to pharmacist perception of the transient nature of their clients, as well as, to the perception of recognition of their role in making the DPIN system work. Themes identified in the exploratory interview can also be used in the development of survey questions which can be administered as a mail-out questionnaire to a larger group of pharmacists.

A model which describes pharmacist use of the DPIN system, derived from survey or grounded theory methods, is essential to the development of strategies which address deficiences in the DPIN system. In addition, this qualitative data can be combined with quantitative methods which measure pharmacist use of the DPIN system to identify links between pharmacist perceptions and their use of the DPIN system. Measures of pharmacist use of the DPIN system may include review of the DPIN prescription database for drug therapy duplications, or other qualitative methods such as ethnomethodology, in which pharmacist behaviour is assessed when actors present with prescriptions. In the researcher's thesis topic, which motivated this qualitative research, pharmacist submission of prescriptions to the DPIN system will be utilized as a measure of their use of DPIN.

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Appendix V. Cover Letter to Manager

Dear PHARMACY MANAGER, September 18,1995

Your pharmacy has been randomly selected to participate in a research project being conducted by the University of Manitoba, Department of Community Health Sciences, to assess the completeness of the Drug Programs Information Network (DPIN) database. A component of the research project includes a survey of pharmacists and pharmacy managers to obtain their evaluations of the DPIN system. The research project has been endorsed by Manitoba Health and the Manitoba Pharmaceutical Association.

Please distribute the survey packages to the pharmacists indicated on the envelope. Every survey package contains a survey, an accompanying cover letter and a pre-addressed envelope to return the survey. Pharmacist names were placed on survey packages by Manitoba Health and are not known to me. Surveys are marked with identification numbers in order to check off surveys returned. I will be following up with a phone call to your pharmacy in 2 weeks with the aim of encouraging you and your pharmacists to return these questionnaires.

Thank you for your cooperation. If you have any questions please contact me at

Anita Kozyrskyj, B Sc Phm
Research Coordinator
Manitoba Centre for Health Policy and Evaluation
St. Boniface Hospital Research Centre
Suite 2008 - 351 Tache Ave
Winnipeg, Manitoba
R2H 2A6

**Appendix V. Cover Letter to Pharmacist**

Dear PHARMACIST, September 18, 1995

One year has passed since the implementation of the Drug Programs Information Network (DPIN). One of the goals of establishing the DPIN system was to help community pharmacists identify drug-related problems for their clients. But has DPIN achieved these goals? Only the experience of Manitoba pharmacists can answer this question.

You are being asked to participate in an evaluation of the DPIN system. Every pharmacist has had his/her own experience with the DPIN system. Every pharmacist experience is valuable for a representative evaluation of DPIN. It is therefore important that this questionnaire be completed and returned.

The questionnaire is part of an independent research project, endorsed by the Manitoba Pharmaceutical Association and Manitoba Health, to assess the completeness of the DPIN database. The research project will involve the analysis of pharmacist surveys in conjunction with a component of a Pharmacare prescription review conducted in pharmacies. A summary of the survey results will be mailed to the pharmacy in which you received this survey.

You may be assured of complete confidentiality and anonymity. The survey envelope has been addressed by Manitoba Health to ensure that you receive the survey, but your name is not known to me and cannot be linked to the survey. The questionnaire has been marked with an identification number so that the number can be checked off when your survey is returned. I will only be able to identify returned questionnaires by the identification number, while Manitoba Health staff, who labelled the survey envelopes, will not have access to the returned questionnaires.

Please return the survey in the pre-addressed envelope by October 2, 1995. Should you have any questions do not hesitate to write or call me at Thank you.

