THE UNMET DEMAND FOR PHARMACISTS: EXPLORING ASSOCIATED FACTORS IN NON-METROPOLITAN, COMMUNITY PHARMACIES OF WISCONSIN.

by

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A thesis submitted in partial fulfillment of

the requirements for the degree of

Master of Science

(Social and Administrative Sciences in Pharmacy)

at the

UNIVERSITY OF WISCONSIN–MADISON

2006

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Date June, 9, 2006

ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. David A. Mott, for his constant support and encouragement throughout the course of my graduate studies. His rational arguments and attention to detail during the completion of this thesis project are greatly appreciated. His willingness to let me pursue my own ideas has helped to make me a better researcher.

Many thanks to my committee members, Dr. David Kreling, and Dr. Joseph Bonnarens. They provided many helpful suggestions that proved invaluable to the completion of this project and undoubtedly improved it.

I would also like to acknowledge the contribution of other faculty members at the University of Wisconsin, whose varied perspectives invariably helped me to get a better understanding of my research area. A special thank you to Dr. Betty Chewning, who has a unique ability to increase people's confidence by her encouraging words.

My graduate experience at the University of Wisconsin could never have been so rich without the endless discussions and friendship offered so generously by all other graduate students at the University of Wisconsin.

I owe a debt of gratitude to my parents for endlessly reminding me that, to be successful in life, there is no substitute for education. Without their constant love, support, and guidance, I would never have made it to this stage in life. With deepest thanks, I acknowledge my best friend and wife-to-be, Pallavi, for her contribution, not just to my thesis project, but also to my life. I can say without a shred of doubt that I am a better person today for all the love that she constantly showers on me.

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ABSTRACT

The goals of this study were: (1) to measure and describe the level of unmet demand for pharmacists (in terms of pharmacist vacancy, pharmacist turnover, and time taken to hire) in non-metropolitan, community pharmacies of Wisconsin, and (2) to explore internal and external factors that may be associated with the presence of pharmacist vacancy at a site. A conceptual model was proposed to explore specific internal and external factors.

A cross-sectional, descriptive survey design was used to collect primary data. A list of 1,213 pharmacies licensed in Wisconsin was obtained from Wisconsin's Department of Regulation and Licensing. The list was reduced to 279 active, non-metropolitan, community pharmacies in Wisconsin by eliminating pharmacies with non-active licenses, pharmacies located in non-community settings or in metropolitan counties. Census sampling was used to select pharmacies.

The manager or owner listed for each pharmacy site was identified as the key informant for that site and served as the source of contact. A participation form and a survey instrument were the principal tools used for collecting primary data. Key informants first received an invitation letter and a participation form, inviting them to participate in the study. The key informants were encouraged to complete the participation form irrespective of whether or not they were willing to participate in the study. A survey packet including a cover letter, an 8-page survey instrument, and a postage paid return envelope was sent to key informants willing to participate in the study. Any potential respondent who did not reply to two *consecutive* mailings (either of the participation form or of the main survey packet) was deemed to be a non-respondent and not contacted with further mailings.

Secondary data sources, which included the Census 2000 database, U.S. Department of Agriculture's Rural Urban Continuum Codes database, and lists of licensed pharmacists, pharmacies, and physicians in Wisconsin obtained from Wisconsin's Department of Regulation and Licensing, were used to measure variables related to external factors. Data analyses were conducted using SPSS version 13.0.

Results showed that one third (33%) of the respondent pharmacy sites had some pharmacist vacancy at the time the survey was completed. Sites that had a vacancy were more likely to: dispense a higher number of prescriptions per day, have a higher requirement of full-time equivalent (FTE) pharmacist positions, have longer hours of operation on Saturdays, offer three or more patient care services or disease state management programs, have a higher number of dispensing related technologies at the site, pay a higher gross hourly wage to their pharmacists, and make it difficult or very difficult for their pharmacists to take planned time off for vacation.

Overall, it appears that for non-metropolitan, community pharmacies in Wisconsin, any change that significantly increases the pharmacist FTE requirement for the site, is likely to increase the probability of a vacant pharmacist position at the site. Factors that were shown to be associated with pharmacist FTE requirement of a site included prescription volume, hours of operation, and number of patient care services provided.

I. INTRODUCTION

Evidence of Pharmacist Shortage

Even a brief review of the literature pertaining to current pharmacy workforce issues will be sufficient to raise an alarm about the shortage of pharmacists facing the United States today. In December 1999, Congress directed the Secretary of Health and Human Services (HHS) to conduct a study to determine whether and to what extent there is a shortage of licensed pharmacists. In December 2000, the Health Resources and Service Administration (HRSA), a branch of the HHS, in response to this Congressional mandate, submitted a report titled 'The Pharmacist Workforce: A Study of the Supply and Demand for Pharmacists'. This report commented that the evidence clearly indicated the emergence of a shortage of pharmacists. They considered the shortage to be dynamic since it appeared to be due to a rapid increase in the demand for pharmacists coupled with a constrained ability to increase pharmacist supply. They further concluded that the shortage of pharmacists was acute because its onset was relatively recent, its severity significant, and its occurrence not clearly expected (Health Resources and Services Administration, 2000).

Occupational shortage occurs in a market when the demand for workers for a particular occupation is greater than the supply of workers who are qualified, available, and willing to do that job (Veneri, 1999). Jobs remain vacant as employers seek to hire more workers than exist or are willing to work at the prevailing wage or salary. The severity of the shortage is determined by the job market's capacity to supply workers. Years of

education and specialized training are required to acquire a pharmacist license; hence, the capacity to supply workers to the pharmacy workforce has been largely constrained.

Evidence of increased vacancy rates and difficulty in hiring pharmacists has been documented in several recent studies. The National Association of Chain Drug Stores (NACDS) Foundation Chain Pharmacy Employment Survey Report for July 2004 showed 4,024 open chain pharmacist positions in the U.S., over 50% increase since 1998 (NACDS Foundation, 2004). Data collected in the 2005 American Society of Health System Pharmacists (ASHP) Pharmacy Staffing Survey suggested a shortage of approximately 2,750 hospital pharmacists nationwide (Pedersen, Schneider, & Scheckelhoff, 2006). Based on data collected from September 1999 through September 2003, the Aggregate Demand Index (ADI) suggested that there was a sustained unmet demand for pharmacists throughout the U.S (Knapp, Quist, Walton, & Miller, 2005).

Measurement of Supply and Demand for Pharmacists

Shortage of pharmacists essentially is due to an imbalance between the supply of and the demand for pharmacists. The supply of pharmacists is well-documented by HRSA's Bureau of Health Professions (BHPr). The BHPr has projected the supply of active pharmacists in the U.S. to reach 224,524 by 2010 and 249,086 by 2020, a 45% increase over the 1991 estimate, at an annual growth rate of 1.3% (Gershon, Cultice, & Knapp, 2000). A 2003 study found that 73,541 new pharmacists graduated from U.S. pharmacy schools over the 10-year period from 1990 through 1999, about 9,500 more than graduated in the 1980s (Cooksey, Walton, Stankewicz, & Knapp, 2003). According to a 2005 report,

8,158 new pharmacists graduated in the year 2004 alone, which was a 12% increase over the number of new graduates in 2000 (Patton, Mayer, & Meyer, 2005).

The existing literature pertaining to demand for pharmacists almost always looks at the *unmet* demand. This unmet demand question has more significance because what interests pharmacy managers and policy makers alike is not necessarily how many pharmacists are required, but how *difficult* it is for employers to hire the required number of pharmacists. The ADI is one such tool for longitudinally tracking the difficulty of filling open pharmacist positions throughout the U.S.

What the ADI or any other current tool is not designed to do, however, is explain why some areas have a greater difficulty hiring pharmacists than others. For example, it is known that the differences in unmet demand for pharmacists are relatively large across states (Knapp & Livesey, 2002) . Some of these differences are paradoxical, as demonstrated by the following examples. Hawaii and Delaware, two of the five states with the lowest unmet demand, do not have schools of pharmacy, which are regarded as important avenues for maintaining an adequate supply of pharmacists statewide (Knapp & Livesey, 2002). Second, the Midwest region, despite a relatively high ratio of pharmacists to population as compared to the national average, has three of the five states with the highest unmet demand – Minnesota, Wisconsin, and Iowa (Knapp & Livesey, 2002).

Factors influencing Unmet Demand for Pharmacists

According to the theory of labor demand, the demand for labor is derived from the demand for the goods that labor helps to produce (Fleisher & Kniesner, 1984). In this case, the principal 'good' that pharmacists help to produce is the 'dispensing of prescription

drugs'. Hence, the demand for pharmacists is heavily dependent on the demand for prescription drugs. Several population level factors determine the demand for prescription drugs in an area, including but not limited to the age of the population, their health status, and their income level. Research has shown that states with the most severe pharmacist shortage levels tend to have large populations, while those with the lowest levels tend to have smaller populations (Knapp et al., 2005). Demand for prescriptions is also dependent on other external factors such as presence of physicians, since they are the ones who prescribe medications. Thus, several factors related to the external environment of a pharmacy are hypothesized to have an influence on the demand for pharmacists at a site and the ability of the site to meet that demand.

In the presence of a shortage, such as the one facing pharmacy today, it is very important to determine geographical markers that help to identify places facing the most severe shortages. It is not feasible for policy makers to collect pharmacist shortage related data for all the pharmacies in the country. Hence, knowledge of where the worst areas are located geographically can be useful in helping to direct resources to those areas. BHPr has set criteria for designating places as having a shortage of health professionals (Health Resources and Services Administration, 2005a). Using these criteria, they maintain a list of all places in the country that have a shortage of primary care physicians, dental health professionals, and mental health professionals (Health Resources and Services Administration, 2005b). These areas are called Health Professional Shortage Areas (HPSAs). The National Health Service Corps (NHSC) then provides incentives for licensed professionals to practice in HPSAs by awarding them with student loan repayments (Young, 2003).

A similar initiative for pharmacy is currently being discussed in Congress. According to the 'Pharmacy Education Aid Act of 2003', any pharmacist who agrees to practice full-time at a health care facility with a critical shortage of pharmacists for at least two years, can take advantage of a loan repayment program (Senator Jack Reed (D-RI), 2003). However, areas with a severe shortage of pharmacists have not yet been identified on a national level. One of the goals of this study is to inform the debate on the selection of external factors (i.e. factors related to the geographical location of a pharmacy) that could help predict areas with pharmacist shortage.

Although external factors associated with a pharmacy may play an important role in influencing the level of unmet demand for pharmacists at the site, there is some anecdotal evidence that the internal characteristics of an individual pharmacy can impact the ability of the site to retain pharmacists. There is ample evidence that work environment can influence job satisfaction, which in turn, affects turnover (Braun, Holloway, Hoffman, Farnham, & Whittle, 1990; Carper, 1996; Cooper & Brown, 1986; Dixon, 2001; Gaither & Mason, 1992; Gelfant, 1990; Kahaleh, 2004; Loeffler, 1993; Onuorah, 2001). It appears that pharmacists in more innovative practices are being challenged to use their patient care knowledge and skills to offer exciting and valuable new services. These services seem to make certain pharmacies more attractive to pharmacists (Maine, 2002). Thus, the internal characteristics of a pharmacy may work in combination with its external characteristics to influence the pharmacist shortage situation at the site. Knowledge of these internal factors that influence the unmet demand for pharmacists at a site can help managers/owners modify their sites to better cope with the current shortage situation.

Supply and Demand for Pharmacists in Rural Areas

For several decades, rural areas have been disadvantaged, relative to other locations, in attracting sufficient numbers of health care providers (Schur & Franco, 1999). Several factors distinguish the demand for health care and supply of health care professionals in rural areas from that in urban areas.

Per-capita income in rural areas is typically lower than in urban areas (Straub & Straub, 1999). This may make the prospect of employment in urban areas more attractive for certain pharmacists. Lack of job opportunities for spouse and conservative attitudes of other professionals may make it difficult to recruit and retain female pharmacists (O'Brien-Gonzales, 2000). The situation is further complicated by the fact that rural employers are competing with non-rural settings on the basis of salaries as well as other benefits associated with an urban location (Schur & Franco, 1999).

Rural areas typically have a higher proportion of elderly and the health status of rural residents is generally worse than urban residents (Ricketts, Johnson-Webb, & Randolph, 1999). These factors suggest a high latent demand for health care, and hence for pharmacists in rural areas. However, rural residents typically have lower incomes (Straub & Straub, 1999) and rural employment is less likely to be associated with health insurance (Mueller & Schur, 2004). As a result, the actual demand for health care in rural areas may be lower than the latent demand. Thus, rural pharmacies are in a separate niche by themselves and it is essential to study them separately from urban pharmacies.

Although pharmacist presence in rural areas is lower than pharmacist presence nationally, pharmacists have a higher presence in rural areas than primary care physicians, physician assistants, nurse practitioners, and nurse midwives (Knapp, Paavola, Maine,

Sorofman, & Politzer, 1999). In some areas, pharmacists may be the only health care professionals available within a distance of several miles. Hence, a rural pharmacist shortage has dire consequences in terms of access to care. Taking all these factors into consideration, this thesis will concentrate only on pharmacies located in non-metropolitan Wisconsin counties. Non-metropolitan counties form a continuum, along which the level of rurality can be measured. The farther a county is located along the non-metropolitan continuum, the more rural it is considered to be.

Study Objectives

The purpose of this study is to investigate the level of unmet demand for pharmacists in community pharmacies that are located in non-metropolitan Wisconsin counties. An additional objective of this study is to determine whether any internal pharmacy characteristics or external factors (related to the geographical location of a site) are associated with the presence of unmet demand for pharmacists at the site. Specific study objectives are:

1. To measure and describe the level of unmet demand for pharmacists (in terms of pharmacist vacancy, pharmacist turnover, and time taken to hire) in non-metropolitan community pharmacies of Wisconsin
2. To explore internal pharmacy characteristics, that may be associated with the presence of pharmacist vacancy at a site.
3. To explore external factors related to the geographical location of a pharmacy, which may be associated with the presence of pharmacist vacancy at the site.

II. LITERATURE REVIEW

This literature review will begin with the current situation and future projections of the pharmacist supply. Factors affecting pharmacist demand will be discussed next, followed by the predictions of supply and demand for other health care professionals. Next, there will be a discussion about rural areas and how factors affecting pharmacist supply and demand in rural areas differ from those in urban areas. Finally, the current situation regarding pharmacist shortage will be discussed, which will lead to an extensive review of factors affecting the unmet demand for pharmacists. The primary goal of this chapter is to propose a conceptual model of specific internal and external factors that help to explain the unmet demand for pharmacists. The conceptual model will be followed by a presentation of the null hypotheses being tested as per the model.

Supply of Pharmacists

In 2000, the Bureau of Health Professions (BHPr) put forth a model to project the supply of new pharmacists in the United States (Gershon et al., 2000). This model takes base year counts of active pharmacists, extracted from the Pharmacy Manpower Project (PMP) census database, then projects those numbers forward in time by (1) adding, each year, the projected number of new entrants; and (2) subtracting, each year, the projected number of pharmacists who will die or retire. The process is iterated from base year 1991 through 2020, the end of the present forecast period (Gershon et al., 2000).

The supply of active pharmacists is projected to reach 224,524 by 2010 and 249,086 by 2020, a 45% increase over the 1991 PMP census estimate of 171,611, an annual growth rate of 1.3%. This supply is expected to expand at a slightly higher rate than the general population. The number of pharmacists per 100,000 population was estimated at 71.2 for 2000, and is projected to rise to 74.9 in 2010 and 76.7 in 2020. About 50% of active pharmacists in 2003 were expected to be women; by 2020, this number is expected to be 64% (Gershon et al., 2000).

Cooksey et al. (2003) described the distribution of U.S. pharmacy schools and compared states to identify high and low producers of graduates over a 10-year period from 1990 through 1999. They found that 73,541 new pharmacists graduated from U.S. pharmacy schools over the 10-year study period, about 9,500 more than graduated in the 1980s. According to a 2005 report, 8,158 new pharmacists graduated in the year 2004 alone, which was a 12% increase over the number of new graduates in 2000 (Patton et al., 2005). The only way to increase supply of pharmacists is to increase the number of pharmacy schools in the country or to increase class size of the pharmacy schools. Currently, there are 90 schools of pharmacy in the U.S. (American Association of Colleges of Pharmacy, 2006).

Demand for Pharmacists

Labor demand is usually referred to as a derived demand. That is, it stems from the demand for commodities that labor helps to produce (Fleisher & Kniesner, 1984). Demand for health care professionals, including pharmacists, is similarly a derived demand and is determined by the overall demand for health care services. Specifically, pharmacist demand

is derived from the demand for 'dispensing of prescription drugs', which is the 'product' that pharmacists help produce.

This demand for prescription drugs is influenced by both micro- (individual) and macro- (societal) level factors.

Micro-level factors:

An important micro-level factor influencing demand for prescription drugs is the patient's real or perceived need to seek health care. This need is influenced by several factors such as the patient's age, health status, socio-economic status, insurance coverage, and direct-to-consumer advertising (McLaughlin, 1994).

The other major micro-level factor influencing demand for prescription drugs is the availability of physicians in the area and physicians' preferences. Preferences may vary by the physician's education or area of specialization. Once the patient makes a decision to seek care from a physician, the physician typically determines, to a great extent, the patient's subsequent demand for healthcare including prescription drugs (McLaughlin, 1994).

Macro-level factors:

Societal-level changes in the U.S. have the potential to create a tremendous change in the demand for prescription drugs. Probably the most significant factor is the aging of the American society. Although age is a micro-level factor, the effect of collective aging of a large proportion of the U.S. population is expected to have several macro-level effects. The increased incidence of chronic disease and disability associated with aging populations will likely increase the overall demand for health care services in the U.S., thus increasing the demand for prescription drugs as well (McLaughlin, 1994).

The extent and nature of prescription drug coverage for the population in a given area affects the demand for prescription drugs. An increase in the number of people covered by insurance will result in more people having access to prescription drugs (McLaughlin, 1994).

A third macro-level factor affecting the need for prescription drugs is the collective health status of the larger community. The incidence and prevalence of diseases such as AIDS, as well as personal lifestyle choices about diet and exercise have important implications for the demand for prescription drugs.

Supply and Demand for other Health Care Professionals

It is important to look at the supply and demand for other health care professionals for two reasons. First, the demand for prescription drugs is influenced by the number of prescribers available in a region (Brown, Brown, Sharma, Hollands, & Smith, 2001). So, evaluating whether there is a current shortage of prescribers (mainly physicians) will help estimate the demand for prescription drugs, and thus the demand for pharmacists. Second, demand for most health care providers primarily originates from the demand for health care. Hence, factors that influence the demand for other health care providers are probably similar to the ones that influence the demand for pharmacists.

Evaluating Shortage of Prescribers (Physicians)

There is no profession other than medicine for which more planning effort has been expended to achieve a workforce of appropriate size or one for which such a high degree of accuracy is sought. There are several reasons for this. Undersupply was a national problem extending from the 1940s to the 1980s in many metropolitan areas. Oversupply raises a

different set of concerns. One is the large expense involved in preparing individuals to be physicians – an expense borne both by medical students and by society (Cooper, 1995). A second reason is the perception that an excessive number of physicians leads to an excessive amount of spending (Brown et al., 2001). Achieving balance between supply and demand for physicians is a high priority.

In 1976, in response to concerns about the rapidly growing supply of physicians, the Graduate Medical Education National Advisory Committee (GMENAC) was established to advise the nation on how many physicians were needed in the United States. In 1980, GMENAC concluded that by 1990, there would be a surplus of 70,000 active physicians (a 13% surplus) and by the year 2000, this surplus would increase to 145,000 (22% surplus). They recommended limiting the number of medical school positions and severely restricting the number of international medical school graduates entering the United States (Graduate Medical Education Advisory Committee, 1981). Concerns about a potential surplus escalated in the 1990s due to the expansion of managed care and its emphasis on primary care. This concern was echoed by the national Council on Graduate Medical Association or COGME (Salsberg & Forte, 2002).

One of the first voices of caution against this popular belief of an impending surplus was raised in 1995 by Dr. Richard Cooper. He assessed physician supply and demand for a period extending to 2020, and concluded that on a national scale, a small surplus of physicians exists, but this surplus is likely to be of modest size until 2010, after which it will recede (Cooper, 1995). In 2002, he and his colleagues concluded that the United States is likely to experience a serious shortage of physicians in the future. This was based on a model developed by the authors that measured the adequacy of physician supply based on

the growth of the nation's economy and on a number of factors that were changing the productivity of the average physician (Cooper, Getzen, McKee, & Laud, 2002). This was followed by a report in 2004 that predicted a shortage of up to 200,000 physicians by the year 2020 (Cooper, 2004). Recently, the American Medical Association (AMA) and the Association of American Medical Colleges (AAMC) have taken the position that previously feared surpluses are unlikely and the COGME has reversed its earlier position, calling instead for an expansion of medical training at the undergraduate and graduate levels (Cooper, 2004).

In summary, physicians are likely to be in modest over-supply until 2010, but the trend is likely to reverse, leading to a shortage by 2020. Given the COGME's call for expansion of medical training, we are likely to see an influx of physicians in the future at a rate higher than the current one. Accounting for the relationship between number of prescribers and the demand for prescription drugs (Brown et al., 2001), we may see an increased demand for prescription drugs in the near future.

Factors influencing demand for other health care providers

The Health Resources and Services Administration's (HRSA) Bureau of Health Professions (BHPr) has developed a Physicians Requirement Model to predict the number of full-time equivalent physicians required in the future (Greenberg & Cultice, 1997). The model incorporates characteristics of the population such as age, and insurance status in helping to predict the requirement for physicians. Age of the population is known to be an important predictor of the demand for prescription drugs. In 2000, although seniors (age 65 and above) constituted only 13% of the population, they accounted for 34% of all the prescriptions dispensed (McCloskey & Schondelmeyer, 2000). Thus, population parameters

which influence the need for health care are likely to be associated with the demand for pharmacists.

The HRSA's BHPr has also developed a Nursing Demand Model (NDM) to forecast demand for RNs, LPNs, and nurse aides by delivery setting and state through 2020 (Health Resources and Services Administration, 2003). Similar to the physicians' model, this model also takes into account the characteristics of the population in order to predict demand. In addition to this, the model attempts to answer two important questions; namely, what level of nursing services will patients require, and who will provide these nursing services. These questions have some interesting parallels in pharmacy, which may help us estimate the level of demand for pharmacists.

Within pharmacy, the relevant question may be: what *type* of services will patients require? Until now, the most common service rendered by pharmacists has been the dispensing of prescription drugs. However, some pharmacies have slowly begun to move towards a more patient-centered approach by providing patient-care services such as health screening, smoking cessation programs, immunization, etc. Also, there are pharmacies which provide disease state management programs such as diabetes management, hypertension management, etc. Whether the provision of such additional services increases the demand for pharmacists in community pharmacies is not known.

The other relevant question in pharmacy is: *who* provides pharmacy services? More specifically, as the volume of prescriptions has increased, pharmacies have started moving towards automated systems that perform most of the dispensing-related tasks before the pharmacist makes a final review of the drug being dispensed (Health Resources and Services Administration, 2000). Whether such dispensing-aiding technologies reduce the

demands on pharmacist time and thus affect the demand for pharmacists needs to be evaluated.

Supply and Demand for Pharmacists in Rural Areas

Supply of pharmacists in rural areas

There are several factors which distinguish rural pharmacist supply from supply in other areas. Remoteness, isolation from other professionals, lower economic returns, and reduced opportunities for advancement remain obstacles in attracting providers. Hence rural areas have been disadvantaged for several decades, relative to other locations in attracting sufficient numbers of health care providers (Schur & Franco, 1999). Studies have shown that although pharmacist presence in rural areas is less than their average presence nationally, pharmacists have a higher presence in rural areas than primary care physicians, physician assistants, nurse practitioners, and nurse midwives (Knapp et al., 1999). Hence, a threat to the rural pharmacist supply has more dire implications, since, in many cases, the pharmacist may be the only available health professional within a distance of several miles.