Anita Kozyrskyj, B Sc Phm
Research Coordinator
Manitoba Centre of Health Policy and Evaluation
St. Boniface Hospital Research Centre
Suite 2008 - 351 Tache Ave
Winnipeg, Manitoba
R2H 2A6

# 1 YEAR WITH DPIN

## A PHARMACIST'S PERSPECTIVE

Department of Community Health Science
University of Manitoba, Winnipeg

Return this questionnaire to:
St. Boniface General Hospital Research Centre
Suite 2008 - 351 Tache Ave
Winnipeg, Manitoba,
R2H 2A6

*This questionnaire is 4 pages long and will take about 15 minutes to complete. Respond to statements 1. through 5. by circling one of the following responses:*

**1 means STRONGLY AGREE**
**2 means SOMEWHAT AGREE**
**3 means NEITHER AGREE NOR DISAGREE**
**4 means SOMEWHAT DISAGREE**
**5 means STRONGLY DISAGREE**

1. Monitoring drug therapy (eg. drug interactions, drug duplication) is an important part of my role as a pharmacist. **1 2 3 4 5**

2. My initial expectations of DPIN were that DPIN would benefit my practice as a pharmacist. **1 2 3 4 5**

3. Having worked with DPIN, my OVERALL impression is that DPIN has benefited my practice as a pharmacist. **1 2 3 4 5**

4. Clients value the drug monitoring services which I provide through my use of DPIN. **1 2 3 4 5**

5. The implementation phase of DPIN allowed for sufficient orientation to how DPIN works. **1 2 3 4 5**

**6. Which of the following two statements best describes your understanding of DPIN requirements? *(Circle 1 response)***

1. ALL PRESCRIPTIONS are REQUIRED to be sent to DPIN

2. ONLY PHARMACARE PRESCRIPTIONS are REQUIRED to be sent to DPIN, but pharmacists can submit all other prescriptions for Drug Utilization Review.

***Respond to statements 7. through 15. by circling one of the following responses:***

**1 means STRONGLY AGREE**
**2 means SOMEWHAT AGREE**
**3 means NEITHER AGREE NOR DISAGREE**
**4 means SOMEWHAT DISAGREE**
**5 means STRONGLY DISAGREE.**

| | | | | | |
|---|---|---|---|---|---|
| 7. Prescriptions are often not sent to DPIN for Drug Utilization Review because of missing PHIN's. | **1** | **2** | **3** | **4** | **5** |
| 8. When I cannot obtain a PHIN from a client, I usually call the DPIN Help Desk for the number. | **1** | **2** | **3** | **4** | **5** |
| 9. I DO NOT find DPIN easy to use. | **1** | **2** | **3** | **4** | **5** |
| 10. I find that DPIN codes are usually NOT clinically significant. | **1** | **2** | **3** | **4** | **5** |
| 11. The dispensary is too busy for me to respond to DPIN codes. | **1** | **2** | **3** | **4** | **5** |
| 12. DPIN IS NOT relevant to my clients as most of them are regular customers and do not get their prescriptions filled at other pharmacies. | **1** | **2** | **3** | **4** | **5** |
| 13. DPIN has enhanced my ability to identify drug-related problems for my clients. | **1** | **2** | **3** | **4** | **5** |
| 14. DPIN has improved my relationship with physicians. | **1** | **2** | **3** | **4** | **5** |
| 15. DPIN has interfered with customer service. | **1** | **2** | **3** | **4** | **5** |

***16. The following A. through F. have been identified as potential problems in the use of the DPIN system. Indicate whether you agree that they are problems by circling one of the listed responses***

**1 means STRONGLY AGREE**
**2 means SOMEWHAT AGREE**
**3 means NEITHER AGREE NOR DISAGREE**
**4 means SOMEWHAT DISAGREE**
**5 means STRONGLY DISAGREE**

| | | | | | | |
|---|---|---|---|---|---|---|
| A. | difficulty in obtaining PHIN's from clients | 1 | 2 | 3 | 4 | 5 |
| B. | DPIN system is not user friendly | 1 | 2 | 3 | 4 | 5 |
| C. | pharmacists are too busy to respond to DPIN codes | 1 | 2 | 3 | 4 | 5 |
| D. | customers are not receptive to pharmacist interventions | 1 | 2 | 3 | 4 | 5 |
| E. | physicians are not receptive to pharmacist interventions | 1 | 2 | 3 | 4 | 5 |
| F. | pharmacists are not reimbursed for the services they provide as a result of DPIN | 1 | 2 | 3 | 4 | 5 |

**17. Are there any other comments which you would like to make about DPIN? If so, please use this space and/or the back cover for that purpose.**

**18. Which of the following best describes your current position in the pharmacy where you received this questionnaire? *(Circle 1 response)***

1. MANAGER/OWNER/FRANCHISEE
2. STAFF PHARMACIST
3. RELIEF PHARMACIST

**19. How many hours per week do you normally work in this pharmacy?**

_____ **hrs**

**20. Are you:** 1. FEMALE
2. MALE

**21. In what year were you first licensed to practise pharmacy in Canada?**

**19**_____

**22. Which of the following degrees do you hold? (Circle all that apply)**

1. B.Sc. Pharmacy
2. M.Sc
3. M.B.A.
4. Ph.D.
5. Pharm D
6. Other (please specify) _____

**23. Please indicate the number of years of experience which you have had as a licensed pharmacist in the following pharmacy settings. (Include experience in Canada and elsewhere if applicable)**

Number of years at this pharmacy ..... _____yr
Number of years elsewhere in community pharmacy..... _____yr
Number of years in hospital pharmacy..... _____yr
Number of years in other areas of practice
(Please specify) _____ _____yr
(Please specify) _____ _____yr

**Thank-you for completing the questionnaire. Your contribution to the evaluation of the DPIN system is greatly appreciated.**

## Appendix V. DPIN Questionnaire

**Appendix VI Distribution of Indian Affairs (IA), Social Services (SS) and Pharmacare (PC) Prescriptions (Rx) Dispensed by Pharmacies**

| Pharmacy | Total Number IA, SS, PC Rx | % IA Rx | % SS Rx | % PC Rx |
|---|---|---|---|---|
| **Indian Affairs Neighbourhood Strata** | | | | |
| 1 | 211 | 66.8 % | 4.7 % | 28.4 % |
| 2 | 153 | 0.7 % | 6.5 % | 92.8 % |
| 3 | 206 | 2.9 % | 20.4 % | 76.7 % |
| 4 | 111 | 26.1 % | 57.7 % | 16.2 % |
| 5 | 549 | 16.6 % | 25.5 % | 57.9 % |
| 6 | 118 | 20.3 % | 42.4 % | 37.3 % |
| 7 | 389 | 77.6 % | 3.9 % | 18.5 % |
| 8 | 140 | 0.7 % | 15 % | 84.3 % |
| 9 | 37 | 43.2 % | 29.7 % | 27 % |
| 10 | 43 | 32.6 % | 25.6 % | 41.9 % |
| 11 | 263 | 26.6 % | 27 % | 46.4 % |
| 12 | 301 | 11.6 % | 28.2 % | 60.1 % |
| 13 | 114 | 51.7 % | 38.6 % | 9.6 % |
| 14 | 218 | 7.8 % | 17.9 % | 74.3 % |
| 15 | 228 | 0 % | 6.6 % | 93.4 % |
| 16 | 115 | 3.5 % | 10.4 % | 86.1 % |
| 17 | 229 | 71.6 % | 7 % | 21.4 % |
| **Social Services Neighbourhood Strata** | | | | |
| 1 | 213 | 4.3 % | 3.8 % | 92 % |
| 2 | 233 | 8.2 % | 5.2 % | 86.7 % |
| 3 | 401 | 1.7 % | 9 % | 89.3 % |
| 4 | 40 | 2.5 % | 5 % | 92.5 % |
| 5 | 579 | 9.7 % | 14.9 % | 75.5 % |
| 6 | 193 | 45.6 % | 4.7 % | 49.7 % |
| 7 | 98 | 15.3 % | 13.3 % | 71.4 % |
| 8 | 111 | 1.8 % | 8.1 % | 90 % |
| 9 | 200 | 16 % | 8 % | 76 % |
| 10 | 90 | 17.8 % | 32.2 % | 50 % |
| 11 | 97 | 16.5 % | 49.5 % | 34 % |
| 12 | 217 | 15.7 % | 27.7 % | 56.7 % |
| 13 | 291 | 1 % | 2.7 % | 96.2 % |
| 14 | 84 | 32.1 % | 13.1 % | 54.8 % |
| 15 | 243 | 29.2 % | 18.1 % | 52.7 % |
| 16 | 504 | 6.5 % | 24 % | 69.4 % |
| 17 | 295 | 3.7 % | 7.8 % | 88.5 % |
| 18 | 203 | 53.7 % | 35.5 % | 10.8 % |