Historically, earnings have been lower in rural settings, a fact that may prevent new graduates from accepting employment in rural areas (O'Brien-Gonzales, 2000). However, the lower earnings may, in turn, be offset by the lower cost of living in these areas. Research about the unique needs of women physicians in rural practice has identified the significance of factors such as job opportunities for spouse, attitudes of other professionals, and parenting benefits like time off for child bearing in difficulty to recruit and retain female pharmacists. This has led to a higher rate of out-migration for women physicians compared to that for men (O'Brien-Gonzales, 2000). Similar research has not been

conducted within pharmacy, but the same trend may be true of female pharmacists in rural areas.

Demand for pharmacists in rural areas

The demand for pharmacists in rural areas is, as elsewhere, a derived demand based on consumer demand for prescription medications and other services. However, there are several factors which differentiate rural consumers' demand for services as well as pharmacy employers' demand for pharmacists. Factors which differentiate rural consumers from urban consumers include age, general health status, income level, and insurance coverage.

The median age of the non-metropolitan population is nearly two full years greater than that of the metropolitan population, and the proportion of those over 65 is 15.0% in non-metropolitan areas as compared to 12.8% in metropolitan areas (Ricketts et al., 1999). Health status of rural residents, a factor in the demand for services, has been well documented as generally worse for rural residents compared with those elsewhere. In rural areas, there are higher rates of chronic diseases and occupation-related injuries, as is the age-adjusted mortality (Ricketts et al., 1999).

Income of rural residents is typically lower than for other areas. In 1980, the average earnings per job was $5,203 less per year for rural workers than for those in metropolitan areas. This gap had widened to $7,589 by 1998 (Straub & Straub, 1999). Also, employment is less likely to be associated with health insurance in rural areas. Mueller and Schur (2004) found that 75% of the urban elderly had some type of drug coverage in 1997 versus 59% of the elderly in rural areas. Urban residents were more likely to have obtained their drug

coverage from an employer-sponsored supplemental plan, and rural residents were more likely to have self-purchased drug coverage.

The demand for health care resulting from these characteristics of the rural population is not straightforward. A higher percentage of elderly and persons in poor health status suggest more demand for prescriptions. However, their comparatively lower income level and lower likelihood of having insurance coverage tend to mitigate this demand.

Unmet Demand for Pharmacists - Pharmacist Shortage

A shortage of labor results when there is an imbalance between the supply of and the demand for labor. Evidence of increased vacancy rates and difficulty in hiring pharmacists has been documented in several recent studies. Three series of surveys have consistently tracked the pharmacist shortage: (1) the NACDS Foundation Chain Pharmacy Employment Survey, (2) the ASHP Pharmacy Staffing Survey, and (3) the Aggregate Demand Index (ADI).

The NACDS Foundation survey has been conducted since 1998. It uses data from member organizations, including chain drug stores, supermarkets, and mass merchandizing organizations to track the severity of pharmacist shortage, vacancies, and specific shortage areas. The July 2004 survey report showed 4,024 open chain pharmacist positions in the U.S. These numbers have increased over 50% since 1998, when only 2,668 vacancies were reported (NACDS Foundation, 2004).

The ASHP survey focuses on health-system pharmacists (primarily hospital pharmacists) and reports the number of vacancies, percentage of total vacancies, and severity of the shortage by type of pharmacist position. Data collected in the 2005 ASHP

survey suggest there is a shortage of approximately 2,750 hospital pharmacists nationwide. These results have remained fairly consistent over the period of the last three years (Pedersen et al., 2003; Pedersen, Schneider, & Scheckelhoff, 2006).

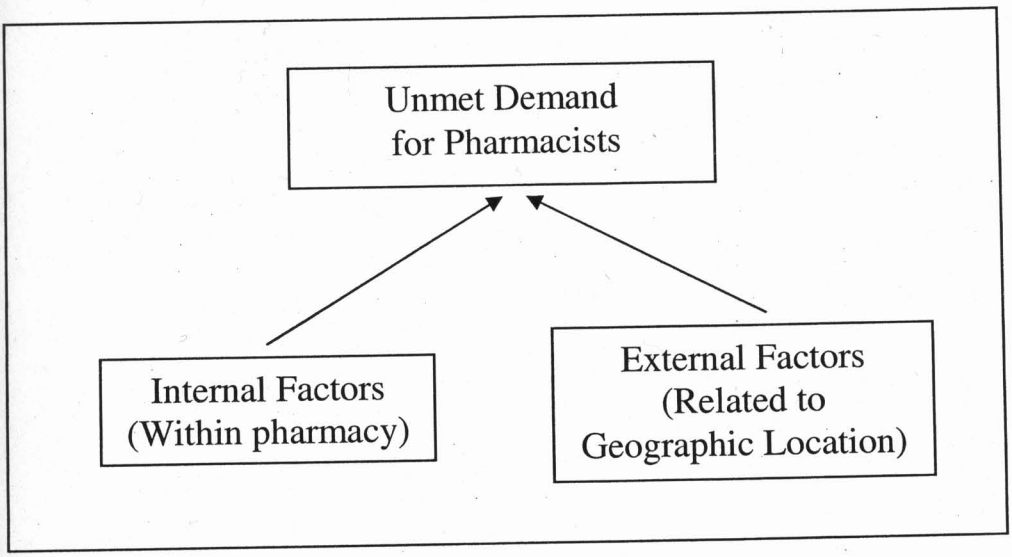
The ADI is a tool for longitudinally tracking the difficulty of filling open pharmacist positions (level of demand for pharmacists) throughout the U.S. A panel of individuals directly involved in hiring pharmacists for their state(s) is recruited. For each state, plus the District of Columbia, panelists estimate the level of difficulty filling positions during the last month based on a 5-point scale. Panelists' data are compiled, and a demand index (the ADI) is determined for each state by calculating the mean of all ratings for that state for that month. The index provides insight into pharmacist demand by practice setting (Knapp & Livesey, 2002). Although the ADI gives a reasonable subjective measure of unmet pharmacist demand, it does not give any objective information about the number of vacant positions by region or the time taken to fill vacant pharmacist positions.

Using the ADI data from August 1999 through July 2001, Knapp and Livesey (2002) reported that demand for pharmacists exceeded the available supply in the U.S. for the study period. Wisconsin was one of the five states with the highest unmet demand level. Substantial, but unexplained differences were noted by state, by region, and by type of pharmacy position (Knapp & Livesey, 2002). Further data collected through September 2003 demonstrated a continuing national pharmacist shortage, as the ability to fill pharmacist vacancies was rated at least moderately difficult; although, a slight downward trend in severity was observed (Knapp et al., 2005).

It is known that the differences in unmet demand for pharmacists are relatively large across states (Knapp & Livesey, 2002) . What the ADI or any other current tool is not

designed to do, however, is explain why some areas have a greater difficulty hiring pharmacists than others. One of the goals of this study is to explore characteristics of a pharmacy site as well as factors associated with a particular location that influence the unmet demand for pharmacists at a site. The main goal of the remainder of this literature review is to identify specific pharmacy related factors (internal factors) and factors associated with the geographical location of a site (external factors) that are hypothesized to be associated with the presence of unmet demand for pharmacists at a site.

Figure 1: Skeleton of Conceptual Model of Unmet Demand for Pharmacists



Internal Factors Affecting the Unmet Demand for Pharmacists

1. Pharmacist Compensation and Benefits

Compensation relative to other employers in the community has begun to play a crucial role in the efforts of pharmacy managers to attract qualified pharmacists to their sites. The last few years have seen a substantial increase in the compensation packages being offered to pharmacists. Between 1997 and 2002, there was an increase of 35-40% in the annual pharmacist salary of Ohio pharmacists (Pedersen & Heitz, 2002). Approximately half of the full-time employee pharmacists in one midwestern state received some type of bonus in 1998; the monetary value of the bonus ranged from $100 to $40,000 (McCaffrey, Garner, & Fenton, 2000). A random sample survey of licensed pharmacists residing in Wisconsin found that between 2001 and 2003, overall annual base salaries for Wisconsin pharmacists increased 13.0% from $80,108 to $90,554, which is more than three times that of general inflation during this period (Mott & Kreling, 2004). They also found that annual bonuses were common for community pharmacists, the average amount of which totaled about $10,000 for many pharmacists (Mott & Kreling, 2004). In general, pharmacists were offered very competitive and comprehensive benefit packages.

Researchers have proposed that the hyper-demand for pharmacists in recent years has led to the rapid increase in pharmacist salaries (Pedersen, 2002). There is evidence that the pharmacy market is willing to pay a wage rate that is at or above the current wage rate to attract new pharmacists (Hansen, Schommer, Hadsall, Larson, & Uden, 2001). This suggests that those sites which cannot afford to offer attractive compensation packages to their pharmacists are at a disadvantage when it comes to either retaining old staff or recruiting new staff. Mott (2000) studied pharmacist job turnover from 1983 to 1997. Data

were collected from a randomized survey of 1,600 licensed pharmacists in four states (Ohio, Massachusetts, Oregon, and Alabama). Overall, salary had the second highest mean rank as a reason for pharmacists leaving their job (Mott, 2000). This emphasizes the importance of salary in retaining pharmacists. This result was in sync with their finding that a larger percentage of pharmacists leaving independent pharmacies ranked salary as a reason for leaving than pharmacists in larger chain settings (Mott, 2000). Studies have shown that chain pharmacists typically have higher wages as compared to independents. Community chain staff pharmacists in all geographical regions within Wisconsin had a higher average annual salary than community independent staff pharmacists (Mott & Kreling, 2004). These differences in salaries across regions and settings coupled with the importance of salary as a tool for retaining and recruiting pharmacists makes it very important to study the effect of relative wage rates on the unmet demand of pharmacists at a site because it is possible that the unmet demand is particularly severe in sites or regions that have lower wage rates than others.

2. Work Aspects:

(i) Work Schedule

Given the ever increasing salaries being offered by some settings, especially the larger chains, hospital pharmacies as well as some of the smaller community settings are using other ways of attracting and retaining qualified pharmacists in the face of stiff competition. Scheduling flexibility is one such method. There have been multiple reports of hospital pharmacies offering flexible and consistent working schedules as a way of luring pharmacists to their sites (Chi, 1991; Karpa, 2000).

A survey of female hospital pharmacists found that almost 80% of the respondents reported flexible schedules as being important or extremely important in balancing their professional and personal lives (Mason, Gaither, Hoffman, & Diokno, 1994). It is logical to think that work-schedule options would help female pharmacists combine career and family responsibilities. Over a decade later, this finding gains even more significance in the face of a steadily increasing proportion of female pharmacists in the workforce. A profile of licensed pharmacists in 1999 in four Midwestern states, including Wisconsin, revealed that almost 44% of the workforce consists of women (Mott, Sorofman, Kreling, Schommer, & Pedersen, 2001). More importantly, greater than 80% of the female workforce was younger than 46 years old, an age-group that is particularly sensitive to the flexibility of work-scheduling due to family responsibilities (Mott et al., 2001). These results are mirrored in a national survey conducted by the Midwest Pharmacy Workforce Research Consortium. They found that over 43% of the nation's licensed pharmacist workforce is women (Pedersen, Doucette, Gaither, Mott, & Schommer, 2000).

Hospital pharmacy directors were surveyed by Gaither et al. (1994) to determine whether their departments offered work-schedule options and to find out their attitudes about providing these options. Flexible scheduling was found to be offered by just below 70% of the hospitals' pharmacies. Almost 65% of the pharmacy directors who responded indicated that offering "flexible schedule" was important or extremely important in recruiting and retaining pharmacist staff (Gaither, Mason, Diokno, & Hoffman, 1994). However, direct effects of scheduling on turnover of pharmacists are not known.

Increasingly, we see pharmacies keeping their prescription departments open longer hours, as well as extending their services on weekends. Pharmacies with such hours of

operation will have to hire pharmacists who are willing to work outside of "normal" business hours, or even worse, require their regular staff pharmacists to work some or all weekends. If only a certain segment of pharmacies are open during late evening or on weekends, it is likely that pharmacists may prefer working for employers who do not require them to work such hours.

(ii) Workload

One measure of pharmacists' workload that has been consistently documented is the growth in prescription medication use and the volume of prescription drugs dispensed in drug stores and other retail outlets (Health Resources and Services Administration, 2000). Prescription volume serves as a useful starting point for measuring changes over time in the level of activity required on the part of the pharmacists. Any increase in the number of prescriptions filled is inevitably accompanied by a corresponding increase in other related functions, including the number of occasions on which patient counseling is called for, the number of occasions on which third party payment issues must be resolved, and so on. The rapid growth in prescription volume that has taken place in recent years is clearly a major contributor to the current pharmacist shortage (Health Resources and Services Administration, 2000).

Between 1992 and 1999, the number of retail prescriptions dispensed per year increased from 1.9 billion to 2.8 billion, a 44% increase or a growth rate of over 5% per year (Health Resources and Services Administration, 2000). During this period, however, the total number of community pharmacists increased by only 9.6% (Health Resources and Services Administration, 2000). Thus, the volume of prescriptions has grown much more

rapidly than the number of pharmacists. Hence, in recent years, pharmacists have been required to oversee the delivery of more and more prescriptions.

Perhaps one of the most important factors influencing prescription medication use growth has been increased third party prescription coverage. Prescription coverage increased dramatically during the 1990s, due to the provision of such benefits by private health insurance and managed care plans. Using data obtained from IMS, the HRSA reported that the proportion of prescriptions paid for by third parties increased from less than half in 1992 to almost four out of five by 1999 (Health Resources and Services Administration, 2000).

Apart from increasing the overall prescription drug use, third-party insurance coverage adds an aspect of work to the pharmacists' job that has been shown to have a negative effect on their productivity. A substantial portion of a pharmacist's time during the day is spent in dealing with issues related to third-party coverage and their formulary requirements. A survey of 870 community and hospital pharmacists in 1998 reported pharmacists spending about 11% of their daily time on third-party claims and adjudication (Ukens, 1998). A similar survey of community pharmacists in 1996 reported a 10% figure (Muirhead, 1996). A 1999 survey of chain store pharmacists reported that 20% of pharmacist time is spent solely on activities directly related to third-party issues such as entering information from the patient's identification card and resolving conflicts related to restrictions on insurance coverage (Landis, 2000).

The Midwest Pharmacy Workforce Consortium surveyed a national sample of pharmacists in 2004. They considered two characteristics of workload: hours worked per week and the proportion of total prescriptions dispensed at the site with which the

respondent was involved personally. They found that pharmacists in independent settings worked more hours in a typical week (44.4 hours) compared with pharmacists in chain (42.8 hours), mass merchandisers (41.1 hours) and supermarkets (41.2 hours) (Mott et al., 2005). There were differences in personally dispensed prescription volumes when pharmacists were categorized by setting. Relative to other practice settings, a greater proportion of pharmacists working in chains (45%) personally dispensed greater than 160 prescriptions daily (Mott et al., 2005).

(iii) Support Staff

In 2004, about 25% of pharmacists reported working with an intern (Mott et al., 2005). At least 40% of the pharmacists working in chain and mass merchandiser pharmacies worked with three or more technicians. There was also a trend of increased staffing in terms of technicians and clerks between 2000 and 2004 (Mott et al., 2005). The use of pharmacy technicians, interns, and residents could be optimized to relieve pharmacists of the burden of prescription dispensing. This may help free up pharmacist time to deal with more patient-care oriented issues.

(iv) Technology

Productivity enhancement in the workplace has been introduced through various types of automation products. Robotics and other systems have been developed for retail as well as institutional pharmacies. These systems can count pills, place them in containers or packaging, label the product, and deliver it to an appropriate check-point for pharmacist's final review (Health Resources and Services Administration, 2000). The productivity enhancements offered by these systems can be substantial. Another enhancement that is expected to improve pharmacist efficiency is greater use of electronically entered and

transmitted prescription orders. They can intercept potential medication errors through checks with patient medical data. This may reduce the amount of time pharmacists must spend in verifying and discussing orders with physicians, currently usually done over the telephone (Health Resources and Services Administration, 2000).

More than 60% of pharmacists that were asked to rate how technology affected them and/or their practice site, reported that technology increased the level of their productivity and the quality of care provided to patients (Mott et al., 2005). Interestingly, though, in the same study, about 10% pharmacists reported that technology had a negative effect on them. More pharmacists reported that technology increased versus decreased demands on their time in the pharmacy (Mott et al., 2005).

(v) Work Activities

Reports in the lay press as well as editorials in certain journals have recently suggested that even in this environment of severe pharmacist shortage, some pharmacies have had little or no problems in recruiting and retaining pharmacist staff (Maine, 2002). Clearly, these employers are doing something different. More specifically, immunization programs, diabetes care programs, and wellness initiatives are among the types of services that are making certain employers more attractive to pharmacists. Pharmacists in these innovative practices are being challenged to use their patient care knowledge and skills to offer exciting and valuable new services (Maine, 2002). This author has heard comments from local pharmacy managers that patient care services at their site are the biggest tool they have in recruiting new pharmacists. New graduates have expressed a willingness to take a 10-15% pay-cut to be able to work in an environment that lets them do more than just filling prescriptions. Although this information is largely anecdotal in nature at this time, it

merits the exploration of the role that pharmacy services have to play in tackling pharmacist shortage at a particular site.

Research conducted by Schommer et al. (2002) showed that, as of 2000, pharmacists reported spending the majority of their time dispensing medications, regardless of their practice setting or the prescription volume at their site. This finding is hardly surprising. Given the widespread shortage of pharmacists, they are forced to perform the one function that is highest on the priority list of any pharmacy site. However, community pharmacists would prefer to devote more of their time to professional responsibilities such as consultation and drug use management, and less time to medication dispensing (Mott et al., 2005). Thus, community pharmacists clearly want a change in what they are routinely doing at their practice sights. Any site which offers them the opportunity to go beyond their routine work activities like dispensing will potentially be a very attractive place for pharmacists to work in; and hence, it may face little or no trouble in recruiting and retaining staff.

In spite of the advantages associated with providing services such as disease management programs, a relatively small proportion of pharmacies are providing them. There are several barriers associated with provision of services that must be overcome to institute a full-fledged program. Van Mil et al. (2001) conducted structured interviews with representatives of pharmacists' organizations and researchers in pharmaceutical care from different European countries. Their objective was to establish the perceived barriers to implementation of pharmaceutical care into community pharmacy practice and the relative importance of these barriers. Lack of reimbursement and lack of time were the two most frequently cited barriers. Lack of communication skills and attitude of pharmacists also

figured in the top 10 (Van Mil, Boer, & Tromp, 2001). Assessment of pharmacies with respect to these barriers will give us a better understanding of their readiness to implement pharmaceutical care programs.

Holdford (1996) conducted a survey of 62 large managed care organizations in 1994 to identify barriers to implementation of disease management programs. He concluded by saying that disease management has been slow to catch on because of structural barriers in the healthcare system , information limitations, and the difficulty of developing alliances between providers and suppliers.

The provision of services may be determined in part by the geographical location of the pharmacy, since some areas afford greater opportunity for such endeavors than others. Health Professional Shortage Areas (HPSAs), by definition, are areas that have a population-to-primary care physician ratio above 3,500 to 1 (or 3,000 to 1 in some cases). More than one half of rural residents live in HPSAs (Knapp et al., 1999). The situation in these areas is not improving. Programs to increase the number of primary care physicians in rural areas have not resulted in a significant redistribution (Rivo & Kindig, 1996). Overall, the current conditions suggest that increasing care in rural areas will require making the best use of existing resources. For approximately 3.7 million rural residents, pharmacists are the only group available to augment the very low physician supply and they should be considered as candidates to increase care for patients (Knapp et al., 1999). Procedures such as assessing and monitoring blood pressure and weight, checking electronic glucose monitor reports, and educating patients on the appropriate use of asthma medications and devices could be done in pharmacies (Knapp et al., 1999).

3. Work Environment or Work Culture

Research has shown that work environment can influence turnover directly or through job satisfaction. Turnover has been defined as the "voluntary choice of an individual to terminate employment in a particular job with a particular organization" (Thompson & Terpening, 1983). One of the major goals of studies viewing turnover from employee's perspective has been to identify the variables in the individual's work environment that precipitate the turnover decision (Cooper & Brown, 1986). A nationwide survey of 2,400 licensed community and hospital pharmacists led to the conclusion that employers can decrease the likelihood of employee turnover through improved working conditions (Gaither & Mason, 1992). Employers can decrease the level of job turnover intention, correlated with job turnover, by increasing the support of pharmacists and their access to resources in the workplace (Kahaleh, 2004). In trying to understand the huge turnover rate at nursing facilities, researchers found that a perceived lack of respect, being left out of decision-making, and not being treated as professionals are some of the main reasons for nurses' turnover (Dixon, 2001).

Turnover is a practical expression of employees' low level of satisfaction with work. Repeatedly, managers and researchers report a direct relationship between lower levels of satisfaction and higher levels of turnover (Schulz, 1993). A meta-analytic study investigating the causal relationships among job satisfaction, turnover intentions, and turnover behavior in nurses found a strong positive relationship between turnover intention and turnover behavior; and a strong negative relationship between job satisfaction and turnover intentions (Irvine & Evans, 1995). Several studies within the health care literature, especially within nursing, have established the fact that job dissatisfaction is associated

with increased employee turnover (Lucas, Atwood, & Hagaman, 1993; Porter & Steers, 1973; Prestholdt, Lane, & Mathews, 1988; Price & Mueller, 1981; Tett & Meyer, 1993).

There are several facets of work environment that have been shown to influence job satisfaction. Perhaps, the most commonly cited one in the health literature is "autonomy". Being a professional means that, by virtue of one's education, one has knowledge that is useful and needed by the people. Being a professional implies the freedom to exercise professional judgment in each situation to the best of one's ability. Being a salaried professional, however, as most pharmacists are, necessarily puts restrictions on the degree of autonomy one can exercise at work. The input that staff pharmacists have in routine decisions like determining their time spent in various activities, choosing the drugs stocked and equipment used at the pharmacy, deciding what goes on prescription labels or choosing how products are merchandised can vary greatly from site to site. While the employer has the responsibility to establish policies and procedures which employees must follow, the employer also has the responsibility to provide opportunities for the pharmacist to function autonomously at work (Schulz, 1993).

Through telephone interviews conducted with Oklahoma pharmacists, Ralph and Langenbach (1987) found that professional autonomy was strongly associated with pharmacists' satisfaction or dissatisfaction with their jobs. A mail survey of practicing pharmacists in six upper mid-western states also found "autonomy" as one of the variables predicting job satisfaction (Lerkiatbundit, 2000). Several studies in nursing have found autonomy/control/shared governance to affect the job satisfaction of registered nurses (Onuorah, 2001; Song, Daly, Rudy, Douglas, & Dyer, 1997). In a report of the Secretary's Commission on Nursing, one recommendation to reduce the nursing shortage cited the need

to involve nurses in decision-making relating not only to nursing practice but also patient care (Bowen, 1989). "Autonomy" has even figured prominently as a variable affecting job satisfaction in physicians (Konrad, Williams, & Linzer, 1999).

Challenging work is another frequently cited variable that influences satisfaction at work. Challenge refers to the opportunity for professionals to fully utilize their knowledge and skills in a way that is inherently stimulating and useful to the employer and patient (Schulz, 1993). Reid, Johnson, and Robertson studied employees of an HMO pharmacy department and reported that pharmacists were more satisfied with aspects of their job that defined the challenge of their work (Ried, Johnson, & Robertson, 1987). A review of previous studies supported the idea that the increased mental challenge afforded by the role of clinical and research pharmacists have a great impact on overall job satisfaction (Cooper & Brown, 1986). Other factors influencing job satisfaction that have been cited in the healthcare literature include respect and recognition from employers (Braun et al., 1990; Loeffler, 1993), support of management (Konrad et al., 1999; Lerkiatbundit, 2000; Lowe, Schellenberg, & Shannon, 2003), good communication (Lowe et al., 2003), and management policies and competence (Braun et al., 1990; Onuorah, 2001).

The challenge for pharmacists is to find aspects of their work which stretch their intellectual skills and abilities to the limit in a meaningful way. The challenge for employers is to create such a work environment. One way of doing this is to incorporate provision of various services and disease management programs at the site, which will help pharmacists step away from their routine dispensing duties to do something more stimulating and rewarding.

In summary, the literature review reinforced the importance of three main internal pharmacy factors in influencing the presence of vacancy at a site. These three factors are: (i) Pharmacist compensation, (ii) Work aspects, and (iii) Work environment / culture. Pharmacist compensation includes the salary or hourly wage for the pharmacist as well as a sign-on bonus, if given. Work aspects for pharmacists include work scheduling, workload, number of support staff, technology, and work activities. Work environment / culture of a site encompasses pharmacists' input in decision-making, emphasis of the site, innovativeness, communication, dispensing and service orientation.