| | | | | |
|---|---|---|---|---|
| **Pharmacare Neighbourhood Strata** | | | | |
| 1 | 86 | 0 % | 5.8 % | 94.2 % |
| 2 | 327 | 2.5 % | 8 % | 89.6 % |
| 3 | 176 | 1.7 % | 14.2 % | 84.1 % |
| 4 | 434 | 0.2 % | 3.7 % | 96.1 % |
| 5 | 362 | 1.1 % | 6.9 % | 92 % |
| 6 | 158 | 5.1 % | 6.3 % | 88.6 % |
| 7 | 32 | 0 % | 12.5 % | 87.5 % |
| 8 | 196 | 45.9 % | 4.1 % | 50 % |
| 9 | 152 | 1.3 % | 24.3 % | 74.3 % |
| 10 | 102 | 6.9 % | 3.9 % | 89.2 % |
| 11 | 140 | 2.1 % | 22.9 % | 75 % |
| 12 | 99 | 0 % | 48.5 % | 51.5 % |
| 13 | 208 | 2.9 % | 22.1 % | 75 % |
| 14 | 238 | 0.8 % | 10.5 % | 88.7 % |
| 15 | 417 | 42 % | 4.8 % | 53.2 % |
| 16 | 211 | 31.7 % | 10.9 % | 57.3 % |
| 17 | 196 | 19.9 % | 29.6 % | 50.5 % |
| 18 | 216 | 0 % | 16.7 % | 83.3 % |
| **Hospital-Based Pharmacy Strata** | | | | |
| 1 | 106 | 0 % | 30.2 % | 69.8 % |
| 2 | 66 | 43.9 % | 9.1 % | 47 % |
| 3 | 114 | 42.1 % | 9.6 % | 48.2 % |
| 4 | 72 | 2.8 % | 9.7 % | 87.5 % |
| 5 | 462 | 38.7 % | 24.2 % | 37 % |

## Appendix VII. Pharmacist Responses to Survey Questions Regarding DPIN

1. Monitoring drug therapy is an important part of my role as a pharmacist.

| 116 Responders | Frequency |
|---|---|
| Strongly Agree | 85.3 % |
| Somewhat Agree | 8.6 % |
| Neither Agree nor Disagree | 0 % |
| Somewhat Disagree | 1.7 % |
| Strongly Disagree | 3 % |

2. My initial expectations of DPIN were that DPIN would benefit my practice as a pharmacist.

| 116 Responders | Frequency |
|---|---|
| Strongly Agree | 50.9 % |
| Somewhat Agree | 28.4 % |
| Neither Agree nor Disagree | 14.7 % |
| Somewhat Disagree | 5.2 % |
| Strongly Disagree | 0.9 % |

3. Having worked with DPIN, my overall impression is that DPIN has benefited my practice as a pharmacist.

| 116 Responders | Frequency |
|---|---|
| Strongly Agree | 25.9 % |
| Somewhat Agree | 54.3 % |
| Neither Agree nor Disagree | 10.3 % |
| Somewhat Disagree | 7.8 % |
| Strongly Disagree | 1.7 % |

4. Clients value the drug monitoring services which I provide through my use of DPIN.

| 116 Responders | Frequency |
|---|---|
| Strongly Agree | 13.8 % |
| Somewhat Agree | 44.8 % |
| Neither Agree nor Disagree | 33.6 % |
| Somewhat Disagree | 6.9 % |
| Strongly Disagree | 0.9 % |

5. The implementation phase of DPIN allowed for sufficient orientation to how DPIN works.

| 116 Responders | Frequency |
|---|---|
| Strongly Agree | 9.5 % |
| Somewhat Agree | 32.8 % |
| Neither Agree nor Disagree | 22.4 % |
| Somewhat Disagree | 17.2 % |
| Strongly Disagree | 18.1 % |

6. Which of the following two statements best describes your understanding of DPIN requirements?
a) All prescriptions are required to be sent to DPIN.
b) Only Pharmacare prescriptions are required to be sent to DPIN, but pharmacists can submit
all other prescriptions for Drug Utilization Review.

| 113 Responders | Frequency |
|---|---|
| Agree with a) | 68.1 % |
| Agree with b) | 31.9 % |

7. Prescriptions are often not sent to DPIN for Drug Utilization Review because of missing PHINs.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 10.2 % |
| Somewhat Agree | 16.9 % |
| Neither Agree nor Disagree | 5.9 % |
| Somewhat Disagree | 20.3 % |
| Strongly Disagree | 46.6 % |