External Factors Affecting the Unmet Demand for Pharmacists

The criterion used to select external factors that could influence the level of unmet demand for pharmacists was that these variables had to be outside the locus of control of any individual pharmacy site. Factors which influence both the supply and demand for pharmacists would impact unmet demand. As seen earlier, demand for pharmacists is mainly derived from the demand for prescriptions. The external factors affecting unmet demand for pharmacists are reflective of this fact and mostly related to the demand for prescription drugs. Factors that could influence pharmacists' decision to live in a particular county were considered as things that could help predict the supply of pharmacists in a county.

Total Population of the county

Walton et al. (2004) examined the impact of supply and demand factors on filled positions for pharmacists and pharmacist extenders (pharmacy technicians and aides), and assessed differences across states through analysis of state-level pharmacist labor market

data. They found that across states, the total population and number of community pharmacy prescriptions were very accurate predictors (R^2=0.99) of the number of pharmacist and pharmacist-extender positions (Walton, Cooksey, Knapp, Quist, & Miller, 2004). These results lend support to the argument that the total population of an area influences the need for pharmacists in that area. In other words, the higher the population, the greater is the demand for pharmacists. Given supply limits, an increased demand for pharmacists increases the difficulty of filling all the pharmacist positions available. Hence, higher demand areas are more likely to face a pharmacist shortage. This argument is well supported by data from the ADI project. ADI data through July 2001 showed that states with the most severe shortage levels tended to have large populations, while those with the lowest levels tended to have smaller populations (Knapp et al., 2005).

Senior population of the county

Approximately 85% of the older American population has at least one chronic condition, and because of their increased likelihood of developing a chronic illness, older Americans are more likely to use prescription drug therapy (Sullivan, Gardner, & Strandberg, 1994). Stevic and colleagues (2000) examined the Spring 1998 cohort of the Medicare Health Outcomes Survey (HOS) to obtain baseline data for seniors' health status in 1998. They found that 65% of Medicare beneficiaries had two or more medical conditions. Over 40% of these beneficiaries had 4 or more medical conditions.

In 2000, seniors accounted for 34% of all prescriptions dispensed, although they constituted only 13% of the population (McCloskey & Schondelmeyer, 2000). On average, older Americans obtained 22.6 prescriptions annually in 1996, more than twice the U.S. average for all age groups. This figure was projected to reach 34.4 prescriptions annually by

2005. Health status in families with seniors (members aged ≥65 years) has been shown to be significantly lower than in families without seniors (McKercher, Taylor, Lee, Chao, & Kumar, 2003). Also, prescription size and prescription drug use was higher in families with senior members.

These trends are reflected in expenditures on prescription medications, which are significantly higher among those aged 65 years and over than among younger people. In the U.S., health spending for persons aged ≥65 years is 3.8 times the health spending for persons aged <65 years (Anderson & Hussey, 2000). Given the increased demand for prescription drugs among the senior population, areas with a high proportion of seniors are likely to have an increased requirement for pharmacists as well.

Number of pharmacists living in the county

A majority of the staff pharmacists working at pharmacy sites within a county are likely to be pharmacists residing in the county. Arguably, some pharmacists living near the border between two counties may work at a site which is not located within their county of residence. However, this is more likely to be an exception rather than a common occurrence. Thus, the ability of pharmacies within a county to adequately staff their sites may depend partly on how many pharmacists reside in that county. It was hypothesized that the proportion of pharmacists to pharmacies in a county may prove to be a useful indicator of vacancy.

Number of pharmacies in the county

The potential employers for a majority of the licensed pharmacists within a county are the pharmacies within the county. If the number of active pharmacists residing in a county is less than the number required by pharmacies within the county, it may lead to an

increase in the level of unmet demand for pharmacists in the county. This makes it useful to compare the pharmacists per pharmacy ratio across counties.

Ideally, pharmacies within a county are expected to reflect the demand for prescriptions within that county. If a county has a low number of pharmacies in spite of having a higher demand for prescriptions (as reflected by total population and senior population of the counties), then the pharmacies may face a higher prescription volume to keep up with the demand. This will lead to an increase in the requirement for pharmacists. As a result, it might be useful to compare population per pharmacy and seniors per pharmacy ratios across counties.

Number of Physicians in the county

There is some evidence in the literature about how the number of physicians available affects health care utilization and expenditures. A survey conducted in 1997 in various Swiss "cantons" (which are similar to states in the U.S.) found that the number of physician consultations per capita increased in the "cantons" having a high physician/population ratio (Crivelli & Domenighetti, 2003). A study conducted on the determinants of health expenditure in OECD countries found that in countries with a FFS payment for physicians, the ratio of physicians/population was positively related to health expenditure (Jonsson & Gerdtham, 2000). Similarly, a study conducted in Canada found that utilization of physician services was associated most consistently with growth in the supply of physicians (Hughes, 1991). One interpretation of these findings is that the possible reduction in average physician income resulting from a greater availability of physicians, seems to be offset via increased health services (Carrin & Hanvoravongchai, 2006).

Prescription drugs form only one part of health care utilization and health care expenditures, but an important one. About 60% of all visits to office-based physicians in 1990 were "drug visits" in which one or more prescription or non-prescription medications were prescribed or provided (Strickland & Hanson, 1996). Thus, if there is a trend towards increased utilization of health care in places with a higher physician/population ratio, there is sufficient reason to expect an increased demand for pharmacists in these areas to fill the additional prescriptions.

Income level of the county

Income level has been shown to be a strong indicator of health care utilization. Even when medications are prescribed by medical personnel, they may or may not be considered "needed" by lower income individuals. Households below the poverty line tend to classify goods and services as absolutely necessary or not absolutely necessary for survival (Strickland & Strickland, 1995). In a study exploring poor Canadians' access to medical treatment services, Williamson and Fast found that 38% of the study participants had failed to obtain physician services when they were sick, and 40% of those who had been prescribed a medication had not filled it (Williamson & Fast, 1998). Lack of money, and lack of affordable transportation were two main barriers to access for the study's participants.

A study to examine the problem of cost-related medication skipping in seniors using a sample of Medicare beneficiaries in 13 states found that cost-related skipping rate was just over 13%, and low income was significantly associated with more skipping (Williamson & Fast, 1998). Similarly, annual income less than $10,000 was found to be one of the strongest predictors of medication restriction (Steinman, Sands, & Covinsky, 2001).

A study conducted on a random sample of over 4,000 Pennsylvania Medicare beneficiaries found that elderly with annual incomes greater than $18,000 were 18% more likely to treat problems with prescription drugs than were persons with annual incomes less than $6,000 (Stuart & Grana, 1998).

One of the ways that income affects health care utilization is through its influence on the ability of people to afford prescription drug coverage. A study conducted by Schommer et al. (2003) found that when other study variables were controlled for, the best predictor for having prescription drug coverage was income level. Seventy-two percent of respondents with annual household incomes of $15,000 or more had prescription drug insurance coverage compared with 60% of respondents with annual income less than $15,000 (Schommer, Mott, Hansen, & Cline, 2003).

Prescription drug coverage makes drugs more affordable and hence covered patients are less likely to skip doses or avoid filling their prescriptions. A study published in Medical Care in 1998 showed that other things being equal, Medicare beneficiaries with supplemental drug coverage were between 6% and 17% more likely to use prescription medications to treat their health problems than beneficiaries without supplemental coverage (Stuart & Grana, 1998). Also, Medicare enrollees without drug insurance were shown to consistently use fewer prescriptions than their insured peers (Poisal & Chulis, 2000).

Another reason why prescription drug coverage increases drug utilization is moral hazard (Mott & Schommer, 2002). Moral hazard occurs because insurance coverage lowers the cost to patients of using prescription drugs, hence increasing their use, sometimes indiscriminately. Prescription drug coverage is associated with higher drug utilization for elderly persons with ostensibly the same health status. For elderly persons with no chronic

disease conditions, drug utilization is more than two times higher for persons with prescription drug coverage than for persons without coverage (Curtiss, 2003). All these factors indicate that low income places are likely to have lower drug utilization rates, and hence lower requirement for pharmacists.

Rurality of the county

Health status of rural residents is generally known to be lower compared to their urban counterparts. Rural populations have relatively high levels of chronic diseases such as arthritis, cardiovascular disease, hypertension, and diabetes (Ricketts et al., 1999). A higher prevalence of chronic diseases would imply a greater utilization of health care and hence greater requirement for pharmacists.

Rural areas have been shown to have a higher proportion of senior population (Ricketts et al., 1999). As demonstrated earlier in this chapter, seniors have more chronic medical conditions and use more prescription medications than a younger population. This potentially implies a greater requirement of pharmacists in rural areas.

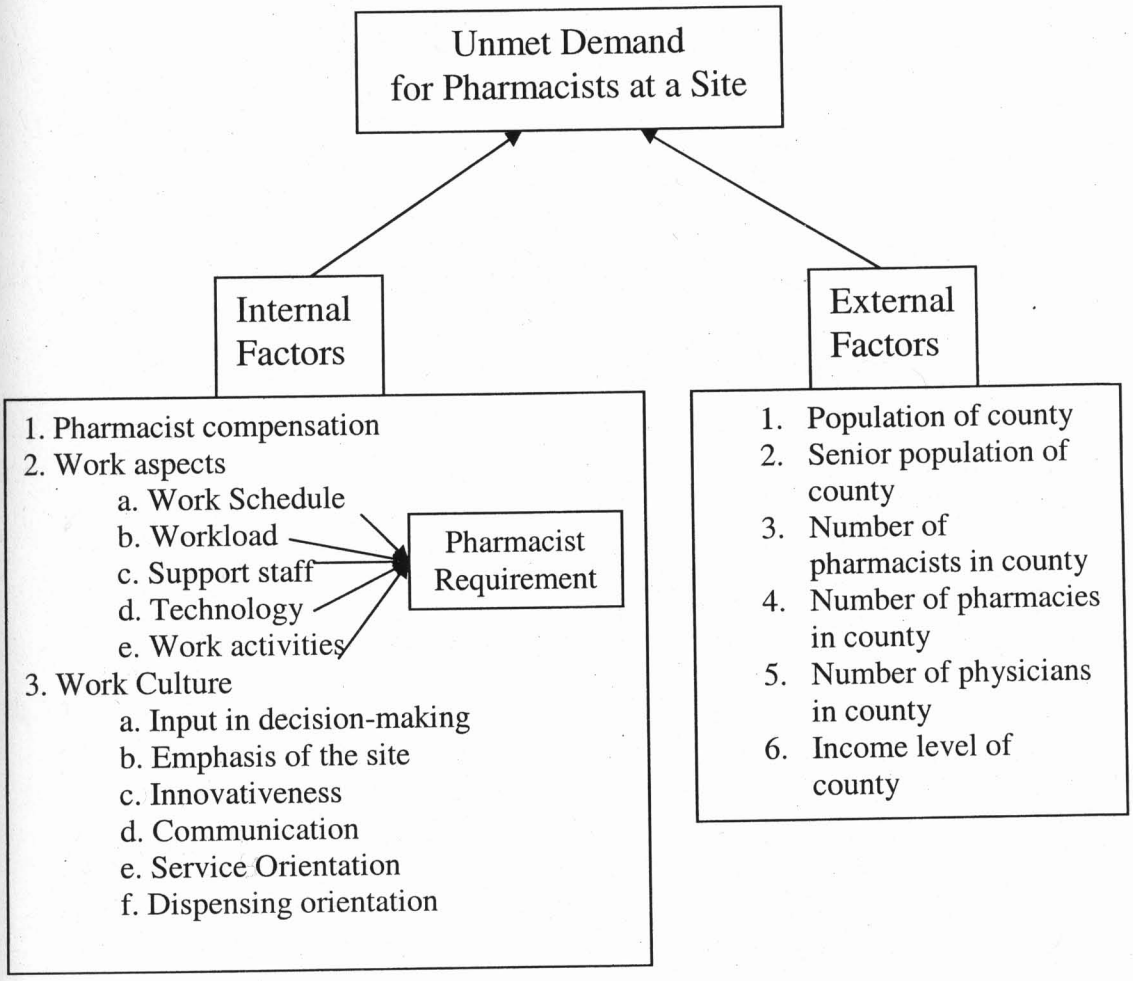
Rural residents typically have a lower income than their urban counterparts (Straub & Straub, 1999) and less likely to have health insurance (Mueller & Schur, 2004). As mentioned previously, both these factors have been shown to independently reduce the utilization of health care including prescription medications. These factors imply a lower requirement for pharmacists than what the total population might suggest.

On the supply side, low per-capita income in rural areas may prevent pharmacists from accepting employment in these areas. Lack of job opportunities for spouse and conservative attitudes of other professionals may make it difficult to recruit and retain female pharmacists. The situation is further complicated by the fact that rural employers are

competing with non-rural settings on the basis of salaries as well as other benefits associated with an urban location. As a result, rural areas have been disadvantaged, relative to other locations, in attracting sufficient number of health care providers including pharmacists (Schur & Franco, 1999).

In summary, seven external factors are hypothesized to be associated with the presence of pharmacist vacancy at a site. These factors include total population of the county, senior population of the county, number of pharmacists in the county, number of pharmacies in the county, number of physicians in the county, income level of the county, and rurality of the county. Based on this literature review, a conceptual model for factors influencing the unmet demand for pharmacists at a site is proposed. (Figure 2)

Figure 2: Conceptual Model of Unmet Demand for Pharmacists



Summary of Literature Review

Overall, the supply of pharmacists in the U.S. has increased steadily over the past 10-15 years. However, the demand for prescription drugs, and hence pharmacists, also has increased rapidly due to several factors, most importantly the aging of the American population. This increase in demand for prescription drugs has outpaced the increase in supply of pharmacists, which has led to a nationwide shortage of pharmacists. Reports of a concurrent shortage for physicians and nurses may mean that patients are more likely to seek health care related information from pharmacists since they are more accessible than most other health care providers in certain regions.

Rural areas may be faced with a particularly severe shortage of pharmacists because of potentially lower supply of pharmacists. At the same time, predicting demand for prescription drugs in rural areas is more difficult because a higher percentage of elderly and persons in poor health status suggest more demand; while their comparatively lower income level and lower likelihood of having insurance coverage tend to mitigate this demand.

This review of the literature helped in proposing a conceptual model for exploring factors associated with the presence of unmet pharmacist demand at a site (Figure 2). Three main internal factors (including pharmacist compensation, work aspects, and work environment / culture) and seven external factors (including total population and senior population of a county, number of pharmacists, pharmacies, and physicians in a county, income level of the county, and rurality of the county) are hypothesized to influence the presence of unmet demand for pharmacists at a site.

Summary of Study Objectives and Hypotheses

The purpose of this study is to investigate the level of unmet demand for pharmacists in community pharmacies that are located in non-metropolitan Wisconsin counties. An additional objective of this study is to determine whether any internal pharmacy characteristics or external factors related to the geographical location of a site are associated with the presence of unmet pharmacist demand (specifically, pharmacist vacancy) at the site. Based on the past literature, a conceptual model was proposed to identify specific internal and external factors that may be associated with unmet pharmacist demand at a site. Formally stated null hypotheses for the proposed association between internal and external pharmacy characteristics and the presence of pharmacist vacancy at pharmacy sites have been stated below.

Internal Factors

Compensation

H1: Whether or not a sign-on bonus was given to the most recently hired pharmacist has no association with the presence of pharmacist vacancy at the site.

H2: Gross hourly wage for the most recently hired pharmacist has no association with the presence of pharmacist vacancy at the site.

Work Schedule

H3: Requirement for all staff pharmacists to work on weekends has no association with the presence of pharmacist vacancy at the site.

H4: Level of difficulty for a staff pharmacist to take planned time off for vacation has no association with the presence of pharmacist vacancy at the site.

H5: Hours of operation for the prescription department on weekdays has no association with the presence of pharmacist vacancy at the site.

H6: Hours of operation for the prescription department on Saturdays has no association with the presence of pharmacist vacancy at the site.

H7: Hours of operation for the prescription department on Sundays has no association with the presence of pharmacist vacancy at the site.

Workload

H8: Score on the 'Workload Effect on Ability to Take Breaks' scale has no association with the presence of pharmacist vacancy at the site.

H9: Average number of prescriptions dispensed per day at a site has no association with the presence of pharmacist vacancy at the site.

H10: Prescriptions dispensed per day per dispensing staff (certified and non-certified technicians, residents, and interns) at a site has no association with the presence of pharmacist vacancy at the site.

H11: Prescriptions dispensed per day per pharmacist at a site has no association with the presence of pharmacist vacancy at the site.

H12: Proportion of prescriptions dispensed per day for all third party patients has no association with the presence of pharmacist vacancy at the site.

Support Staff

H13: Number of technicians per 100 prescriptions dispensed at a site has no association with the presence of pharmacist vacancy at the site.

H14: Number of support staff (certified and non-certified technicians, residents, and interns) per 100 prescriptions dispensed at a site has no association with the presence of pharmacist vacancy at the site.

Technology

H15: Number of dispensing aiding technologies at a site has no association with the presence of pharmacist vacancy at the site.

Work Activities

H16: Proportion of time spent by pharmacists at a site in patient consultation has no association with the presence of pharmacist vacancy at the site.

H17: Proportion of time spent by pharmacists in medication dispensing has no association with the presence of pharmacist vacancy at the site.

H18: Whether any patient-care service (PCS) or disease state management (DSM) program is offered at a site has no association with the presence of pharmacist vacancy at the site.

H19: Number of PCS or DSM programs offered at a site has no association with the presence of pharmacist vacancy at the site.

H20: Whether or not pharmacist time is scheduled for provision of PCS or DSM has no association with the presence of pharmacist vacancy at the site.

H21: Whether or not majority of PCS or DSM provision takes place when at least 2 pharmacists are on duty has no association with the presence of pharmacist vacancy at the site.

H22: Whether or not a pharmacy is paid for PCS or DSM has no association with the presence of pharmacist vacancy at the site.

H23: Pharmacist hours spent per week at a site in providing PCS or DSM has no association with the presence of pharmacist vacancy at the site.

Required Pharmacists

H24: Total number of pharmacists in terms of FTEs required by a site has no association with the presence of pharmacist vacancy at the site.

External Factors

H25: Population of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H26: Population per pharmacist ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H27: Population per pharmacy ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H28: Population per physician ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H29: Senior population of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H30: Seniors per pharmacist ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H31: Seniors per pharmacy ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H32: Seniors per physician ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H33: Pharmacists per pharmacy ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H34: Proportion of population that is comprised of seniors for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H35: Per capita income of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

H36: Level of rurality of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.

III. RESEARCH METHODS

In this section of the thesis, the methods used to address the objectives of the study are presented. First, the research design will be discussed, followed by the operational definition and measurement of study variables. Then, the sampling frame and sample size will be reviewed. This will be followed by a discussion of the data collection tools and procedures, data processing and entry, as well as methods used to handle missing data. Finally, the statistical methods used to analyze the data, and test for possible non-response bias will be reviewed.

Research Design

Previous studies that have measured the level of unmet pharmacist demand in community pharmacies have not shown how internal pharmacy characteristics or external factors related to the pharmacy's location are associated with unmet demand. Consequently, it was necessary to collect primary data to partially address the objectives of this study. More specifically, a cross-sectional, descriptive survey design was used to collect data about the level of unmet pharmacist demand and to be able to describe the internal pharmacy characteristics that may be associated with pharmacist vacancy. Pharmacy site was used as the unit of analysis. In addition to primary data, secondary data sources were used to extract information on external factors related to a pharmacy's location that may be associated with pharmacist vacancy.

Characteristics of the sample members are measured only once in a cross-sectional survey design (Churchill, 1995). In a descriptive design, theoretically relevant variables are operationalized, measured, and not manipulated, as they would be in an experimental design. The independent variables that were measured followed from the model of unmet demand for pharmacists outlined in the previous chapter (Figure 2).

Operational Definition of Variables

Dependent Variables

Three different dependent variables were measured to describe unmet demand for pharmacists in this study. They were as follows:

1. Pharmacist vacancy: presence of any pharmacist vacancy at a site and number of FTE positions vacant, if any vacancy.
2. Pharmacist turnover: number of pharmacists that left employment within the past 12 months
3. Time taken to hire: average time taken to hire pharmacist(s) during the past 12 months from the time that a position became available

Independent variables

Factors hypothesized to be associated with unmet demand for pharmacists were used as independent variables in the study and measured at two levels. The first level included variables that describe the pharmacy site and the environment in which staff pharmacists work. Presumably, these are the factors that make a site attractive or unattractive for pharmacists, and would contribute to their decision to work or continue working at the site. Through literature review and conversations with pharmacists, factors

related to a pharmacy site which could potentially influence pharmacists' decision to work at a site were determined and questions were formulated to measure the variables. These variables, referred henceforth as "Internal Factors", were as follows:

1. Pharmacist compensation: salary or hourly wage for the most recently hired pharmacist and amount of sign-on bonus, if given.
2. Work aspects
    a. Work schedule: hours of operation, requirement to work on weekends, and ability to take planned time off for vacation
    b. Work load: prescription volume, proportion of third party prescriptions, and difficulty in taking a short break for lunch or personal errands during working hours
    c. Support staff: number of other pharmacists, technicians, residents, interns, and/or clerks working at the site
    d. Technology: number and type of technologies used at the pharmacy
    e. Work activities: time spent in dispensing and non-dispensing activities, number and type of patient-care services (PCS) and/or disease state management (DSM) programs offered, and the level to which such services/programs are provided.
    f. Pharmacist requirement: pharmacist full-time equivalents (FTEs) currently employed plus FTE positions vacant.
3. Work environment / culture
    a. Input in decision making: level of input by staff pharmacists in pharmacy-related decisions made at the site

b. Emphasis of the site: emphasis placed by the site on different aspects of pharmacy practice such as people, business, and innovation
c. Innovativeness: level of innovativeness displayed by the site in dispensing, provision of services, recruiting and retaining staff.
d. Communication: level of communication between staff and management
e. Service Orientation: level of orientation of employed pharmacists towards providing patient-care services and disease management programs
f. Dispensing Orientation: level of orientation of employed pharmacists towards dispensing prescriptions only

The second level at which independent variables were collected for this study dealt with factors that are external to a pharmacy site i.e. the factors related to its external environment, which are associated with the presence of unmet pharmacist demand at the site. These were not measured through the survey instrument, they were extracted from various secondary sources. These variables, referred henceforth as "External Factors", were as follows:

1. Population: total population of the county in which the pharmacy is located, extracted from Census 2000 data.
2. Senior population: total population over 65 years for the county in which the pharmacy is located, extracted from Census 2000 data.
3. Number of pharmacists: number of licensed pharmacists residing in the county in which the pharmacy is located. This was extracted from a list of licensed pharmacists obtained from Wisconsin's Department of Regulation and Licensing.

4. Number of pharmacies: number of all pharmacies (community and non-community) with an active license, present in the county in which the pharmacy is located. This was extracted from a list of licensed pharmacies obtained from Wisconsin's Department of Regulation and Licensing.
5. Number of physicians: number of licensed physicians residing in the county in which the pharmacy is located. This was extracted from a list of licensed physicians obtained from Wisconsin's Department of Regulation and Licensing.
6. Income level: average per-capita income of residents of the county, in which the pharmacy is located
7. Rurality: score on the U.S. Department of Agriculture's Rural-Urban Continuum Code (RUCC).

The seven variables described above were either used alone or in combination to create twelve variables that represent external factors. These twelve variables are: (1) population, (2) population per pharmacist, (3) population per pharmacy, (4) population per physician, (5) senior population, (6) seniors per pharmacist, (7) seniors per pharmacy, (8) seniors per physician, (9) pharmacists per pharmacy, (10) percent population comprised of seniors, (11) per capita income, and (12) rurality. All of these 12 variables were measured at the level of the county in which the pharmacy was located.

Measures

The source of the data for all dependent and independent variables has been summarized in Table 1.

Table 1
Source of data for dependent and independent variables

Variable Name	Source of data
Dependent Variables	
Unmet demand for pharmacists	5a
Pharmacist turnover	6, 7
Time taken to hire	8c
Independent Variables	
Internal Factors	
Compensation	11, 12
Work aspects	
Work schedule	13, 14, 19a
Workload	15, 16, 17, 19b, 19c
Support staff	17
Technology	20
Work activities	18, 22-26
Pharmacist requirement	3, 5a
Work culture	27-29n
External factors	
Population	Census 2000 database
Senior population	Census 2000 database
Number of pharmacists	Wisconsin Department of Regulation and Licensing
Number of pharmacies	Wisconsin Department of Regulation and Licensing
Number of physicians	Wisconsin Department of Regulation and Licensing
Income level	Census 2000 database
Rurality	Rural-Urban Continuum Codes database

Dependent variables

(i) Pharmacist vacancy

Pharmacist vacancy was measured in terms of presence or absence of a vacant pharmacist position at the site. If a vacancy was present, the number of FTE pharmacist positions vacant was asked.

(ii) Pharmacist turnover

Pharmacist turnover at a site was measured in terms of the total number of pharmacists that left the site within the past 12 months. For each pharmacist that left during the past 12 months, the pharmacist's age, gender, amount of time (months) worked at the pharmacy before leaving, hours worked per week, and primary reason for leaving were asked.

(iii). Time taken to hire

For sites that had hired a new pharmacist within the past 12 months, time taken to hire was measured by asking about the average time it took for the site to hire a pharmacist from the time that the position became available.

Although three variables were measured to describe the unmet demand for pharmacists at a site, only one of them (i.e. presence of pharmacist vacancy) was used as a dependent variable in bivariate and multivariate analyses for exploring the relation of internal and external factors with unmet demand.

Independent variables

I. Internal Factors

a. Compensation

Two aspects of pharmacist compensation were measured. First, the current base compensation for the pharmacist most recently hired to work at the pharmacy was asked. This could be reported either in terms of an hourly wage or in terms of gross earnings per pay period (week / two weeks / twice a month / month). This question was adapted from the 2004 National Pharmacist Workforce Survey (Mott et al., 2005). Second, whether or not a sign-on bonus was given to the most recently hired pharmacist was asked. If a sign-on bonus was given, the amount given (if in a monetary form), or the kind and quantity given (if in a non-monetary form) was requested.

b. Work Aspects

(i) Work Schedule

Three aspects related to work schedule or scheduling flexibility were assessed. They included: (i) hours of operation for the site's prescription department on weekdays, Saturdays, and Sundays, (ii) whether or not all the staff pharmacists hired at the site were *required* to work on weekends, and finally, (iii) on a scale of very difficult (1) to very easy (4), how difficult it is for pharmacists at the site to take planned time off for vacation.

(ii) Workload

Five measures were used to assess aspects of workload for pharmacists working at the site. They included: (i) the average number of prescriptions dispensed at the site per day, (ii) average number of prescriptions dispensed per day per pharmacist employed, (iii) average number of prescriptions dispensed per day per dispensing staff, (iv) the proportion

of prescriptions dispensed at the site covered by third party payers, and (v) the level of difficulty experienced by staff pharmacists in taking short and long breaks from the workplace. This was measured by rating, on a scale of very difficult (1) to very easy (4), how difficult it is for pharmacists at the site to: (1) take a scheduled break of about 30-60 minutes for lunch, and (2) leave the workplace for a short while during working hours to run a personal errand.

(iii) Support staff

Numbers for the following categories of support staff were ascertained: (a) Pharmacists (b) Non-certified pharmacy technicians (c) Certified pharmacy technicians (d) Pharmacy residents (e) Pharmacy interns (f) Clerks. This question was adapted from the 2004 National Pharmacist Workforce Survey (Mott et al., 2005).

(iv) Technology

Presence or absence of the following types of technologies at a site was ascertained: (a) Automated dispensing system (e.g. Scriptpro) (b) Automated patient refill-request system (c) Bar coding for prescriptions (d) Tablet/Capsule counter (e.g. Baker cell) (e) Electronic Prescription Order System (f) Computerized Pharmaceutical care profile / Documentation system. This question was adapted from the 2004 National Pharmacist Workforce Survey (Mott et al., 2005).

(v) Work Activities

On average, the proportion of time that a typical staff pharmacist at the site spent in doing consultation, drug-use management, business management, and medication dispensing was asked. Consultation was defined as time spent in consulting and communicating with patients about prescription medications, interacting/communicating

with other health professionals on patient's behalf, and providing patient education. Drug use management was defined as assessing and evaluating patient medication-related needs, monitoring and adjusting treatment to attain desired outcomes. Business management was defined as managing pharmacy personnel, finances, and systems, processing and reconciling third party claims, and other business management activities. Medication dispensing was defined as time spent in preparing, dispensing, distributing, and administering medications. This question was adapted from the 2004 National Pharmacist Workforce Survey (Mott et al., 2005).

Next, whether or not any patient-care services and/or disease management programs were being offered at the site was asked. Examples of patient-care services included specialty compounding, immunization, health screening, wellness screening, smoking cessation, medication therapy management, and weight loss/control. Disease State Management (DSM) programs included diabetes, hyperlipidemia, hypertension, asthma, cancer, AIDS, anti-coagulation clinic, and pain management. This question was adapted from the 2004 National Pharmacist Workforce Survey (Mott et al., 2005). If at least one of the patient-care services or DSM programs listed above was being offered, the following information related to providing these services or programs was requested: (a) how many hours per week on average do pharmacists spend performing these activities, (b) is any of the time spent in doing these activities scheduled i.e. set aside only for this, (c) is a majority of time spent doing these activities during a period when there are at least two pharmacists on duty, and (d) is the pharmacy being paid for providing such activities.

(vi) Pharmacist requirement

The pharmacist requirement of a site in terms of FTEs was calculated by summing the responses to two separate questions on the instrument. These two questions included: the number of FTEs represented by the pharmacists currently employed at the site, and the number of FTE pharmacist positions that were currently vacant at the site.

c. Work Environment / Culture

Work environment / culture at the site was measured using the following aspects of the workplace: input of staff pharmacists in decision-making, emphasis of the site, innovativeness, communication, dispensing and service orientation.

The input of staff pharmacists in decision-making was measured using a ten-item measure. These items rated, on a scale of 1 (no input) to 3 (high input), the level of input that the staff pharmacists had in: choosing which hours to work at the pharmacy, determining time spent in dispensing vs. non-dispensing activities, offering patient-care services and/or DSM programs, deciding on the number of pharmacists and support staff working alongside them, delegating responsibilities to support staff, deciding on drugs stocked at the pharmacy, deciding on pharmacy related equipment or technology used at the site, selecting reference manuals or drug information softwares used at the site, and developing management policies that affect pharmacists.

The emphasis of the site was measured using a nine-item measure. These items rated, on a scale of 1 (no emphasis) to 3 (high emphasis), the level of emphasis that the site places on: volume of work performed, quality of care provided to patients, professional development of pharmacists, financial performance of the site, pharmacists' efforts to balance work and non work activities, making sure pharmacists are heard by management,

recognition of pharmacists for excellent performance, adopting new technology and developing new services. This question was adapted from the 2004 National Pharmacist Workforce Survey (Mott et al., 2005).

The innovativeness, communication, service orientation, and dispensing orientation at the site were measured by using a 5-point scale of Strongly Disagree (1) to Strongly Agree (5). Innovativeness of the site was measured using four items. These items measured the innovativeness of the site with respect to the dispensing process, provision of non-dispensing patient-centered services, recruiting and retaining techniques. Communication between management and staff pharmacists was measured using a four-item measure. These items asked whether pharmacists at the site: were informed by management about what needs to be done to accomplish organizational goals, have routine direct contact with members of management, approach management about new practice ideas, are given feedback by management about their performance. This question was adapted from the 2004 National Pharmacist Workforce Survey (D. A. Mott et al., 2005).

The service and dispensing orientations of the site were assessed using three items each. The Dispensing orientation scale asked if pharmacists at the site: were highly motivated to dispense prescriptions as fast and as accurately as possible, had a real opportunity to spend all their time just dispensing drugs if they wanted to, would be supported by the management if they wanted to spend all their time just dispensing drugs. The Service orientation scale asked if pharmacists at the site: were highly motivated to move beyond traditional dispensing roles towards more patient-care services and/or disease management programs, had a real opportunity to move beyond dispensing drugs towards

more patient care-type activities if they wanted to, would be supported by the management if they wanted to move beyond dispensing drugs towards more patient care-type activities.

II. External Factors

Population of a county, senior population for a county, and per capita income for a county were extracted from the Census 2000 data accessible through the Census website. The rurality of a county was measured using the Rural-Urban Continuum Codes (RUCC) that are published on the United States Department of Agriculture's website. Number of active pharmacies in the county, number of licensed pharmacists in the county, and the number of licensed physicians in the county was extracted through lists obtained from Wisconsin's Department of Regulation and Licensing.

Sample

Sampling Frame and Plan

Prior experience of researchers in the Department of Social and Administrative Sciences at the University of Wisconsin suggested that the response rates to mail surveys would be higher in Wisconsin than in the United States as a whole. For this reason, state level, as opposed to national level data were collected for the study. Theoretically, it was conceptualized that a somewhat different set of factors influences the level of unmet demand for pharmacists in metropolitan vs. non-metropolitan areas. This is due to the geographical and demographic peculiarities of non-metropolitan areas and the unique set of recruiting problems that follow from these. Work responsibilities of a community pharmacist are relatively different from those of an institutional pharmacist. Hence, for the

purposes of this study, it was decided to concentrate on a very specific group consisting of non-metropolitan, community pharmacies in Wisconsin.

A list of all the pharmacies licensed in Wisconsin was purchased from Wisconsin's Department of Regulation and Licensing. This list contained the following information for each licensed pharmacy: name of the pharmacy, address, manager/owner, and status of the pharmacy license. The status of the pharmacy license included information on whether the license for the pharmacy was currently active or non-active. The non-active license categories included pharmacies with licenses that were expired, limited, non-working (majority of the cases), revoked, or voluntarily surrendered. All the pharmacies that did not have a current active license were eliminated from the list. This left a total of 1,213 pharmacies with active licenses.

Based on the zip code for each pharmacy, the county in which the site was located was identified using the web resources *Addresses.com* (*Addresses,* 2005) or *Homeinfomax.com* (*HomeinfoMax,* 2005). The United States Department of Agriculture's Rural-Urban-Continuum-Code (RUCC) was determined for each of the pharmacies with active licenses based on the county in which they were located (Economic Research Service). The RUCC forms a classification scheme that distinguishes metropolitan counties by the population size of their metropolitan area, and non-metropolitan counties by degree of urbanization and adjacency to a metropolitan area(s). The metropolitan and non-metropolitan categories were subdivided into three and six sub-categories respectively, resulting in a nine-part county codification. A higher code indicates a greater rurality of the county (Economic Research Service). A county that has a code of 4 or higher is considered to be a non-metropolitan county. Since our target population was non-metropolitan

pharmacies, all of the pharmacies that were located in metropolitan counties (code 1 to 3) were eliminated from the list. This left a total of 372 active, non-metropolitan pharmacies.

The focus of this research was community pharmacies, which included independent pharmacies, chain pharmacies, mass merchandiser pharmacies, and supermarket pharmacies. The list of pharmacy names for the 372 non-metropolitan pharmacies with active licenses was examined and pharmacy names that suggested an obvious connection with a hospital or a clinic were eliminated. The revised list was then scanned by a senior researcher in the department who was familiar with several pharmacies in the state. Some additional pharmacies that were known to be non-community were eliminated in this process. A cautious approach was taken by both researchers, eliminating only those pharmacies, which, they were fairly certain, were non-community settings. At the end of this process, a list 279 active, non-metropolitan, community pharmacies licensed in Wisconsin remained. This served as the sampling frame for the study. The ninety three non-community pharmacies excluded consisted of 32 hospital pharmacies, 16 clinic pharmacies, 22 medical center pharmacies, 3 health system pharmacies, and 20 other miscellaneous pharmacy settings such as home health, nursing home, compounding only, etc.

Sample Size

Since the sampling frame consisted of only 279 pharmacies, it was feasible to use census sampling, given the resources at our disposal. The other rationale for census sampling was that a response from all or most pharmacies from a particular county would allow us to profile that county in terms of its unmet demand for pharmacists in community settings.

Data Collection

The data for this study were collected by two separate methods. Data describing internal pharmacy characteristics were collected through the use of a cross-sectional survey design. Data describing external pharmacy characteristics were extracted from several different secondary sources.

The manager or owner listed for each pharmacy site was identified as the key informant for that site. The key informant served as the source of contact at each site. It was decided to collect information about the pharmacies from the key informants (managers/owners) because they would be expected to have access to information regarding vacant pharmacist positions, recent pharmacist turnover and recent pharmacist hires. Also, they would be expected to have information about internal pharmacy characteristics such as pharmacist compensation, hours of operation, staff employed, prescriptions dispensed, and other services provided by pharmacists at the site.

Design of Tools for Data Collection

Tools that were used to collect data from the key informants included: (1) the invitation letter and participation form, and (2) the main survey instrument. The invitation letter, participation form, and the main survey instrument were designed following the principles of the Tailored Design Method (TDM) advocated by Dillman (Dillman, 2000). These principles have been field tested extensively and shown to improve survey response rates and to decrease item non-response.

Invitation letter and Participation form

The invitation letter and participation form were printed on natural color, 8 ½" by 14" 65# cover stock and featured the School of Pharmacy's return address as well as the

signatures in black ink of the researcher and his advisor. The top half was the invitation letter that explained briefly the nature and purpose of the forthcoming survey and asked for the respondents' cooperation in completing it. The bottom half consisted of the participation form which listed questions regarding willingness to participate, reasons for non-participation (if applicable) and questions to assess non-response bias. The two parts were separated by a perforated line. To assess non-response bias, the participation form requested demographic information such as age of the key informant and practice setting of the site, as well as pharmacist demand related information including FTE pharmacists employed currently, current vacant pharmacist positions, pharmacists leaving employment within past 12 months and average number of prescriptions dispensed per day. A copy of this invitation letter and participation form can be found in Appendix A. (Although the actual invitation letter and participation form were printed together on a single 8½" by 14" paper, they have been separated on two pages for the appendix due to lack of enough space on a single 8½" by 11" paper).

Main Survey instrument

The survey packet was mailed in a 6" by 9" brown colored clasp envelope with the School of Pharmacy's return address. The packet contained: (1) a one-page cover letter explaining the purpose of the study and requesting participation, (2) an 8-page survey form, and (3) a postage-paid, white, 6" by 9" return envelope. The cover letter was printed on color, 8 ½" by 11" School of Pharmacy letterhead and featured the signatures in black ink of the researcher and his advisor. A copy of the cover letter can be found in Appendix B. The survey form was printed on white, 11" by 17" 70# Royal Fiber stock. It was folded

once (with the cover letter on top and the return envelope at the bottom) before it was placed in the envelope. A copy of the survey form can be found in Appendix C.

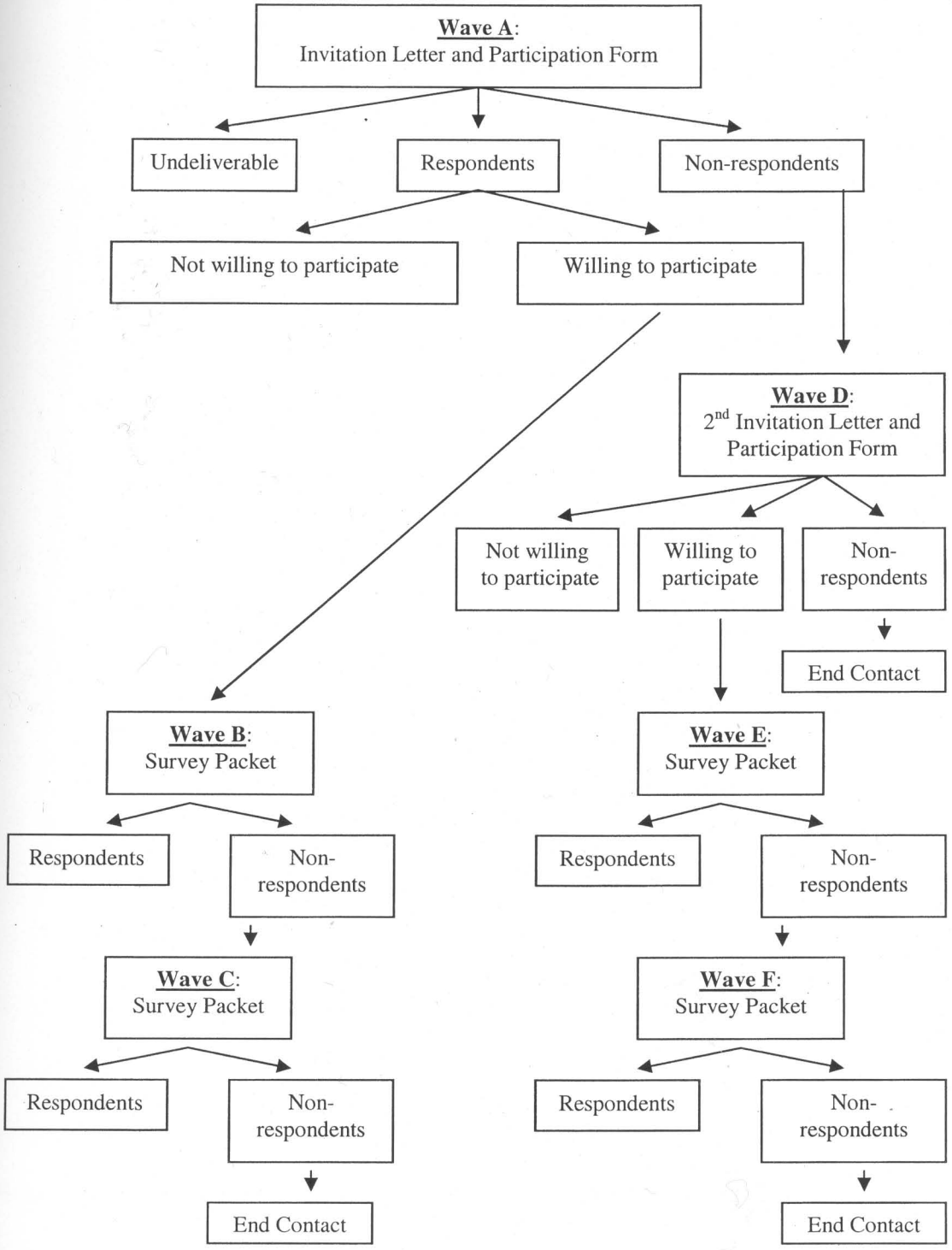
Procedure for data collection

Pre-Testing of instruments

The pre-testing of a survey involves the scrutinization of the items comprising the survey form before any formal data collection begins (Churchill, 1995). In this manner, survey items that prove confusing or ambiguous can be reworded or otherwise altered. The invitation letter, participation form, and the main survey form was reviewed by two groups prior to any mailings. The first group consisted of members of the researcher's examining committee, all of whom were familiar with mail survey research. The second group consisted of two practicing pharmacists, one of whom was a pharmacy manager at a local community pharmacy and the other was a part-time relief pharmacist at the same site. After review, comments and suggestions were incorporated into the instrument.

The only major change to the instruments at this stage was the omission of a question in the main survey form that sought to identify components of disease state management (DSM) programs that were offered by sites which were involved in DSM. The purpose of the question was to identify different levels at which various sites were offering DSM. It was, however, appropriately suggested by a committee member, that this purpose was already being served by other descriptive questions on the survey and omission of this question would free up valuable space on the questionnaire. A copy of the omitted question can be found in Appendix D.

Figure 3: Survey Administration Waves



Survey Administration

The survey was fielded using a modification of methods suggested by Dillman (2000) and proceeded in a manner outlined below. Figure 3 gives a detailed pictorial representation of the six waves (A to F), used to field the survey.

Wave A:

First, an invitation letter and participation form was sent to the key informant at each sampled pharmacy. The invitation letter explained, in short, the current situation pertaining to the shortage of pharmacists in Wisconsin and how it affects pharmacy managers. The key informants were then encouraged to offer help by filling out the participation form as well as the main survey form that would follow. They were requested to participate in the study, regardless of whether or not their site currently faced a pharmacist shortage. If they refused to participate, a reason for the refusal was sought. Irrespective of their willingness to participate in the study (i.e. complete the main survey form), the key informants were requested to complete the participation form, tear off along the line of perforation, fold the second half so that the business reply return address showed on the outside, tape it closed and drop in the U.S. mail. An identification number was written above the return address in order to track responses and to aid in sending the survey packet to only those who agreed to participate.

Wave B:

A survey packet containing a one-page cover letter, an 8-page survey form, and a postage-paid return envelope was sent to all key informants who expressed a willingness to participate in the study, as soon as their participation form was received in the mail. An

identification number was written on the business reply envelope to track responses and to prevent re-mailing of the survey packet to previous respondents.

Wave C:

Three weeks after the first mailing of the survey packet (wave B), a second survey packet was sent to all key informants who had expressed willingness to participate through the participation form (wave A), but failed to respond to the first mailing of the survey (wave B). The cover letter sent with this packet had an additional paragraph urging them to disregard this mailing if they had already responded to the first survey (wave B). A copy of this can be found in Appendix E.

Wave D:

Three weeks after the first mailing of the invitation letter and participation form (wave A), a second invitation letter and participation form was sent as a reminder to all the key informants who had failed to respond to the first mailing of the invitation letter and participation form (wave A).

Wave E:

Key informants who responded to the second mailing of the invitation letter and participation form (wave D), were sent a survey packet if they expressed willingness to participate.

Wave F:

Three weeks after mailing the survey packets in wave E, another survey packet was sent as a reminder to the key informants who had failed to respond to the earlier mailing of the survey packet (wave E).

The rule of thumb used was that any potential respondent who did not reply to two *consecutive* mailings was deemed to be a non-respondent, and hence not followed-up with further mailings. The two consecutive mailings could be represented by: (1) two consecutive mailings of the invitation letter and participation form (i.e. waves A and D), or (2) two consecutive mailings of the survey packet (waves B & C or waves E & F).

Variables related to external pharmacy characteristics were collected at the level of the county in which the pharmacy was located. Data were collected from several different secondary sources. These external variables included: population, population per pharmacist, population per pharmacy, population per physician, senior population, seniors per pharmacist, seniors per pharmacy, seniors per physician, pharmacists per pharmacy, percent population comprised of seniors, per capita income, and rurality.

Data Processing and Entry

All survey forms were returned to the School of Pharmacy by first class U.S. mail. This allowed the researcher to identify non-deliverable survey packets and develop a more accurate estimate of the response rate. When the survey forms were received by the researcher they were numbered consecutively so they could be identified later for data entry purposes. The number placed on the return envelope before mailing was used only to track responses. The number placed on the survey after receipt allowed the responses to remain anonymous since there was no connection to the respondents' original number except on the survey form itself and therefore no connection to the respondent's name or address.

All the data were coded and entered by the researcher. After data entry was completed, the data were examined using frequency counts for all variables. This allowed the researcher to identify any cases where the variable values fell outside the expected values. These cases were then verified by referral to the appropriate survey form and, if in error, were corrected.

Missing Data

Missing data is another potentially serious problem when conducting research with primary data. This is especially true when multivariate analysis is involved since most analysis programs will serially reject cases if any of the variables involved are missing. This results in the potential problem of reducing the power of the analysis by a substantial amount if many cases have missing values.

If a value was found to be missing, a category was added to the coding that reflected the respondent did not answer this question. These categories were then used in subsequent analyses. The second half of the "Pharmacy characteristics" section of the survey consisted of multi-item measures for assessing work culture. Missing data for these items was substituted using the respondent's average ranking for the rest of the items on the scale. If data on more than half of the items on a scale was missing for a respondent, then the entire scale was considered to have missing data.

Data Analyses

Univariate Analyses

Data analysis for this study consisted of a number of different phases including univariate, bivariate, and multivariate analyses. The first phase consisted of calculating

descriptive statistics for most variables in the dataset. This included calculating proportions and counts for all categorical variables and means and standard deviations for all continuous variables. These analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 13.0

Non-Respondent Analyses

For survey research, it is important to determine if there is any non-response bias present in the responses obtained since this may influence the validity of the conclusions from the survey. Non-response bias in this study was evaluated by comparing respondents to the main survey with (1) respondents to the participation form only, and with (2) total non-respondents.