8.When I cannot obtain a PHIN from a client, I usually call the DPIN Help Desk for the number.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 75.4 % |
| Somewhat Agree | 13.6 % |
| Neither Agree nor Disagree | 1.7 % |
| Somewhat Disagree | 5.1 % |
| Strongly Disagree | 4.2 % |

9. I do not find DPIN easy to use.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 2.5 % |
| Somewhat Agree | 9.3 % |
| Neither Agree nor Disagree | 12.7 % |
| Somewhat Disagree | 41.5 % |
| Strongly Disagree | 33.9 % |

10. I find that DPIN codes are usually not clinically significant.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 11.9 % |
| Somewhat Agree | 45.8 % |
| Neither Agree nor Disagree | 24.6 % |
| Somewhat Disagree | 14.4 % |
| Strongly Disagree | 3.4 % |

11. The dispensary is too busy for me to respond to DPIN codes.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 3.4 % |
| Somewhat Agree | 22.9 % |
| Neither Agree nor Disagree | 18.6 % |
| Somewhat Disagree | 30.5 % |
| Strongly Disagree | 24.6 % |

12. DPIN is not relevant to my clients as most of them are regular customers and do not get their prescriptions filled at other pharmacies.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 2.5 % |
| Somewhat Agree | 11 % |
| Neither Agree nor Disagree | 11.9 % |
| Somewhat Disagree | 36.4 % |
| Strongly Disagree | 38.1 % |

13. DPIN has enhanced my ability to identify drug-related problems for my clients.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 33.1 % |
| Somewhat Agree | 53.4 % |
| Neither Agree nor Disagree | 5.9 % |
| Somewhat Disagree | 4.2 % |
| Strongly Disagree | 3.4 % |

14. DPIN has improved my relationship with physicians.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 12.7 % |
| Somewhat Agree | 31.4 % |
| Neither Agree nor Disagree | 44.9 % |
| Somewhat Disagree | 6.8 % |
| Strongly Disagree | 4.2 % |

15. DPIN has interfered with customer service.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 8.5 % |
| Somewhat Agree | 20.3 % |
| Neither Agree nor Disagree | 24.6 % |
| Somewhat Disagree | 24.6 % |
| Strongly Disagree | 22 % |

16. Potential problems in the use of DPIN are:
A. difficulty in obtaining PHINs from clients

| 116 Responders | Frequency |
|---|---|
| Strongly Agree | 11.9 % |
| Somewhat Agree | 55.1 % |
| Neither Agree nor Disagree | 10.2 % |
| Somewhat Disagree | 16.9 % |
| Strongly Disagree | 5.9 % |

B. DPIN is not user friendly.

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 11 % |
| Somewhat Agree | 20.3 % |
| Neither Agree nor Disagree | 27.1 % |
| Somewhat Disagree | 22.9 % |
| Strongly Disagree | 18.6 % |

C. pharmacists are too busy to respond to DPIN codes

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 4.2 % |
| Somewhat Agree | 26.3 % |
| Neither Agree nor Disagree | 18.6 % |
| Somewhat Disagree | 30.5 % |
| Strongly Disagree | 20.3 % |

D. customers are not receptive to pharmacist interventions

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 6.8 % |
| Somewhat Agree | 21.2 % |
| Neither Agree nor Disagree | 22.9 % |
| Somewhat Disagree | 36.4 % |
| Strongly Disagree | 12.7 % |

E. physicians are not receptive to pharmacist interventions

| 118 Responders | Frequency |
|---|---|
| Strongly Agree | 4.2 % |
| Somewhat Agree | 24.6 % |
| Neither Agree nor Disagree | 21.2 % |
| Somewhat Disagree | 33.1 % |
| Strongly Disagree | 16.9 % |

F. pharmacists are not reimbursed for the services they provide as a result of DPIN

| **118 Responders** | **Frequency** |
|---|---|
| Strongly Agree | 53.4 % |
| Somewhat Agree | 21.2 % |
| Neither Agree nor Disagree | 12.7 % |
| Somewhat Disagree | 5.9 % |
| Strongly Disagree | 6.8 % |