Before the mailing of the survey packet, an invitation letter and participation form was sent to the entire sample. The participation form contained questions related to participation (whether or not they wanted to participate), reasons for not participating (if applicable) and potential non-response bias questions. Key informants who returned this part saying they were willing to participate were sent the main survey packet. All key informants were requested to fill out this participation form, irrespective of whether or not they were planning to participate. This produced two categories of people for conducting non-response bias. We had the respondents to the main survey packet who provided information on the main survey form as well as on the participation form. Also, we had the second group of people who were non-respondents for the main survey; but who had responded to the participation form sent along with the invitation letter. Bivariate analyses were performed between these two categories to determine if there were any differences on

the variables collected. The reasons for non-response were analyzed to determine why sampled subjects had decided not to participate in the main survey. In addition to this, non-response bias analysis was also conducted between respondents to the main survey and total non-respondents (i.e. those who did not even respond to the invitation letter and participation form) on external variables related to their location.

Psychometric Evaluation of Multi-Item Measures

All multi-item measures employed in this study were subjected to psychometric evaluations of reliability and validity as discussed by Churchill (1979). Validity concerns the degree to which an instrument measures what it is supposed to measure (Nunnaly & Bernstein, 1994). Three types of validity have traditionally been discussed: content, criterion, and construct. For the purpose of this study, the construct validity of items used was studied. A construct can be described as a latent variable that is not directly observable and measurable (Streiner & Norman, 1995). One method that can be used to study the construct validity of items is factor analysis (Nunnaly & Bernstein, 1994). Factor analysis allows us to explore two aspects of the validity of items used to measure a given construct: convergent and discriminant. Convergent validity involves the extent to which items which should correlate highly with a trait do so. Discriminant validity concerns the extent to which items in a measure that should not correlate with other measures do not correlate with them. This study used some scales with items that had not been used previously. As a result, it was considered very important to conduct discriminant validity analysis on the items to see whether a scale hypothesized by the researcher to measure one particular construct was, in fact, measuring two or more distinct constructs.

Briefly, factor analysis is a statistical method that allows one to examine the correlations that exist among a set of items and to determine whether these items can be condensed into a smaller, underlying set of dimensions (Hair, Tatham, Anderson, & Black, 1998). Interpretability of factors can be improved through rotation. The rotation method selected for these analyses was Varimax rotation. Varimax is a type of orthogonal rotation that attempts to maximize the dispersion of loadings within factors. Therefore, it tries to load a smaller number of variables highly on to each factor resulting in more interpretable clusters of factors, thus simplifying their interpretation (Field, 2000). Standardized factor loadings of 0.50 or higher were generally assumed to provide evidence of convergent validity for the items comprising each measure. A high loading on a single, distinct factor and low loadings on other factors were assumed to provide evidence of discriminant validity.

It was deemed necessary to perform factor analysis before continuing with further psychometric evaluations in order to identify specific constructs within the multi-item scales based on the factor loadings of individual items within the scales. The multi-item measures were then purified by deleting items that failed to exhibit relatively high corrected item-total correlations, as proposed by Churchill (Churchill, 1979). For the purposes of this study, items failing to exhibit a corrected item-total correlation of 0.40 or higher were deleted.

Reliability is the extent to which an instrument measures some trait on an individual at different times, consistently (Streiner & Norman, 1995). At a minimum, a measure must be reliable in order for it to be valid. One type of reliability is internal consistency. Internal consistency is a function of the average correlations among items in a measure and the

number of items comprising a measure (Nunnaly & Bernstein, 1994). Internal consistency for all scales that were assumed to be scored on at least an interval scale was assessed using Cronbach's coefficient alpha. All reliability and factor analyses were conducted using 'available case' analysis and the sample sizes available are as noted in Tables 12 through 14 in Chapter IV.

Bivariate Analyses

To address the objectives of this study, "presence of any pharmacist vacancy" was used as a dependent variable in bivariate and multivariate analyses. The two other dependent variables collected, namely, pharmacist turnover and time taken to hire were only used to describe the unmet demand for pharmacists at respondent sites.

In bivariate analysis, all the independent variables were cross-classified by the presence of unmet demand at the pharmacy site. The bivariate relationships between the independent variables and the dependent variable (presence of pharmacist vacancy) were tested using the Pearson chi-square test of independence for categorical variables and the Student's t-test for continuous variables. Statistical tests were evaluated at an alpha (Type I error) level of 0.05 or 0.01. These analyses were conducted using SPSS version 13.0.

Multivariate Analyses

A logistic regression model was used as the primary multivariate analysis technique in this study. The model was used to estimate factors associated with having a vacant pharmacist position at a pharmacy. It was estimated using variables from the conceptual model of unmet demand for pharmacists. Only those variables that were shown to be

significantly different between sites with and without vacancy in bivariate analyses were included in the multivariate model in order to increase the parsimony of the model. The statistical significance of the coefficients in the model was evaluated using the t-statistic at an alpha level of 0.05. This analysis was also conducted using SPSS version 13.0.

IV. RESULTS

The results of the study will be discussed in this chapter of the thesis. First, the results of the survey pre-test are discussed. This will be followed by the response rate calculations and a description of the respondent sample on the variables collected in the survey. The results of the analysis for non-response bias will then be discussed. Next, the multi-item measures collected in the survey will be evaluated for reliability and validity. The results of the bivariate tests of study hypotheses are then provided. Finally, the results of the multi-variate analyses using logistic regression will be discussed.

Survey Pre-test Results

The pre-test of the survey instrument was conducted in two phases. The first phase consisted of a review of the instrument by the researcher's thesis committee. The principal change resulting from the review was the omission of one question from the final instrument. The pre-test instrument included a question which instructed the key informants to put a check mark for each component of the disease management program that their site provides (See Appendix D). The main intention of this question was to determine the extent to which a site provided disease state management (DSM). It was suggested by a reviewer that most sites that do provide DSM would be involved in each component of the process to varying extents. Hence, a checklist of DSM components may not be able to differentiate the sites based on their extent of DSM provision. It was suggested that other questions already included in the instrument such as time spent in providing these services might do a better

job of differentiating the sites based on the extent to which they provide DSM. Hence, this question was omitted from the final draft of the survey instrument.

The second phase of the survey pre-test consisted of a review of the instrument by two practicing pharmacists, one of whom was a pharmacy manager at a local chain store. His insight was considered to be extremely useful since he was a pharmacy manager (like most of the key informants); although he was not a part of the sample because his pharmacy was not located in a non-metropolitan area of Wisconsin. Both the reviewers expressed little concern regarding the language or the flow of the questions. Very minor changes were made based on their suggestions.

Main Survey Mailing Results

Response Rate

The first mailing of the invitation letter and participation form occurred at the end of August, 2005. The subsequent mailings of survey packets continued until the first week of November, 2005. Two hundred and seventy nine invitation letters and participation forms were mailed out during the first mailing (wave A). The survey packets were mailed out in several waves. A schematic representation of the waves is provided in Figure 4, along with the number of subjects corresponding to each wave. The response rate for these mailings is summarized in Tables 2, 3a, and 3b. The response rate for each wave is calculated separately (Table 2), as is the response rate to the participation form mailings (Table 3a), and survey packet mailings (Table 3b).

Of the 279 invitation letters and participation forms sent out during wave A, 3 were undeliverable. Additionally, 9 responses were from key informants at non-community sites

(based on their answers to the participation form). Of the 267 invitation letters and participation forms assumed deliverable to key informants at community sites, a total of 133 responses were received, for an adjusted response rate of 49.81%. Of the 133 key informants that responded, 111 expressed a willingness to participate in the study and 22 refused to participate.

The first wave of the survey packet (wave B) was sent to the 111 key informants who responded to wave A, and expressed a willingness to participate. Eighty-three key informants responded to wave B of the survey packet mailing, for a response rate of 74.77%. The 28 key informants who did not respond to wave B, received the second wave of the survey packet mailing (wave C). Fourteen key informants responded to wave C, for a response rate of 50.0%.

The 134 key informants who had not responded to wave A, were sent a second mailing of the invitation letters and participation forms (wave D). Five responses were found to be from key informants at non-community sites (based on their answers to the participation form). Of the 129 invitation letters and participation forms assumed deliverable to key informants at community sites, a total of 39 responses were received, for an adjusted response rate of 30.23%. Of the 39 key informants that responded, 21 expressed a willingness to participate in the study and 18 refused to participate.

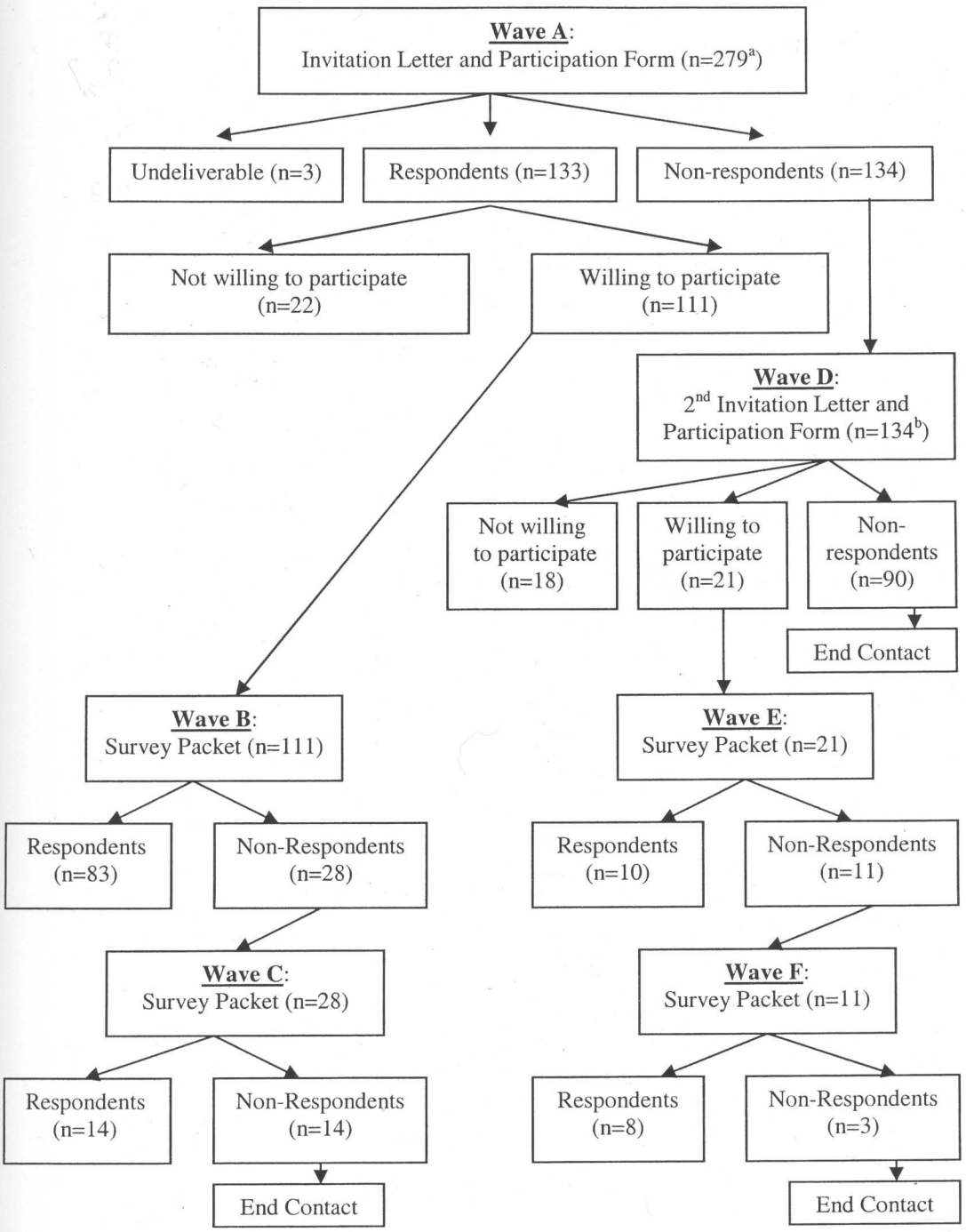
A survey packet (wave E) was sent to the 21 key informants who responded to wave D and expressed a willingness to participate. Ten key informants responded to wave E, for a response rate of 47.62%. The 11 key informants who did not respond to wave E, were sent another mailing of the survey packet (wave F). This constituted the last wave of survey

packet mailing. Eight key informants responded to this second wave, for a response rate of 72.73%.

Of the 279 key informants that were part of the original sample, 3 were found to have undeliverable addresses and 14 were found to be working at non-community sites. Of the 262 key informants at community sites that received at least 1 mailing of the participation form, 172 responded for a response rate of 65.65% (Table 3a).

One-hundred thirty-two key informants at community sites responded to one of the two mailings of the participation form and expressed a willingness to participate; hence, they received at least one mailing of the main survey packet. Of these 132 key informants that received a survey packet, 115 responded for a response rate of 87.12% (Table 3b).

Figure 4: Response Rate to Survey Waves



a. Subsequent to mailing, it was found out that 9 sites were non-community; hence, they were not included in the response rate calculations.
b. Subsequent to mailing, it was found out that 5 sites were non-community; hence, they were not included in the response rate calculations.

Table 2
Response rate description

1st Invitation letter and participation form (wave A)		2nd Invitation letter and participation form (wave D)	
Packets mailed	279	Packets mailed	134
Adjustments to sample		*Adjustments to sample*	
Undeliverable	3	Undeliverable	0
Non-community sites [a]	9	Non-community sites [a]	5
Adjusted sample	**267**	Adjusted sample	**129**
Responses		Responses	
Willing to participate	111	*Willing to participate*	21
Unwilling to participate	22	*Unwilling to participate*	18
Total Responses	**133**	Total Responses	**39**
Non-respondents	134	Non-respondents	90
Adjusted Response Rate (133/267)	49.81%	Adjusted Response Rate (39/129)	30.23%
Survey Packet (wave B)		Survey Packet (wave E)	
Packets mailed	**111**	Packets mailed	**21**
Respondents	**83**	Respondents	**10**
Non-respondents	28	Non-respondents	11
Response Rate (83/111)	74.77%	Response Rate (10/21)	47.62%
Survey Packet (wave C)		Survey Packet (wave F)	
Packets mailed	**28**	Packets mailed	**11**
Respondents	**14**	Respondents	**8**
Non-respondents	14	Non-respondents	3
Response Rate (14/28)	50.0%	Response Rate (8/11)	72.73%

a. The 14 non-community sites included 6 hospital pharmacies, and 8 "other" pharmacies. Examples of "other" pharmacies include federal pharmacy, clinic pharmacy, long-term care pharmacy, HMO pharmacy, compounding-only pharmacy.

Table 3.a
Response Rate to the Participation Form Mailings

	All	Independents	Chains	MM	SM
Key informants that were sent a participation form	279				
Adjustments to sample					
Undeliverable	3				
Non-community sites	14				
Key informants at community sites that received the participation form	262	128	74	44	16
Respondents to participation form	172	80	55	21	16
Willing to participate	132	58	42	20	12
Unwilling to participate	40	22	13	1	4
Adjusted Response Rate (%)	**65.65**	62.5	74.32	47.73	100

Table 3.b
Response Rate to the Survey Packet Mailings

	All	Independents	Chains	MM	SM
Key Informants that received the survey packet	132	58	42	20	12
Respondents to the survey packet mailings	115	47	40	17	11
Response rate (%)	**87.12**	81.03	95.24	85.0	91.67

Description of the Respondent Sample (Univariate Analyses)

General

A general description of the respondent key informants' practice sites is provided in Table 4. The largest proportion of respondents was working at independent pharmacies (40.9%) followed by chain pharmacies (34.8%). The average number of licensed pharmacists currently employed at the respondents' sites was 2.58, and the average number of FTE positions represented by the employed pharmacists was 2.0.

Pharmacist Vacancy

Table 5 contains a description of the respondents' practice sites in terms of the pharmacist vacancies. One third (33.0%) of the respondents reported having a vacant pharmacist position at their site currently. Of the sites that had a vacant pharmacist position, on average, 0.89 FTE positions were vacant per site. Only a very small proportion of respondents (7.9%) reported having more than 1.0 FTE pharmacist positions vacant.

Interestingly, when data from all participation forms was used to calculate vacancy rates, just below a quarter of the pharmacy sites (23.8%) reported having a vacant pharmacist position. The different vacancy rates (33% vs. 23.8%) were due to change in the vacancy situation at sites from the time they responded to the participation form to the time they responded to the main survey form.

Pharmacist turnover

A description of turnover during the past 12 months in respondents' practice sites is provided in Table 6. Approximately one third of the respondents (31.3%) reported that at least one pharmacist had left their site during the past 12 months. A small proportion of respondents (13.9%) reported two or more pharmacists leaving their site within the past 12

months. Data for all the pharmacists who reportedly had left employment at the respondent sites during the past 12 months were pooled together for further analyses. Of the 44 pharmacists who had left employment at these sites in the past 12 months, a majority were male (68.2%), and just about half (50.1%) were over 40 years old. On average, pharmacists worked for approximately 68 months at the respondents' sites before leaving, with over a majority (54.5%) working for up to 24 months before leaving. A majority of the pharmacists who left, worked 40 hours per week at the site before leaving. Only 15.9% of all pharmacists who left within the past 12 months reportedly left primarily because of some negative aspect of the site. In fact, over half (54.5%) of the pharmacists who left within the past 12 months, left for a reason that had absolutely no connection to the site (e.g. retired or deceased = 13.6%, relocated or family-related reason = 31.8%, internal transfer = 9.1%).

New pharmacist hires

Table 7 contains a description of new pharmacist hires during the past 12 months in respondents' practice sites. Over a quarter of the respondents (27.8%) reported their site hired new pharmacist(s) during the past 12 months. A majority (87.5%) of the respondents' sites that hired new pharmacist(s) during the past 12 months hired only a single pharmacist. On average, it took respondents' sites 7.3 months to hire a new pharmacist from the time that a position became available.

Table 4
General characteristics of respondents' practice sites
(n = 115)

Variable	N (%)	Mean (SD)
Setting		
Independent	47 (40.9)	
Chain	40 (34.8)	
Mass Merchandiser	17 (14.8)	
Supermarket	11 (9.6)	
Licensed pharmacists currently employed		2.58 (1.15)
1	16 (13.9)	
2	49 (42.6)	
3	27 (23.5)	
≥ 4	23 (20.0)	
Full-Time Equivalent (FTE) pharmacists currently employed		2.0 (0.89)
1.0	25 (21.7)	
>1.0 but < 2.0	24 (20.9)	
2.0	29 (25.2)	
>2.0 but ≤ 3.0	23 (20.0)	
> 3	14 (12.2)	

Table 5
Description of pharmacist vacancy in respondents' practice sites

Variable	Main Survey Respondents		All Participation Form Respondents	
	N (%)	Mean (SD)	N (%)	Mean (SD)
Vacant pharmacist position(s)				
Yes	38 (33.0)		41 (23.8)	
No	77 (67.0)		120 (69.8)	
Missing	0 (0)		11 (6.4)	
	n = 115		n = 172	
Pharmacist vacancies in terms of FTE		0.89 [b] (0.46)		0.87 (0.46)
> 0 but < 0.5	3 (7.9)		6 (14.6)	
0.5	10 (26.3)		8 (19.5)	
> 0.5 but < 1.0	1 (2.6)		1 (2.4)	
1.0	21 (55.26)		19 (46.3)	
> 1.0 but ≤ 1.5	2 (5.3)		2 (4.9)	
> 1.5	1 (2.6)		3 (7.3)	
Missing	0 (0)		2 (4.9)	
	n = 38 [a]		n = 41 [a]	

a. The 'n' for this analysis is less because it only consists of respondent sites that had a vacant pharmacist position
b. Without considering one outlier (FTE vacancies = 3.0), the mean number of FTE vacancies for the remaining 37 sites would be 0.83 FTE positions

Table 6
Description of turnover during past 12 months in respondents' practice sites

Variable	N (%)	Mean (SD)
Any pharmacist(s) left within past 12 months (n = 115 sites)		
Yes	36 (31.3)	
No	79 (68.7)	
Number of pharmacists who left within past 12 month (n = 36 [a] sites)		1.22 (0.64)
1	31 (86.11)	
≥ 2	5 (13.89)	
Age of all pharmacists who left within past 12 months (n = 44 [b] pharmacists)		42.77 (13.56)
≤ 30	12 (27.3)	
31 – 40	10 (22.7)	
41 - 50	9 (20.5)	
51 - 60	9 (20.5)	
61 - 70	4 (9.1)	
Gender of all pharmacists who left within past 12 months (n = 44 [b] pharmacists)		
Male	30 (68.2)	
Female	14 (31.8)	
Time in months worked at pharmacy before leaving for pharmacists who left within past 12 months (n = 44 [b] pharmacists)		68.16 [c] (107.49)
< 12 months (< 1 year)	7 (15.9)	
12 months (1 year)	8 (18.2)	
13 – 24 months (1 to 2 years)	9 (20.45)	
25 – 36 months (2 to 3 years)	6 (13.64)	
37 – 60 months (3 to 5 years)	5 (11.36)	
> 60 months (> 5 years)	9 (20.45)	
Hours worked per week for pharmacists who left within past 12 months (n = 44 [b] pharmacists)		34.26 [d] (14.35)
≤ 15 hrs / week	7 (15.9)	
16-30 hrs / week	5 (11.4)	
31-39 hrs / week	0 (0)	
40 hrs / week	28 (63.6)	
> 40 hrs / week	4 (9.1)	

Variable	N (%)	Mean (SD)
Primary reason for leaving for pharmacists who left within the past 12 months (n = 44 [b] pharmacists)		
Retired or deceased	6 (13.6)	
Relocate or family reason	14 (31.8)	
Same company – different position	4 (9.1)	
Different job – positive reason [e]	7 (15.9)	
Different job – no reason [f]	6 (13.6)	
Different job – negative reason [g]	7 (15.9)	

a. The 'n' for this analysis is less than 115 because it only consists of respondent sites that reported at least one pharmacist leaving employment during the past 12 months (n = 36)
b. The 'n' for this is 44 because it is an analysis of the data on all *pharmacists (not sites)* who left employment at the respondent sites during the past 12 months (n = 44)
c. Without considering nine outliers (time worked greater than 60 months), the mean amount of time worked at the sites before leaving would be 22.7 months for the remaining 35 sites. The original mean of 68.16 months may be skewed by long-term employees leaving the site.
d. Without considering one outlier (hours worked greater than 40 per week), the mean number of hours worked at the sites before leaving would be 33.2 hours per week for the remaining 43 sites. The original mean of 34.26 hours per week may be skewed by one pharmacist working 80 hours per week.
e. This category included pharmacists who reportedly left for a reason that primarily indicated a positive prospect about the new job, rather than a negative aspect of the old job. E.g. desired clinical position, desired hospital position, more hours available, closer to home, management opportunity, and better opportunity to use computer knowledge.
f. No reason reported by the key informant (that does not necessarily mean that no reason was given by the leaving pharmacist)
g. This category included pharmacists who reportedly left for a reason that primarily indicated a negative aspect of the old job. E.g. unpaid bonus, too stressful, not happy, too many hours, displeased with corporate management.

Table 7
Description of new pharmacist hires during past 12 months in respondents' practice sites

Variable	N (%)	Mean (SD)
New pharmacists hired during past 12 months (n = 115 sites)		
Yes	32 (27.8)	
No	83 (72.2)	
Number of pharmacists hired during past 12 months (n = 32 [a] sites)		1.16 (0.45)
1	28 (87.5)	
2	3 (9.4)	
3	1 (3.1)	
Time taken in months to hire new pharmacist since availability of position (n = 32 [a] sites)		7.3 [b] (10.0)
≤ 0.5 months	6 (18.8)	
> 0.5 months but ≤ 1 month	3 (9.4)	
> 1 month but ≤ 3 months	6 (18.8)	
> 3 months but ≤ 6 months	8 (25.0)	
> 6 months but ≤ 12 months	3 (9.4)	
> 12 months but ≤ 18 months	3 (9.4)	
> 18 months	3 (9.4)	

a. The 'n' for this analysis is less than 115 because it only consists of respondent sites that hired a new pharmacist(s) during the past 12 months (n = 32)
b. Without considering three outliers (time taken greater than 18 months), the mean amount of time taken by the sites to hire would be 4.7 months for the remaining 29 sites.

Internal Pharmacy Characteristics

A description of respondents' practice sites in terms of internal pharmacy characteristics is presented in Table 8. Approximately one-third of the respondents (30.4%) reported that a sign-on bonus was given to the most recently hired pharmacist. An average of $7,406.30 was paid as a sign-on bonus by sites that did report doing so for the most recently hired pharmacist. On average, the respondents' practice sites were open for 10.0 hours on weekdays, and 6.2 hours on Saturdays. Only one third (33.0%) of the respondent sites were open on Sundays and for those that were open, the mean hours of operation on Sunday equaled 6.3 hours. A majority of the respondents' practice sites (71.3%) required their staff pharmacists to work on weekends.

On average, the respondents' practice sites dispensed 226.3 prescriptions per day, and three quarters (74.8%) of the sites dispensed greater than 80% of their daily prescription volume for patients covered by third party payers (i.e. Medicaid and private third party). On average, the respondents' practice sites dispensed 137.0 prescriptions per day per pharmacist and 51.3 prescriptions per day per dispensing staff. Dispensing staff was defined as the number of pharmacists, certified technicians, non-certified technicians, pharmacy residents and interns on duty at the site during the busiest portion of the workday. On average, respondents' practice sites had 1.32 technicians and 1.33 support staff on duty for every 100 prescriptions dispensed per day. Support staff was defined as the number of certified technicians, non-certified technicians, pharmacy residents and interns on duty at the site during the busiest portion of the workday.

Over 22% of the respondent practice sites had no dispensing aiding technologies at their site, while a majority (56.5%) had 1 or 2 dispensing aiding technologies. Dispensing

aiding technologies included automated dispensing system, automated patient-refill request system, bar coding for prescriptions, tablet/capsule counter, and electronic prescription order system. On average, staff pharmacists at respondents' practice sites spent 34.1% of their time in patient consultation and 42.2% of their time in medication dispensing.

A majority of the sites (56.5%) did offer some patient care services (PCS) or disease state management (DSM) programs in their sites. For the sites that did offer some PCS/DSM, the mean number of PCS/DSM offered was 3.6, with over a majority of these sites (55.4%) offering 3 or more PCS/DSM. On average, sites that did offer some PCS/DSM, spent 7.8 hours per week offering those services/programs. A majority of the sites (84.6%) did not have time specifically scheduled for these activities. Over 61% of respondents reported that a majority of the time when PCS/DSM programs were performed, there were at least 2 pharmacists on duty. A total of 27.7% of the respondents who did have a PCS/DSM at their site reported that their pharmacy was being paid for these services or programs.

On average, the respondents' sites had a requirement of 2.30 Full Time Equivalent (FTE) pharmacist positions. This number corresponded to a requirement of almost 3 pharmacists on average per site. If all the required FTE pharmacist positions at the respondent sites were full, the pharmacists at the sites would have a mean prescription workload of about 80 prescriptions per day.

Table 8
Description of internal pharmacy characteristics in respondents' practice sites

Variable	N (%)	Mean (SD)
Whether sign-on bonus was given to the most recently hired pharmacist (n = 115)		
Yes	35 (30.4)	
No	64 (55.7)	
Don't know	15 (13.0)	
Missing	1 (0.9)	
Amount of sign-on bonus, if given (n = 35 [a])		7,406.3 (3,337.1)
$ 1,000	1 (2.9)	
$ 2,000	3 (8.6)	
$ 5,000	10 (28.6)	
$ 7,500	2 (5.7)	
$ 10,000	15 (42.9)	
$ 15,000	1 (2.9)	
Missing	3 (8.6)	
Hours of operation per weekday for pharmacy's prescription department (n = 115)		10.0 (1.6)
≤ 8 hrs	4 (3.5)	
> 8 but ≤ 10 hrs	86 (74.8)	
> 10 but ≤ 12 hrs	11 (9.6)	
> 12 but ≤ 14 hrs	14 (12.2)	
Hours of operation on Saturdays for pharmacy's prescription department (n = 115)		6.2 (3.0)
0 hrs	12 (10.4)	
> 0 but ≤ 4 hrs	23 (20.0)	
> 4 but ≤ 6 hrs	20 (17.4)	
> 6 but ≤ 8 hrs	26 (22.6)	
> 8 but ≤ 10 hrs	31 (27.0)	
> 10 but ≤ 12 hrs	2 (1.7)	
> 12 but ≤ 14 hrs	1 (0.9)	
Whether pharmacy is open on Sundays *(n = 115)*		
Yes	38 (33.0)	
No	77 (67.0)	

Variable	N (%)	Mean (SD)
Hours of operation on Sundays for pharmacy's prescription department (n = 38)		6.3 (2.0)
> 0 but ≤ 4 hrs	9 (23.7)	
> 4 but ≤ 6 hrs	10 (26.3)	
> 6 but ≤ 8 hrs	18 (47.4)	
> 8 but ≤ 10 hrs	1 (2.6)	
Staff pharmacists required to work on weekends (n = 115)		
Yes	82 (71.3)	
No	33 (28.7)	
Average number of prescriptions dispensed at the site per day (n = 115)		226.3 (109.7)
0 - 100	13 (11.3)	
101 - 200	45 (39.1)	
201 - 300	38 (33.0)	
301 - 400	12 (10.4)	
401 - 500	5 (4.3)	
501 - 600	2 (1.7)	
Proportion of prescriptions dispensed for all third party patients i.e. Medicaid and private 3rd party(n = 115)		86.7 (8.7)
0 - 30	1 (0.9)	
31 - 60	0 (0)	
61 - 70	4 (3.5)	
71 - 80	21 (18.3)	
81 - 85	16 (13.9)	
86 - 90	40 (34.8)	
91 - 100	30 (26.1)	
Missing	3 (2.6)	
Prescriptions per day per pharmacist employed (n = 115)		137.0 (49.1)
0 - 100	31 (27.0)	
101 - 125	23 (20.0)	
126 - 150	29 (25.2)	
151 - 200	23 (20.0)	
201 - 250	8 (7.0)	
251 - 300	1 (0.9)	
Missing	1 (0.9)	

Variable	N (%)	Mean (SD)
Prescriptions per day per dispensing staff[c] employed (n = 115)		51.3 (14.7)
0 - 20	2 (1.7)	
21 - 40	27 (23.5)	
41 - 50	34 (29.6)	
51 - 60	27 (23.5)	
61 - 80	20 (17.4)	
81 - 100	4 (3.5)	
Missing	1 (0.9)	
Number of technicians per 100 prescriptions (n = 115)		1.32 (0.76)
0.00 – 0.50	3 (2.61)	
0.51 – 1.00	35 (30.43)	
1.01 -1.50	49 (42.61)	
1.51 – 2.00	21 (18.26)	
> 2.00	6 (5.22)	
Missing	1 (0.87)	
Number of support staff[d] per 100 prescriptions (n = 115)		1.33 (0.77)
0.00 – 0.50	3 (2.61)	
0.51 – 1.00	35 (30.43)	
1.01 -1.50	48 (41.74)	
1.51 – 2.00	22 (19.13)	
> 2.00	6 (5.22)	
Missing	1 (0.87)	
Number of dispensing aiding technologies[e] at the site (n = 115)		1.54 (1.19)
0	26 (22.61)	
1	32 (27.83)	
2	33 (28.70)	
3	16 (13.91)	
4	6 (5.22)	
5	1 (0.87)	
Missing	1 (0.87)	

Variable	N (%)	Mean (SD)
Percent of time spent by pharmacists in consultation (n = 115)		34.14 (17.81)
Up to 10%	14 (12.17)	
11% to 25%	29 (25.22)	
26% to 40%	38 (33.04)	
41% to 50%	17 (14.78)	
51% to 75%	13 (11.30)	
76% and up	3 (2.61)	
Missing	1 (0.87)	
Percent of time spent by pharmacists in medication dispensing (n = 115)		42.21 (22.81)
Up to 10%	16 (13.91)	
11% to 25%	13 (11.30)	
26% to 40%	29 (25.22)	
41% to 50%	18 (15.65)	
51% to 75%	29 (25.22)	
76% and up	9 (7.83)	
Missing	1 (0.87)	
Any Patient care service (PCS) or Disease State Management (DSM) offered (n = 115)		
Yes	65 (56.5)	
No	49 (42.6)	
Missing	1 (0.9)	
Number of PCS or DSM, if offered (n = 65 [b])		3.6 (2.3)
1	11 (16.92)	
2	17 (26.15)	
3	8 (12.31)	
4	11 (16.92)	
5	6 (9.23)	
6	2 (3.08)	
7	5 (7.69)	
8 or more	4 (6.15)	
Missing	1 (1.54)	

Variable	N (%)	Mean (SD)
Hours spent per week by site in providing PCS or DSM (n = 65 [b])		7.8 (8.0)
≤ 1.0 hours	8 (12.3)	
1.1 to 5.0 hours	22 (33.8)	
5.1 to 10.0 hours	16 (24.6)	
10.1 to 20.0 hours	11 (16.9)	
20.1 to 40.0 hours	3 (4.6)	
Missing	5 (7.7)	
Time scheduled only for providing patient care services or DSM programs (n = 65 [b])		
Yes	7 (10.8)	
No	55 (84.6)	
Missing	3 (4.6)	
Majority of patient care services or DSM program provision when at least 2 pharmacists are on duty (n = 65 [b])		
Yes	40 (61.5)	
No	22 (33.8)	
Missing	3 (4.6)	
Pharmacy paid for patient care services or DSM program provision (n = 65 [b])		
Yes	18 (27.7)	
No	44 (67.7)	
Missing	3 (4.6)	
Number of FTE pharmacist positions required by the site (n = 115)		2.30 (1.07)
1	18 (15.65)	
> 1 but ≤ 2	43 (37.39)	
> 2 but ≤ 3	33 (28.70)	
> 3 but ≤ 4	15 (13.04)	
> 4	6 (5.22)	
Number of pharmacists required by the site (n=115)		2.99 (1.39)
≤ 2	38 (33.04)	
> 2 but ≤ 3	27 (23.5)	
> 3 but ≤ 4	29 (25.2)	
> 4 but ≤ 6	18 (15.65)	
> 6 but ≤ 8	3 (2.61)	

Variable	N (%)	Mean (SD)
Prescriptions per day per required pharmacist (n = 115)		80.10 (31.24)
0 - 50	15 (13.04)	
51 - 65	24 (20.9)	
66 - 80	31 (27.0)	
81 - 100	18 (15.7)	
101 - 150	23 (20.0)	
151 - 200	4 (3.48)	

a. The 'n' for this analysis is less than 115 because it only consists of respondent sites that reported giving a sign-on bonus to the most recently hired pharmacist (n = 35)
b. The 'n' for this analysis is less than 115 because it only consists of respondent sites that offered any patient-care service or DSM program (n = 65)
c. 'Dispensing staff' was defined as the number of pharmacists, certified technicians, non-certified technicians, pharmacy residents and interns on duty at the site during the busiest portion of the workday.
d. 'Support staff' was defined as the number of certified technicians, non-certified technicians, pharmacy residents and interns on duty at the site during the busiest portion of the workday.
e. 'Dispensing aiding technologies' included automated dispensing system, automated patient-refill request system, bar coding for prescriptions, tablet/capsule counter, and electronic prescription order system.

External factors

Table 9 contains a description of the respondents' practice sites in terms of external factors. About three quarters (72.2%) of the respondents' practice sites were located in counties with a population of 60,000 or less. The mean population per pharmacist, population per pharmacy, and population per physician for respondents' practice sites was 1,572, 3,936, and 1,866 respectively. Over three quarters (77.4%) of the respondents' practice sites were located in counties with a senior population of 9,000 or less. The mean number of seniors per pharmacist, seniors per pharmacy, and seniors per physician was 249, 609, and 300 respectively. The mean number of pharmacists living in a county per pharmacy located in the county was 2.69 pharmacists. Most of the sites (95.6%) were located in counties whose senior population accounted for 10-20% of the total population. Over 90% of the sites were located in counties with a per capita annual income of $15,000 to $20,000 and over 75% of the sites were located in counties with USDA Rural-Urban Continuum code of 4 to 6.

Table 9
Description of external factors related to respondents' practice sites
(n = 115)

Variable	N (%)	Mean (SD)
1.Population of county		47,282 (24,376)
0 – 20,000	21 (18.3)	
20,001 – 40,000	24 (20.9)	
40,001 – 60,000	38 (33.0)	
60,001 – 80,000	14 (12.2)	
80,001 – 100,000	18 (15.7)	
2. Population per licensed pharmacist		1,572 (655)
≤ 1,000	14 (12.17)	
1,001 – 1,500	44 (38.3)	
1,501 – 2,000	40 (34.8)	
2,001 – 3,000	15 (13.04)	
> 3,000	2 (1.74)	
3. Population per pharmacy		3,936 (1,096)
2,000 – 3,000	29 (25.22)	
3,001 – 4,000	32 (27.83)	
4,001 – 5,000	40 (34.78)	
> 5,000	14 (12.17)	
4. Population per physician		1,866 (1,654)
≤ 1,000	12 (10.43)	
1,001 – 1,500	41 (35.7)	
1,501 – 2,000	27 (23.5)	
2,001 – 3,000	24 (20.87)	
> 3,000	11 (9.57)	
5. Senior population of county		7,069 (3,170)
0 – 3,000	17 (14.8)	
3,001 – 6,000	25 (21.7)	
6,001 – 9,000	47 (40.9)	
9,001 – 12,000	14 (12.2)	
12,001 – 15,000	12 (10.4)	

Variable	N (%)	Mean (SD)
6. Seniors per pharmacist		249 (135)
100 – 200	36 (31.30)	
201 – 300	39 (33.9)	
201 – 300	20 (17.4)	
301 – 400	15 (13.04)	
> 400	5 (4.35)	
7. Seniors per pharmacy		609 (170)
400 – 500	32 (27.83)	
501 – 600	26 (22.61)	
601 – 700	37 (32.17)	
701 – 800	15 (13.04)	
> 800	5 (4.35)	
8. Seniors per physician		300 (321)
≤ 200	44 (38.26)	
201 – 300	41 (35.65)	
301 – 400	13 (11.30)	
> 400	17 (14.78)	
9. Pharmacists per pharmacy		2.69 (0.86)
1.0 – 2.0	28 (24.35)	
2.1 – 3.0	54 (46.96)	
3.1 – 4.0	25 (21.74)	
> 4.0	8 (6.96)	
10. Percent population of county comprised of seniors		15.76 (2.48)
> 10 ≤ 15	36 (31.3)	
> 15 ≤ 20	74 (64.3)	
> 20 ≤ 25	5 (4.3)	
11. Per capita income of county		18,633 (1,533)
$15,001 – $18,000	50 (43.5)	
$18,001 – $20,000	54 (47.0)	
$20,001 – $24,000	11 (9.6)	

Variable	N (%)	Mean (SD)
12. Rurality of county [a]		
RUCC = 4/5/6	87 (75.65)	
RUCC = 7/8/9	28 (24.35)	

a. Rurality as defined by the United States Department of Agriculture's Economic Research Service (ERS/USDA) branch. A Rural Urban Continuum Code (RUCC) of 4 to 9 indicate a non-metropolitan county. The higher the code, greater is the rurality of the county. So counties with RUCC between 4 to 6 would be "less rural" than counties with RUCC 7 to 9.

Estimation of Non-Response Bias

The next phase of data analysis involved determining if non-response bias was present in the respondent sample. Non-response bias can occur when the responses obtained from the individuals who responded to the survey are significantly different from what would have been obtained if there had been complete participation by all of the individuals in the survey sample. First, the main survey respondents were compared with the total non-respondents (i.e. key informants who did not even send back the participation form) (Table 10). These two groups were not found to be significantly different either in terms of their setting or any of the external factors. Next, the main survey respondents were compared to the participation form respondents for all of the variables that were collected in the participation form (Table 11). The participation form respondents were significantly different from the main survey respondents only in terms of the key informants' age; the main survey respondents being significantly younger.

Table 10
Comparison between *Main survey* and *Total non-respondents*

Variable	Main Survey Respondents	Total non-respondents	
	N (%)		Chi-square (df)
Rurality (n = 205)			
RUCC 4 to 6	87 (75.7)	67 (74.4)	0.04 (1)
RUCC 7 to 9	28 (24.3)	23 (25.6)	
Setting (n = 205)			
Independent	47 (40.9)	48 (53.3)	
Chain	40 (34.8)	19 (21.1)	5.00 (2)
MM / SM	28 (24.3)	23 (25.6)	
	Mean (SD)		T-score (df)
Population of county	47,282.28 (24,376.41) (n = 115)	47,381.76 (26,799.83) (n = 90)	-0.28 (203)
Population per pharmacist	1,571.54 (654.83) (n = 115)	1,520.24 (483.42) (n = 90)	0.62 (203)
Population per pharmacy	3,935.68 (1,096.03) (n = 115)	4,187.70 (1,503.35) (n = 90)	-1.39 (203)
Population per physician	1,865.90 (1,654.14) (n = 115)	2,315.22 (2,389.87) (n = 90)	-1.59 (203)
Senior population	7,068.62 (3,169.94) (n = 115)	7,019.37 (3,435.84) (n = 90)	0.11 (203)
Seniors per pharmacist	248.92 (134.95) (n = 115)	240.85 (93.73) (n = 90)	0.53 (203)
Seniors per pharmacy	608.99 (169.67) (n = 115)	650.35 (242.71) (n = 90)	-1.43 (203)
Seniors per physician	300.48 (321.08) (n = 115)	379.54 (477.05) (n = 90)	-1.42 (203)

Variable	Main Survey Respondents	Total non-respondents	
	Mean (SD)		T-score (df)
Pharmacists per pharmacy	2.69 (0.86) (n = 115)	2.98 (1.48) (n = 90)	-1.77 (203)
Percent seniors	15.76 (2.48) (n = 115)	15.75 (2.46) (n = 90)	0.04 (203)
Per capita income	$18,633.08 (1,533.37) (n = 115)	$18,798.79 (1,701.97) (n = 90)	-0.73 (203)

Table 11
Comparison between *Main survey* and *Participation form* respondents

Variable	Main Survey Respondents	Participation form respondents	
	Mean (SD)		T-score (df)
Age of key informant in years	46.33 (10.90) (n = 113 [a])	51.76 (10.68) (n = 45 [b])	-2.84* (156)
Number of FTE pharmacists employed currently	1.94 (0.86) (n = 113 [a])	3.09 (8.82) (n = 44 [b])	-1.37 (155)
Number of pharmacists who left within past 12 months	0.37 (0.64) (n = 114 [a])	0.56 (1.04) (n = 45 [b])	-1.38 (157)
Average number of prescriptions dispensed at the site per day	221.14 (103.88) (n = 111 [a])	196.38 (94.92) (n = 45 [b])	1.38 (154)
Population of county	47,282.28 (24,376.41) (n = 115)	43,065.11 (23,695.21) (n = 57)	1.08 (170)
Population per pharmacist	1,571.54 (654.83) (n = 115)	1,591.30 (702.93) (n = 57)	-0.18 (170)
Population per pharmacy	3,935.68 (1,096.03) (n = 115)	4,090.32 (1,299.06) (n = 57)	-0.82 (170)
Population per physician	1,865.89 (1,654.14) (n = 115)	1,959.69 (1,307.63) (n = 57)	-0.37 (170)
Senior population	7,068.62 (3,169.94) (n = 115)	6,509.18 (2985.35) (n = 57)	1.11 (170)
Seniors per pharmacist	248.92 (134.95) (n = 115)	256.25 (132.54) (n = 57)	-0.34 (170)
Seniors per pharmacy	608.99 (169.67) (n = 115)	644.66 (207.74) (n = 57)	-1.20 (170)

Variable	Main Survey Respondents	Participation form respondents	
	Mean (SD)		T-score (df)
Seniors per physician	300.48 (321.08) (n = 115)	312.62 (217.94) (n = 57)	-0.26 (170)
Pharmacists per pharmacy	2.69 (0.86) (n = 115)	2.75 (0.79) (n = 57)	-0.40 (170)
Percent seniors	15.76 (2.48) (n = 115)	16.04 (2.35) (n = 57)	-0.70 (170)
Per capita income	18,633.08 (1,533.37) (n = 115)	18,811.25 (1,646.74) (n = 57)	-0.70 (170)
	N (%)		Chi-square (df)
Setting	*(n = 115)*	*(n = 57)*	
Independent	47 (40.9)	33 (57.9)	
Chain	40 (34.8)	15 (26.3)	4.53 (2)
Mass Merchandiser Or Supermarket	28 (24.3)	9 (15.8)	
Any turnover during past 12 months	*(n = 114)*	*(n = 45)*	
Yes	35 (30.70)	14 (31.11)	0.00 (1)
No	79 (69.30)	31 (68.89)	
Unmet pharmacist demand	*(n = 114)*	*(n = 47)*	
Pharmacist vacancy	29 (25.44)	12 (25.53)	0.00 (1)
No pharmacist vacancy	85 (74.56)	35 (74.47)	
Rurality	*(n = 115)*	*(n = 57)*	
RUCC 4 to 6	87 (75.7)	44 (77.2)	0.05 (1)
RUCC 7 to 9	28 (24.3)	13 (22.8)	

a. The 'n' for this analysis is less than 115 because of missing data
b. The 'n' for this analysis is less than 57 because of missing data
* $p < 0.05$, two-tailed

Psychometric Evaluations of Multi-Item Measures

Before proceeding further with bivariate or multivariate analyses of the study sample, the multi-item measures employed in the study were evaluated for reliability and validity. This was done to verify that these measures were valid enough to be included in further analyses. Each of these analyses is conducted using 'available cases' and thus the number of cases available for each analysis is not 115, but varies as noted in each table.

These evaluations began with a factor analysis of the multi-item measures using Varimax rotation. This analysis helps to ascertain the discriminant validity of the measures and also helps to ensure that individual items correlate highly with the measures they are proposed to. Based on the conceptual model and past literature, specific items were grouped together as part of a single scale in the survey instrument. The factor analyses were conducted separately on each scale in the survey instrument. Factor analysis was not conducted on items of all the scales together because it was possible that items from two different construct scales might load significantly on a single factor because the constructs may be inter-related, although they are theoretically different.

Results of the factor analysis are presented in Table 12. Items in two of the pre-determined scales (namely, 'Innovativeness of Site', and 'Communication at the Site') were found to load significantly on a single factor. All the items in these scales exhibited loadings of greater than 0.60 with their proposed measures. Thus, the researcher judged that items within each of these two scales could be grouped together to form a summary score for their respective scales.

Items within the 'Level of Input of Staff Pharmacists' scale loaded on two distinct factors. Henceforth, items in factor one will be collectively referred to as 'Level of input of

staff pharmacists in pharmacy operations', and items in factor two will be collectively referred to as 'Level of input of staff pharmacists in determining their professional role'.

Items within 'Emphasis of Site' scale loaded on three distinct factors. Henceforth, items in factor one will be collectively referred to as 'Emphasis of site on people' scale, items in factor two will be collectively referred to as 'Emphasis of site on innovation' scale, and items in factor three will be collectively referred to as 'Emphasis of Site on business' scale.

Items within the 'Orientation of site' scale loaded on two distinct factors. Henceforth, items in factor one will be collectively referred to as 'Service Orientation' scale, and items in factor two will be collectively referred to as 'Dispensing Orientation' scale.

Factor analysis was not conducted on the 'Workload Effect on Ability to Take Breaks' scale and the 'Overall Pharmacist Satisfaction' scale since both these scales contained only two items.

Table 12

Factor Analysis using Varimax Rotation on Multi-Item Scales assumed to be Interval Level in Nature

Items [a]	Factor [b]		
	1	2	3
Scale: 'Level of Input of Staff Pharmacists' (n = 109 [c])			
INPUT 1		0.72	
INPUT 2		0.73	
INPUT 3		0.75	
INPUT 4	0.50		
INPUT 5	0.57		
INPUT 6	0.64		
INPUT 7	0.70		
INPUT 8	0.78		
INPUT 9	0.81		
INPUT 10	0.75		
Scale: 'Emphasis of Site' (n = 111 [c])			
EMPHA 1			0.83
EMPHA 2	0.65		
EMPHA 3	0.72		
EMPHA 4			0.85
EMPHA 5	0.76		
EMPHA 6	0.76		
EMPHA 7	0.62		
EMPHA 8		0.90	
EMPHA 9		0.65	
Scale: 'Innovativeness of Site' (n = 115)			
INNOV 1	0.65		
INNOV 2	0.82		
INNOV 3	0.81		
INNOV 4	0.79		
Scale: 'Communication at the Site' (n = 114 [c])			
COMMU 1	0.80		
COMMU 2	0.85		
COMMU 3	0.76		
COMMU 4	0.81		

Items [a]	Factor [b]		
	1	2	3
Scale: 'Orientation of site' (n = 115)			
ORIENT 1		0.53	
ORIENT 2	0.71		
ORIENT 3		0.91	
ORIENT 4		0.88	
ORIENT 5	0.90		
ORIENT 6	0.87		

a. See Appendix F for key of item codes.
b. Loadings less than 0.50 on a factor not shown in the table
c. The 'n' for this analysis is less than 115 due to missing data on more than half items within the scale

Next, the corrected item-total correlation for the items in each scale was examined. The corrected item-total correlation is the correlation of the score of that particular item with the total score of the scale with that item deleted (Churchill, 1979). The results of the analysis are displayed in Table 13. Inspection of these results show that, with the exception of two items i.e. INPUT 1 and ORIENT 1, with corrected item-total correlations of 0.38 and 0.26 respectively; all items displayed item-total correlation higher than 0.40. It was decided to drop the variable INPUT 1 before proceeding with further analyses because it was responsible for the low reliability of the scale and conceptually, it did not fit well with the other two measures of the factor. The variable ORIENT 1 was also dropped from further analyses because it brought down the reliability of the scale considerably from 0.88 (without the item) to 0.71 (with the item). Also, the item mean and distribution for ORIENT 1 was very different from those of the other two items in the scale.

Table 13

Corrected Item-Total Correlations for Multi-Item Scales assumed to be Interval in Nature

Items [a]	Corrected Item-Total Correlations
Scale: 'Workload Effect on Ability to Take Breaks' (n = 115)	
WKEFF 1	0.77
WKEFF 2	0.77
Scale: 'Level of Input of Staff Pharmacists in Pharmacy Operations' (n = 109 [b])	
INPUT 4	0.59
INPUT 5	0.67
INPUT 6	0.53
INPUT 7	0.55
INPUT 8	0.74
INPUT 9	0.70
INPUT 10	0.67
Scale: 'Level of Input of Staff Pharmacists in Determining Their Professional Role' (n = 109 [b])	
INPUT 1	0.38
INPUT 2	0.51
INPUT 3	0.55
Scale: 'Emphasis of Site on People' (n = 111 [b])	
EMPHA 2	0.50
EMPHA 3	0.56
EMPHA 5	0.51
EMPHA 6	0.72
EMPHA 7	0.62
Scale: 'Emphasis of Site on Innovation' (n = 111 [b])	
EMPHA 8	0.42
EMPHA 9	0.42
Scale: 'Emphasis of Site on Business' (n = 111 [b])	
EMPHA 1	0.49
EMPHA 4	0.49
Scale: 'Innovativeness of Site' (n = 115)	
INNOV 1	0.44
INNOV 2	0.65
INNOV 3	0.60
INNOV 4	0.56

Items [a]	Corrected Item-Total Correlations
Scale: 'Communication at the Site' (n = 114 [b])	
COMMU 1	0.63
COMMU 2	0.70
COMMU 3	0.58
COMMU 4	0.64
Scale: 'Service Orientation' (n = 115)	
ORIENT 2	0.46
ORIENT 5	0.73
ORIENT 6	0.68
Scale: 'Dispensing Orientation' (n = 115)	
ORIENT 1	0.26
ORIENT 3	0.74
ORIENT 4	0.66
Scale: 'Overall Pharmacist Satisfaction' (n = 115)	
RPHSAT 1	0.84
RPHSAT 2	0.84

a. See Appendix F for key of item codes.
b. The 'n' for this analysis is less than 115 due to missing data

Finally, reliability analyses were performed for each multi-item measure used in the study. These analyses consisted of Cronbach's Coefficient Alpha for all measures consisting of items assumed to be measured at the interval level. The results of these analyses, as well as other descriptive statistics for each measure, are featured in Table 14. Reliability analyses showed that two of the scales (namely, 'Emphasis of site on innovation', and 'Emphasis of site on business') had a reliability of less than 0.70. Given the fact that 'Emphasis of site on business' was only a two-item measure with reliability of 0.66, it was decided to use this scale in further analyses; however the results should be interpreted with caution. 'Emphasis of site on innovation' was correlated significantly ($r = 0.5$, $\alpha = 0.01$) with the 'Innovativeness of site' scale. In light of the fact that the former had only 2 items with reliability of 0.60, it was decided to discontinue its use for further analyses in favor of the 'Innovativeness of site' scale, which had 4 items with reliability of 0.76. All the other scales had acceptable reliability i.e. 0.70 or higher. A score for each respondent was computed for every scale by summing the scores on each individual item of that scale. These scores were then used in bivariate and multivariate analyses.

Table 14
Reliability and Summary Statistics for Purified Multi-Item Scales

Scale	Items [a]	Reliability	Range	Mean	Std. Dev.	Per-Item Mean
'Workload Effect on Ability to Take Breaks' (n = 115)	2/2	0.86 [b]	2 - 8	4.15 [d]	1.85	2.07
'Level of input of staff pharmacists in pharmacy operations' (n = 109)	7/7	0.86 [c]	7 – 21	13.61 [e]	3.43	1.94
'Level of input of staff pharmacists in determining their professional role' (n = 109)	3/2	0.70 [b]	2 – 6	4.16 [e]	1.07	2.08
'Emphasis of site on people' (n = 111)	5/5	0.80 [c]	5 – 15	11.11 [f]	2.27	2.22
'Emphasis of site on innovation' (n = 111)	2/2	0.60 [b]	2 – 6	4.05 [f]	1.03	2.03
'Emphasis of site on business' (n = 111)	2/2	0.66 [b]	2 – 6	4.51 [f]	1.12	2.25
'Innovativeness of Site' (n = 115)	4/4	0.76 [c]	4 – 20	12.17 [g]	2.91	3.04
'Communication between management and staff' (n = 114)	4/4	0.82 [c]	4 – 20	15.12 [h]	2.84	3.78
'Service Orientation' (n = 115)	3/3	0.78 [c]	3 – 15	10.35 [i]	2.47	3.45
'Dispensing Orientation' (n = 115)	3/2	0.88 [b]	2 – 10	5.90 [j]	2.12	2.95
'Overall Pharmacist Satisfaction' (n = 115)	2/2	0.91 [b]	2 - 10	7.91 [k]	1.47	3.96

a. Items in original measure / items in final measure
b. Pearson correlation
c. Cronbach coefficient alpha
d. Items measured using a 4-point scale (1=Very difficult, 2=Difficult, 3=Easy, 4=Very easy). A lower score on this scale indicates a more negative effect of workload on ability to take breaks.
e. Items measured using a 3-point scale (1=no input, 2=moderate input, 3= high input). A higher score on this scale indicates greater input.
f. Items measured using a 3-point scale (1=no emphasis, 2=moderate emphasis, 3= high emphasis). A higher score on this scale indicates greater emphasis.
g. Items measured using a 5-point scale (1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strongly agree). A higher score on this scale indicates greater innovativeness.
h. Items measured using a 5-point scale (1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strongly agree). A higher score on this scale indicates better communication between management and staff.
i. Items measured using a 5-point scale (1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strongly agree). A higher score on this scale indicates greater orientation of the site towards service provision.
j. Items measured using a 5-point scale (1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strongly agree). A higher score on this scale indicates greater orientation of the site towards dispensing drugs only.
k. Items measured using a 5-point scale (1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree, 5=strongly agree). A higher score on this scale indicates higher overall satisfaction for pharmacists working at the site.

Bivariate Analyses

For the next step in the analysis, data were cross-tabulated by whether or not there was a current vacant pharmacist position at the site. This aids in distinguishing important differences between the sites which do and do not have a vacancy and may give some indication of variables that are important in predicting sites with a pharmacist vacancy. The overall bivariate relationship between each variable and the presence or absence of a vacancy was tested with either the Pearson Chi-Square test or the Independent-Samples T Test, as appropriate, to determine which differences were significant between the two groups.

Table 15 shows a comparison of sites with or without vacancy on variables related to setting, pharmacist turnover, and new pharmacist hires. The two groups are not significantly different in their setting distribution. Sites with pharmacist vacancy were more likely to have a pharmacist leaving within the past 12 months, had a higher mean for number of pharmacists leaving during past 12 months, and took significantly longer to hire a new pharmacist within past 12 months since availability of position.

Table 15

A comparison between sites with or without vacancy on setting, pharmacist turnover, and new pharmacist hires.

Variable	Vacancy	No vacancy	
	N (%) [a]		Chi-square (df)
Setting (n = 115)			
Independent	12 (31.6)	35 (45.5)	2.05 (2)
Chain	15 (39.5)	25 (32.5)	
Mass Merchandiser or Supermarket	11 (28.9)	17 (22.1)	
Did any pharmacist leave within past 12 months? (n = 115)			
Yes	20 (52.63)	16 (20.78)	12.00** (1)
No	18 (47.37)	61 (79.22)	
Hired new pharmacist(s) during past 12 months? (n = 115)			
Yes	11 (28.95)	21 (27.27)	0.04 (1)
No	27 (71.05)	56 (72.73)	
	Mean (SD)		T-score (df)
Number of pharmacists that left within past 12 months (n = 115)	0.74 (0.92)	0.21 (0.41)	4.27** (113)
Number of pharmacists hired during past 12 months (n = 115)	0.39 (0.72)	0.29 (0.48)	0.96 (113)
Months taken to hire since availability of position, if new pharmacist hired within past 12 months (n = 32 [b])	12.37 (14.15)	4.69 (5.86)	2.18* (30)

a. All percentages are column percentages
b. The 'n' for this analysis is less than 115 because it only consists of respondent sites that hired a new pharmacist(s) during the past 12 months (n = 32)

** $p < 0.01$, two-tailed test
* $p < 0.05$, two-tailed test

A comparison of sites with or without vacancy on internal pharmacy characteristics is presented in Table 16. Sites with pharmacist vacancy paid, on average, a higher gross hourly wage to the most recently hired pharmacist.

Key informants at sites with a vacancy were more likely to report *difficult* or *very difficult* for their pharmacists to take planned time off for a vacation as compared to key informants at sites without vacancy. Interestingly, although both the groups were generally similar in terms of requiring all their staff pharmacists to work on weekends, it was seen that sites which reported a vacancy had longer hours of operation on Saturdays.

Sites that reported a vacancy had a higher volume of prescriptions dispensed at their site per day as compared to sites that did not report a vacancy. It was interesting to note that in spite of this difference, both the groups were generally similar when compared on the basis of volume of prescriptions per pharmacist or volume of prescriptions per dispensing staff.

There were no significant differences between sites with and without vacancy in terms of the number of technicians or overall support staff available per 100 prescriptions. Sites that reported a vacancy had, on average, a higher number of dispensing aiding technologies at their site.

Sites with and without vacancy were generally similar in terms of the proportion of time their pharmacists spent in either medication dispensing or consultation. The two groups were also similar when compared on the basis of whether or not they offered any patient-care services (PCS) or disease-state management (DSM) programs. However, among the sites that did offer some PCS or DSM programs, sites reporting a vacancy were more likely to offer 3 or more such PCS or DSM programs as compared to sites that did not

report a vacancy. For the sites that did provide some PCS or DSM programs, there were no significant differences between the "vacancy" and "no vacancy" groups when compared on the four variables that were collected to describe the level of provision of these services. Sites reporting a vacancy had a significantly higher requirement for FTE pharmacist positions than sites without vacancy.

Several scales were used to measure different aspects of work culture at pharmacy sites. The summated scores calculated for each of these scales were compared between sites with or without vacancy. Very interestingly, the two groups did not show significant differences on any of the scales measuring aspects of work environment / culture at the site.

Table 16
A comparison between sites with or without vacancy on internal pharmacy characteristics

Variable	Vacancy	No vacancy	
Compensation			
	N (%) [a]		Chi-square (df)
Whether sign-on bonus was given to most recently hired pharmacist (n = 99 [b])			
Yes	16 (47.1%)	19 (29.2%)	3.10 (1)
No	18 (52.9%)	46 (70.8%)	
	Mean (SD)		T-score (df)
Gross hourly wage in dollars for most recently hired pharmacist (n = 105 [b])	47.76 (6.20)	44.87 (5.57)	2.42* (103)
Work Schedule			
	N (%)		Chi-square (df)
All staff pharmacists required to work on weekends (n = 115)			
Yes	29 (76.32)	53 (68.83)	0.70 (1)
No	9 (23.68)	24 (31.17)	
Level of difficulty for a pharmacist to take planned time off for vacation (n = 115)			
Difficult or Very difficult	17 (44.7)	20 (26.0)	4.11* (1)
Easy or Very easy	21 (55.3)	57 (74.0)	
Is the prescription department open on Sundays? (n = 115)			
Yes	14	24	0.37 (1)
No	24	53	
	Mean (SD)		T-score (df)
Number of hours open per Weekday (n = 115)	10.38 (1.60)	9.78 (1.49)	1.98 (113)
Number of hours open on Saturdays (n = 115)	7.16 (2.55)	5.67 (3.16)	2.53* (113)

Variable	Vacancy	No vacancy	
Workload			
	Mean (SD)		T-score (df)
Summated score for 'Workload Effect on Ability to Take Breaks' scale (n = 115)	4.18 (1.71)	4.13 (1.92)	0.15 (113)
Average number of prescriptions per day at site (n = 115)	260.82 (123.21)	209.21 (98.85)	2.42* (113)
Prescriptions per day per dispensing staff (n = 114 [b])	52.19 (16.10)	50.81 (14.07)	0.47 (112)
Prescriptions per day per pharmacist (n = 114 [b])	146.58 (54.57)	132.35 (45.83)	1.46 (112)
Percent prescriptions dispensed for all third party patients (n = 112 [b])	86.80 (7.02)	86.64 (9.55)	0.10 (110)
Support staff			
	Mean (SD)		T-score (df)
Number of technicians per 100 prescriptions (n = 114 [b])	1.31 (0.63)	1.32 (0.82)	-0.08 (112)
Number of support staff per 100 prescriptions (n = 114 [b])	1.33 (0.64)	1.33 (0.82)	-0.00 (112)
Technology			
	Mean (SD)		T-score (df)
Number of dispensing aiding technologies at the site (n = 114 [b])	2.03 (1.08)	1.29 (1.18)	3.24* (112)
Work Activities			
	Mean (SD)		T-score (df)
Percent of time spent by pharmacists in consultation (n = 114 [b])	35.16 (18.33)	33.63 (17.64)	0.43 (112)
Percent of time spent by pharmacists in medication dispensing (n = 114 [b])	41.71 (21.70)	42.46 (23.49)	-0.17 (112)

Variable	Vacancy	No vacancy	
Work Activities			
	N (%)		Chi-square (df)
Whether any Patient-care service or DSM program is offered (n = 114 [b])			
Yes	21 (55.3)	44 (57.9)	0.07 (1)
No	17 (44.7)	32 (42.1)	
Number of Patient-care services or DSM programs offered (n = 64 [c])			
1 or 2	5 (23.8)	23 (53.5)	5.05* (1)
3 or more	16 (76.2)	20 (46.5)	
Time scheduled for provision of PCS or DSM (n = 62 [c])			0.52 (1)
Yes	3 (15)	4 (9.5)	
No	17 (85)	38 (90.5)	
Majority of PCS or DSM provision when at least 2 pharmacists on duty (n = 62 [c])			
Yes	12 (60)	28 (66.7)	0.26 (1)
No	8 (40)	14 (33.3)	
Pharmacy paid for PCS or DSM (n = 62 [c])			
Yes	6 (30)	12 (28.6)	0.01 (1)
No	14 (70)	30 (71.4)	
	Mean (SD)		T-score (df)
Hours spent per week per pharmacy in providing PCS or DSM (n = 60 [c])	9.07 (7.30)	7.24 (8.30)	0.84 (58)
Required pharmacists			
	Mean (SD)		T-score (df)
Total number of pharmacists required in terms of FTEs (n = 115)	3.06 (1.06)	1.92 (0.86)	6.20** (113)
Work Environment / Culture			
	Mean (SD)		T-score (df)
Score on 'Level of input of staff pharmacists in pharmacy operations' scale (n = 109 [b])	13.06 (3.23)	13.85 (3.51)	-1.12 (107)
Score on 'Level of input of staff pharmacists in determining their professional role' scale (n = 109 [b])	4.03 (1.18)	4.22 (1.02)	-0.85 (107)

Variable	Vacancy	No vacancy	
Work Culture			
	Mean (SD)		T-score (df)
Score on 'Emphasis of site on people' scale (n = 111 [b])	10.89 (2.33)	11.22 (2.25)	-0.71 (109)
Score on 'Emphasis of site on business' scale(n = 111 [b])	4.66 (1.19)	4.47 (1.06)	0.87 (109)
Score on 'Innovativeness of Site' scale (n = 115)	12.39 (2.86)	12.05 (2.94)	0.59 (113)
Score on 'Communication at the Site' scale (n = 114 [b])	14.84 (3.11)	15.26 (2.71)	-0.74 (112)
Score on 'Service Orientation' scale (n = 115)	9.97 (2.40)	10.53 (2.50)	-1.14 (113)
Score on 'Dispensing Orientation' scale (n = 115)	5.87 (2.0)	5.91 (2.19)	-0.10 (113)
Score on 'Overall Pharmacist Satisfaction' scale (n = 115)	7.55 (1.54)	8.09 (1.41)	-1.87 (113)

a. All percentages in this table are column percentages
b. The 'n' for this analysis is less than 115 due to missing data
c. These analyses were conducted on the respondent sites (n = 65) that offered any patient-care service or DSM program currently. The 'n' may further vary from 65 due to missing data.

** $p < 0.01$, two-tailed test
* $p < 0.05$, two-tailed test

Finally, variables related to the external environment of a pharmacy were compared between sites with and without vacancy (Table 17). Sites with and without vacancies were not found to be significantly different across any of the variables related to external factors.

Table 17
A comparison between sites with or without vacancy on external variables

Variable	Vacancy	No vacancy	
	Mean (SD)		T-score (df)
1. Population of county (n = 115)	50,683 (22,550)	45,603 (25,202)	1.05 (113)
2. Population per pharmacist (n = 115)	1,644 (990)	1,536 (403)	0.83 (113)
3. Population per pharmacy (n = 115)	4,103 (1226)	3,853 (1,024)	1.15 (113)
4. Population per physician (n = 115)	1,476.23 (986.45)	2,058.20 (1,875.40)	-1.79 (113)
5. Senior population of county (n = 115)	7,598 (3,116)	6,807 (3,184)	1.26 (113)
6. Seniors per pharmacist (n = 115)	264 (212)	242 (73)	0.84 (113)
7. Seniors per pharmacy (n = 115)	632 (215)	598 (143)	1.01 (113)
8. Seniors per physician (n = 115)	235.59 (170.65)	332.50 (370.58)	-1.5 (113)
9. Pharmacists per pharmacy (n = 115)	2.83 (1.02)	2.62 (0.77)	1.18 (113)
10. Percent population of county comprised of seniors (n = 115)	15.6 (2.4)	15.8 (2.5)	-0.52 (113)
11. Per capita income of county (n = 115)	$18,791 (1,311)	$18,555 (1,634)	0.77 (113)
	N (%) [a]		Chi-square (df)
12. Level of rurality of the county (n = 115)			
Less rural (RUCC = 4-6)	31 (81.58)	56 (72.73)	1.08 (1)
More rural (RUCC = 7-9)	7 (18.42)	21 (27.27)	

a. All percentages are column percentages

Based on the results of bivariate analyses described above, Table 18 gives a summary of the proposed study hypotheses that were supported by the results. There was support for hypotheses # 2, 4, 6, 9, 15, 19, and 24. These hypotheses relate to the differences between sites with and without vacancy on gross hourly wage for most recently hired pharmacist, level of difficulty for staff pharmacists to take planned time off for vacation, hours of operation for the prescription department on Saturdays, average number of prescriptions dispensed per day at a site, number of dispensing aiding technologies at a site, number of PCS or DSM programs offered at a site, total number of pharmacists in terms of FTEs required by a site.

Table 18
Summary of results for hypothesis testing

Study Hypotheses Proposed	Results [a]
INTERNAL FACTORS	
Compensation	
H1: Whether or not a sign-on bonus was given to the most recently hired pharmacist has no association with the presence of pharmacist vacancy at the site.	N.S.
H2: Gross hourly wage for the most recently hired pharmacist has no association with the presence of pharmacist vacancy at the site.	+
Work Schedule	
H3: Requirement for all staff pharmacists to work on weekends has no association with the presence of pharmacist vacancy at the site.	N.S.
H4: Level of difficulty for a staff pharmacist to take planned time off for vacation has no association with the presence of pharmacist vacancy at the site.	+
H5: Hours of operation for the prescription department on weekdays has no association with the presence of pharmacist vacancy at the site.	N.S.
H6: Hours of operation for the prescription department on Saturdays has no association with the presence of pharmacist vacancy at the site.	+
H7: Hours of operation for the prescription department on Sundays has no association with the presence of pharmacist vacancy at the site.	N.S.
Workload	
H8: Score on the 'Workload Effect on Ability to Take Breaks' scale has no association with the presence of pharmacist vacancy at the site.	N.S.
H9: Average number of prescriptions dispensed per day at a site has no association with the presence of pharmacist vacancy at the site.	+
H10: Prescriptions dispensed per day per dispensing staff (certified and non-certified technicians, residents, and interns) at a site has no association with the presence of pharmacist vacancy at the site.	N.S.
H11: Prescriptions dispensed per day per pharmacist at a site has no association with the presence of pharmacist vacancy at the site.	N.S.
H12: Proportion of prescriptions dispensed per day for all third party patients has no association with the presence of pharmacist vacancy at the site.	N.S.

Study Hypotheses Proposed	Results [a]
Support Staff	
H13: Number of technicians per 100 prescriptions dispensed at a site has no association with the presence of pharmacist vacancy at the site.	N.S.
H14: Number of support staff (certified and non-certified technicians, residents, and interns) per 100 prescriptions dispensed at a site has no association with the presence of pharmacist vacancy at the site.	N.S.
Technology	
H15: Number of dispensing aiding technologies at a site has no association with the presence of pharmacist vacancy at the site.	+
Work Activities	
H16: Proportion of time spent by pharmacists at a site in patient consultation has no association with the presence of pharmacist vacancy at the site.	N.S.
H17: Proportion of time spent by pharmacists in medication dispensing has no association with the presence of pharmacist vacancy at the site.	N.S.
H18: Whether any patient-care service (PCS) or disease state management (DSM) program is offered at a site has no association with the presence of pharmacist vacancy at the site.	N.S.
H19: Number of PCS or DSM programs offered at a site has no association with the presence of pharmacist vacancy at the site.	+
H20: Whether or not pharmacist time is scheduled for provision of PCS or DSM has no association with the presence of pharmacist vacancy at the site.	N.S.
H21: Whether or not majority of PCS or DSM provision takes place when at least 2 pharmacists are on duty has no association with the presence of pharmacist vacancy at the site.	N.S.
H22: Whether or not a pharmacy is paid for PCS or DSM has no association with the presence of pharmacist vacancy at the site.	N.S.
H23: Pharmacist hours spent per week at a site in providing PCS or DSM has no association with the presence of pharmacist vacancy at the site.	N.S.
Required Pharmacists	
H24: Total number of pharmacists in terms of FTEs required by a site has no association with the presence of pharmacist vacancy at the site.	+

Study Hypotheses Proposed	Results [a]
EXTERNAL FACTORS	
H25: Population of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H26: Population per pharmacist ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H27: Population per pharmacy ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H28: Population per physician ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H29: Senior population of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H30: Seniors per pharmacist ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H31: Seniors per pharmacy ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H32: Seniors per physician ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H33: Pharmacists per pharmacy ratio for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H34: Proportion of population that is comprised of seniors for the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H35: Per capita income of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.
H36: Level of rurality of the county in which a site is located has no association with the presence of pharmacist vacancy at the site.	N.S.

a. N.S. = Non-significant test; do not reject the null hypothesis

+ = Significant test; reject null hypothesis. Positive association.

Multivariate Analyses

The next phase of the data analysis was to analyze logistic regression models predicting the presence or absence of a vacant pharmacist position at a pharmacy site. These models allow an assessment of the association of an independent variable with the dependent variable (vacancy or no vacancy) when it is taken in context of all other factors that are hypothesized to be associated with the outcome. This is contrasted with the bivariate analysis that considers only the association of a particular independent variable with the dependent variable. Only those independent variables that were found to be significantly different between sites with and without vacancy in bivariate analyses were included in the multivariate models. This was done in order to improve the power of the analysis, especially keeping in mind the relatively small sample size for running these models. In addition, setting was included as an independent variable in the model since it has historically been associated with vacancy rates.

To start the model estimation, a zero-order correlation matrix for all independent variables that were being employed in the multivariate models was evaluated. As stated earlier, these included only those variables that were shown to be statistically significant during bivariate analyses and setting. The correlation matrix is displayed in Table 19. The correlation matrix was analyzed for strong correlations between variables, which might suggest signs of possible multi-collinearity problems.

One potential problem was that the correlation between "Total Pharmacist FTEs required" and "Average number of prescriptions per day" was very high (0.72). A mechanism to overcome this potential problem would be to drop one of the variables from the model since both are measuring a similar attribute. A logical reason for this high

correlation is that the total number of pharmacist FTEs required at a site will be driven, to a large extent, by the volume of prescriptions that a pharmacy dispenses per day since most pharmacists spend a majority of their time dispensing prescriptions. However, the number of pharmacist FTEs required at a site is also reflective of other characteristics of the site, such as provision of PCS or DSM programs, time devoted by pharmacists to dispensing vs. other functions, etc. Hence, it was decided to drop the "Average number of prescriptions per day" variable in favor of the FTE requirement variable since it was believed to be more reflective of a pharmacy's internal environment.

Table 20 shows the results of the logistic regression model predicting the presence or absence of pharmacist vacancy at a site. The total pharmacist FTEs required by a site significantly predicts the presence of pharmacist vacancy at the site. Higher pharmacist FTE requirement at a site significantly increased the odds of a pharmacist vacancy at the site.

Table 19
Correlation matrix for individual level variables employed in multivariate analyses

	Total Pharmacist FTEs required	Gross hourly wage	Hours of operation on Saturdays	Easy or very easy to take planned time off for vacation
Gross hourly wage	.03			
Hours of operation on Saturdays	.48 **	.12		
Easy or very easy to take planned time off for vacation	.08	-.18	.13	
Average number of prescriptions per day	.72 **	.08	.39 **	.12
Number of dispensing related technologies	.30 **	.23 *	.28 **	-.05
Three or more PCS or DSM offered	.15	.14	.03	-.01
Independent setting	.07	-.29 **	-.24 **	.19 *

** $p < 0.01$, two-tailed test
* $p < 0.05$, two-tailed test

	Average number of prescriptions per day	Number of dispensing related technologies	Three or more PCS or DSM offered
Number of dispensing related technologies	.33 **		
Three or more PCS or DSM offered	.16	.25 **	
Independent setting	.15	-.24 *	.06

** $p < 0.01$, two-tailed test
* $p < 0.05$, two-tailed test

Table 20
Logistic Regression results for likelihood of having a vacant pharmacist position at a pharmacy (n = 104)

Variable [a]	Wald Statistic	p-value	Odds Ratio Exp (B)	95% Confidence Interval for Odds ratio
Total Pharmacist FTEs required	15.83	0.00**	4.25	2.06 – 8.68
Gross hourly wage	1.99	0.16	1.09	0.97 – 1.23
Hours of operation on Saturdays	0.00	0.96	0.99	0.78 – 1.26
Easy or very easy to take planned time off for vacation [a]	2.37	0.12	0.41	0.13 – 1.28
Number of dispensing related technologies	0.35	0.55	1.16	0.72 – 1.86
Three or more PCS or DSM offered [a]	0.42	0.52	1.44	0.48 – 4.36
Independent setting [a]	1.43	0.23	0.44	0.12 – 1.69

a. Three independent variables were entered in the model as categorical variables. The reference categories for these variables were: "difficult or very difficult to take planned time off for vacation", "two or less PCS or DSM offered", and "chain/mass merchandiser or supermarket setting".

** $p < 0.01$, two-tailed test

V. DISCUSSION

The discussion and interpretation of the results of this study are presented in this chapter. This chapter will begin with a discussion of the results as they pertain to specific objectives of the study, followed by suggestions for improvement in the theoretical model that was proposed. The implications of the results for future research will be discussed next. This will be followed by a discussion of the limitations of the study.

Explanation of Results

Objective 1a: Measure the unmet demand for pharmacists

Of the non-metropolitan pharmacy key informants that responded to the survey, 33% reported having a current vacancy. To the best of the author's knowledge, this is the first report of the actual proportion of pharmacies in the state (albeit, a sub-section of all pharmacies) that have a vacancy. Very interestingly, when data from all participation forms were used, it was found that only 23.8% pharmacy sites reported having a vacancy. These differences in vacancy rates were not found to be attributable to non-response bias. The different vacancy rates were due to change in the vacancy situation at sites from the time they responded to the participation form to the time they responded to the main survey form. This change in vacancy rates in such a short period highlights the dynamic nature of vacant pharmacist positions and underscores the importance of collecting such data on a regular basis.

For those pharmacies reporting a vacancy (n = 38), the mean number of vacant pharmacist positions in terms of FTEs was 0.89. This means that within the 115 pharmacies that responded, a total of 33.82 (38 * .89) FTE pharmacist positions were vacant. Extrapolating this number for all the 279 non-metropolitan community pharmacies in Wisconsin that were sampled, we get a total of 82 (279 * 33.82 / 115) vacant FTE pharmacist positions. Non-metropolitan community pharmacies form only a small proportion (approximately 23 %) of all pharmacies in the state. We currently do not have information about vacancy rates in metropolitan pharmacies; hence it would be difficult to predict the total shortfall of pharmacists that the state faces. However, assuming similar vacancy rates across all pharmacies, it is estimated that the state-level shortfall could be over 350 (82 * 100 / 23) FTE pharmacists.

The pattern of in-migration and out-migration of pharmacists will play an important role in determining how many pharmacists are actually needed. Although it's not feasible or advisable for a school of pharmacy to expand their class size to 350, these numbers may be helpful for members of the UW School of Pharmacy Admissions Committee in trying to determine the number of students to be admitted for the doctor of pharmacy program.

Another useful piece of information that can be extracted from these data is the percent of FTE positions available that are vacant. Overall, there were 264.62 FTE positions available within the 115 pharmacies that responded. Of these, 33.82 FTE positions were vacant. Thus, 12.8% of all FTE positions available for the respondent sites were vacant. Looking at the trend in this number over a period of time will give a good sense of whether the pharmacist shortage situation is improving or deteriorating. In 2004, the Wisconsin Hospital Association reported a 2.6% vacancy rate for hospital pharmacists

statewide (Wisconsin Hospital Association, 2004). The vacancy rate seen in our sample may be higher because only non-metropolitan, community pharmacies were considered. A sample of all the pharmacies in the state will provide a clearer picture of why these differences arise.

Objective 1b: Describe the unmet demand for pharmacists

Sites with vacancy were more likely to have pharmacist(s) that left within the past 12 months as compared to sites without a vacancy. Also, sites with vacancy had significantly higher *number* of pharmacists that left within the past 12 months and took significantly more time to hire a pharmacist since the availability of a position. Thus, both turnover and time taken to hire were shown to be related with presence of a vacancy. Literature shows that turnover at pharmacy sites can be reduced by improving job satisfaction of pharmacists through improvement of their work environment (Cooper & Brown, 1986; Schulz, 1993). However, results from this study proved inconclusive in this regard for 2 reasons: (1) none of the factors related to work environment or work culture of a site proved significantly different across sites with and without vacancy, and (2) only 16% of all pharmacists who left within the past 12 months reportedly left primarily because of some negative aspect of the site. In fact, over half (54.5%) of the pharmacists who left within the past 12 months, left for a reason that had absolutely no connection to the site (e.g. retired or deceased = 13.6%, relocated or family-related reason = 31.8%, internal transfer = 9.1%). Results of this study support the conclusion that reducing turnover at a site may make it less likely to have a vacancy; but reducing turnover may be difficult.

Almost 28% of pharmacies reported hiring new pharmacist(s) during the past 12 months. Also, for those pharmacies that did hire new pharmacist(s) during the past 12

months, 43.8% reportedly took between 1 and 6 months to hire the new pharmacist, while 9.4% and 18.8% took between 6 and 12 months and over 12 months, respectively, to hire the new pharmacist since the position became available. This suggests that several pharmacies are going short-staffed for extended periods of time. The relatively high number of pharmacies faced with a vacant pharmacist position, coupled with the prolonged period required by some sites to find a new pharmacist, adds detail to the shortage picture in non-metropolitan Wisconsin counties.

Objective 2: Internal pharmacy characteristics

The second objective of the study was to explore internal pharmacy characteristics that are related to the unmet demand for pharmacists at a site. Based on the conceptual model, the internal characteristics for a pharmacy were divided into three domains i.e. (a) Pharmacist compensation and benefits (b) Work aspects (c) Work environment / culture.

(i) Pharmacist compensation and benefits

Sites with and without pharmacist vacancy were significantly different with respect to the gross hourly wage given to the most recently hired pharmacist. However, gross hourly wage was not found to be a significant predictor of vacancy in the multivariate model. Sites with vacancy had a *higher* mean hourly wage for their most recently hired pharmacist. Although not statistically significantly, a greater proportion of sites with vacancy (47.1%) reported giving a sign-on bonus to the most recently hired pharmacist as compared to sites without vacancy (29.2%).

This was a very interesting finding because it was somewhat contradictory to what was hypothesized by the researcher based on the literature review. There is evidence that the pharmacy market is willing to pay a wage rate that is at or above the current wage rate

to attract new pharmacists (Hansen et al., 2001). A randomized survey of licensed pharmacists in four states showed that salary had the second highest mean rank as a reason for pharmacists leaving their job (Mott, 2000). This might suggest that those sites which cannot afford to offer attractive compensation packages to their pharmacists are at a disadvantage when it comes to either retaining old staff or recruiting new staff. Contrary to this argument, the study found that sites without a vacant pharmacist position actually paid a *lower* mean hourly wage to their most recently hired pharmacist.

The effect of wage on vacancy may be confounded by a site's setting. Though not statistically significant, independent pharmacies had a lower vacancy rate (25.5%) compared to other settings (38.2%) i.e. Chain, Mass Merchandiser (MM), and Supermarket (SM). Independent settings also have a significantly lower mean hourly wage ($ 43.69) as compared to other settings ($47.25). Thus, independent pharmacies, which are typically associated with low hourly wages, also have low vacancy rates as compared to other settings. Multivariate analyses showed that gross hourly wage was not a significant predictor of vacancy when setting was included in the model. This lends support to the argument that the effect of wage on vacancy may be confounded by setting.

(ii) Work aspects

Work Schedule

As might be expected, key informants reported that pharmacists in sites with vacancy were more likely to find it "difficult" or "very difficult" to take planned time off for a vacation. This factor can be hypothesized to work in a cyclic fashion. Having vacancy (and thus being short-staffed) would make it difficult for pharmacists at the site to schedule

a vacation. Difficulty in scheduling a vacation might make a site less attractive for pharmacists to work and could make them more likely to leave, thus aggravating the vacancy situation at the site. Sites with and without vacancy were not different in their requirements for staff pharmacists to work on weekends. More than 70% of all pharmacies required their staff pharmacists to work on weekends. Similarly, sites with and without vacancy were not different with respect to hours of operation for the prescription department per weekday. Also, there were no differences observed when sites were compared on the basis of whether or not the prescription department was open on Sundays. However, sites with vacancy had significantly longer hours of operation on Saturdays as compared to the no vacancy sites. This suggests that pharmacists may not prefer to work long hours on weekends and sites that are open for longer hours on weekends find it harder to recruit and retain pharmacists. Given the relatively high income of pharmacists, it is logical to think that they value the free time on weekends more than the marginal extra earning accrued by working long hours on weekends.

Workload

Sites with vacancy dispensed significantly more prescriptions per day on average as compared to sites without vacancy. However, sites with vacancy did not dispense significantly higher number of prescriptions per day *per pharmacist* or prescriptions per day *per dispensing staff* (pharmacists + certified technicians + non-certified technicians + residents + interns). This seems to suggest that sites with and without vacancy do not differ in terms of prescription-related workload for their pharmacists.

If we looked at prescriptions per *required* pharmacist rather than just looking at prescriptions per employed pharmacist, it may give us an idea about the kind of prescription

workload that pharmacy sites are expecting their pharmacists to have *if* they are able to recruit all the FTE positions that are vacant. For this, the number of required *pharmacist FTEs* was converted into the number of required *pharmacists*. In our sample, 230.87 FTEs employed represented 297 actual pharmacists. Thus each FTE position was represented by 1.3 pharmacists. Using this number, we converted required FTEs to required pharmacists for each site and then calculated the prescriptions per required pharmacist for each site.

The mean number of prescriptions per required pharmacist per day for our sample was 80.10 prescriptions. The North Carolina Board of Pharmacy has proposed 150 prescriptions per pharmacist per day as a threshold for the number of prescriptions that can be dispensed safely by a pharmacist without increasing the probability of a medication error (North Carolina Board of Pharmacy, 1997). If a medication error occurs at any North Carolina pharmacy where more than 150 prescriptions per pharmacist per day were dispensed on that day, then the pharmacist can be cited for disciplinary proceedings by the Board. This number was determined by averaging 10 to 20 prescriptions per hour over a 6 to 12 hour work day for a pharmacist [(10*6 + 20*12) / 2].

One reason that the number of prescriptions per required pharmacist per day in our sample was much less could be that the role of a community pharmacist has evolved in the 9 years since this number was proposed by the North Carolina Board. Pharmacists may be expected to spend more time solving patient medication issues or insurance coverage issues, which slow down the process of dispensing. At the very least, this study shows that the threshold number of prescriptions per pharmacist per day proposed by the North Carolina Board in 1997 needs to be revisited and possibly, revised.

Table 21 shows the mean number of prescriptions per required pharmacist per day for sites in various categories that might be expected to have differences in requirement. Prescriptions per day per required pharmacist are not significantly different across sites with low vs. high volume of prescriptions, nor are they different across sites with no PCS/DSM, 1 or 2 PCS/DSM, and 3 or more PCS/DSM. However, sites with vacancy had a significantly lower mean for prescriptions per required pharmacist per day (65.4 prescriptions) as compared to sites without vacancy (87.3 prescriptions). That leads us to a very interesting question of whether sites with vacancy are essentially trying to overstaff their pharmacies. In other words, are vacant FTE positions at these sites over-estimated due to an expectation for their pharmacists to fill fewer prescriptions? It is possible, however, that the lower prescription workload aimed for, is to compensate for the time that pharmacists spend doing other activities such as patient care services and DSM programs. Multivariate analyses to examine these relationships are beyond the scope of this thesis' objectives and are planned for the future.

Table 21
Mean number of prescriptions per required pharmacist per day

Categories of pharmacy sites	Prescriptions per required pharmacist per day	
	Mean	Std. Dev.
All respondent sites (n = 115)	80.10	31.24
Sites with vacancy (n = 38)	65.4 [a]	23.1
Sites without vacancy (n = 77)	87.3 [a]	32.3
Low volume (up to 300 prescriptions per day) pharmacies (n = 96)	77.89 [b]	32.10
High volume (more than 300 prescriptions per day) pharmacies (n = 19)	91.26 [b]	24.19
No PCS or DSM sites (n = 49)	80.49 [c]	33.38
1 or 2 PCS or DSM sites (n = 28)	81.05 [c]	30.70
3 or more PCS or DSM sites (n = 36)	80.07 [c]	29.89

a. t-test; $t(113) = -3.74$, $p < 0.001$.
b. t-test; $t(113) = -1.72$, $p = 0.09$.
c. ANOVA; $F(2,110) = 0.01$, $p = 0.99$.

FTE pharmacists required

Sites with vacancy had a significantly greater requirement for pharmacists in terms of FTEs than sites without vacancy. This variable was also the only significant predictor of vacancy at a site in a multivariate model that included several predictor variables that were associated with vacancy in bivariate analyses. Sites that had a higher requirement for pharmacists, given the site's level of work scheduling, work load, support staff, technology, and work activities, find it harder to recruit for the extra positions than they would if they had a lower requirement.

Among the internal factors, FTE requirement of a site was significantly correlated with the site's prescription volume i.e. average number of prescriptions dispensed per day ($r = 0.72$), hours of operation on Saturdays ($r = 0.48$), and number of PCS and DSM offered ($r = 0.23$). All these variables were shown to be significantly different across sites with and without pharmacist vacancy. In short, sites with a high prescription volume, more services, and longer hours of operation on Saturdays have a greater demand for pharmacists (i.e. high requirement) and hence, are more likely to face a vacancy.

Table 22 shows the mean hours of operation, PCS/DSM offered and prescription volume, split by FTE requirement. There is a very clear trend that sites with higher FTE requirement have longer hours of operation, higher prescription volume, and offer more number of PCS/DSM. Analysis of Variance showed that hours of operation on weekdays, Saturdays, and Sundays, total hours of operation in a week, number of PCS/DSM provided, and numbers of prescriptions dispensed per day are significantly different across the various categories of FTE requirement.

Among external factors, FTE requirement of a site was significantly negatively correlated (r = -0.21) with the RUCC for the county in which the site was located. In other words, FTE requirement of a site is likely to decrease as the rurality of a site's location increases i.e. high FTE requirement is more likely to be prevalent in less rural (or more urban) areas. Also, FTE requirement of a site was significantly correlated (r = 0.21) with the population per pharmacy ratio of the site's county. In other words, for a given number of pharmacies in a county, as the population of the county increases, the FTE requirement of the pharmacies in the county is likely to increase i.e. high FTE requirement is more likely to be prevalent at sites in counties which have fewer pharmacies as compared to the total population.

Among sites that had no vacancy, FTE requirement ranged from 1.0 to 4.0 (mean of 1.9); where as, among sites with vacancy, FTE requirement ranged from 1.35 to 5.60 (mean of 3.1). No site with an FTE requirement below 1.35 had a vacancy (n=30); where as, all sites with an FTE requirement greater than 4.0 had a vacancy (n=6).

Table 22
Hours of operation, number of PCS/DSM, and prescription volume, split by FTE requirement of site

	FTE Requirement				
	Up to1.0 FTE (n = 18)	1.1 to 2.0 FTE (n = 43)	2.1 to 3.0 FTE (n = 33)	3.1 to 4.0 FTE (n = 15)	Greater than 4.0 FTE (n = 6)
Mean hours of operation on weekdays [a]	8.9	9.5	10.7	10.9	11.0
Mean hours of operation on Saturdays [b]	2.9	5.7	7.7	7.8	7.1
Mean hours of operation on Sundays [c]	0.9	1.0	3.4	3.1	4.0
Total mean hours of operation in a week [d]	12.7	16.1	21.7	21.7	22.1
Mean number of PCS/DSM provided [e]	1.1	1.7	2.4	2.5	3.5
Average number of prescriptions dispensed per day [f]	140	172	262	337	398

a. ANOVA; $F(4,110) = 8.67$, $p < 0.001$
b. ANOVA; $F(4,110) = 12.34$, $p < 0.001$
c. ANOVA; $F(4,110) = 4.56$, $p < 0.01$
d. ANOVA; $F(4,110) = 9.58$, $p < 0.001$
e. ANOVA; $F(4,110) = 3.86$, $p < 0.05$
f. ANOVA; $F(4,110) = 25.63$, $p < 0.001$

Support staff

As expected from the workload related results, sites with and without vacancy did not differ either in terms of the number of technicians per 100 prescriptions, or in terms of the number of support staff per 100 prescriptions (support staff included certified and non-certified technicians, interns, and residents).

Technology

Sites with vacancy had a significantly higher number of dispensing aiding technologies at their site. These technologies included automated dispensing system, automated patient refill-request system, bar coding for prescriptions, table / capsule counter, and electronic prescription order system. It was hypothesized by the researcher that sites with lower numbers of dispensing aiding technologies may place a higher workload on their pharmacists and thus make them more likely to have a vacancy because of negative workload effect. However, the result turned out to be contradictory to the hypothesis. On the other hand, this result is consistent with the finding that sites with a vacancy were more likely to be busier places with higher numbers of prescriptions dispensed per day. The number of dispensing related technologies at a site was correlated at 0.33 (significant at alpha of 0.01) with the average number of prescriptions dispensed at a site per day. Thus, it fits with the theme that the busier a pharmacy, the more likely it is to have a vacancy.

Work Activities

Sites with and without vacancies were not significantly different in terms of the percent time spent by their pharmacists in consultation or medication dispensing. Assuming pharmacists want to spend less time in dispensing and more time in consultation (Schommer, Pedersen, Doucette, Gaither, & Mott, 2002), sites with and without vacancy

were no different in allowing their pharmacists to do that. Sites with and without vacancy were not different as far as offering any patient care services or disease state management (DSM) programs. Interestingly, however, sites with a vacancy were more likely to offer 3 or more patient care services or DSM programs as compared to sites without a vacancy. Again, this is very consistent with the previous results which showed that the busier a site (higher prescription volume), the more likely it is to have a vacancy. Results in this case suggest that sites which offer higher number of patient care services or DSM programs (3 or more) need more pharmacists to provide these services and hence, are more likely to have a vacancy.

It was hypothesized that sites which provide services or programs at a higher level are more likely to provide a desirable work environment for pharmacists and hence less likely to have a vacancy. The level at which these services or programs are provided was measured using four variables, namely (a) whether a specific time is scheduled for such activities (b) whether majority of such activities are carried out when there are at least 2 pharmacists on duty (c) whether the site is paid for such activities, and (d) hours spent per week per pharmacy in such activities. Sites with and without vacancies were found to be no different in the level of provision of PCS/DSM as measured by these four variables.

(iii) Work Culture

Several variables reflecting the work culture of a pharmacy site were measured. These included: (1) level of input of staff pharmacists in the professional role played by them as well as in the prescription department operations, (2) emphasis of the site on people, innovation, and business, (3) innovativeness of the site, (4) orientation of the site

toward dispensing or service provision, and (5) communication between staff and management at the site. Sites with and without vacancy were not found to be significantly different on any of the variables measured under this domain.

It was hypothesized by the researcher that the current situation of pharmacist shortage would empower practicing pharmacists in a way that they could choose to work in sites that have a positive work culture. Thus, it was reasoned that sites with attributes such as low input of pharmacists, and poor communication with management would be more likely to have a vacancy. However, it was found that culture of the site had no association with the presence or absence of vacancy at the site.

One reason for this could be that pharmacists in non-metropolitan areas might give more importance to other factors in determining where to work. Pharmacies in some non-metropolitan counties are very sparsely distributed. There are only a few sites in some counties, and these too may be separated by a long distance. In such circumstances, it might be more important for the pharmacists to work in a site that is closest to their home or the place where their spouse is working. In such cases, the work culture of a site may not be an important factor for pharmacists to consider in their decision to work at the site.

Objective 3: External pharmacy characteristics

The third objective of the study was to explore external pharmacy characteristics that might be associated with the unmet demand for pharmacists at a site. These were variables measured at the county level and were mostly concerned with the population, population characteristics, number of pharmacies and number of pharmacists within the county in which the pharmacy was located. It was hypothesized that such characteristics of the market in which the site operated might influence the level of unmet demand for

pharmacists. None of the external variables measured at the county level including population, population per pharmacist, population per pharmacy, population per physician, senior population (≥ 65), seniors per pharmacist, seniors per pharmacy, seniors per physician, pharmacists per pharmacy, percent population comprised of seniors, and per capita income were found to have a significantly different mean across sites with and without vacancy. Sites with vacancy were also not found to be any less or more likely to be in a more rural area.

Previous literature suggests that the pharmacist shortage is likely to be more severe in areas with higher population, possibly because of greater demand for prescription drugs. However, we have a specific subset of pharmacies; namely, ones that are located in non-metropolitan counties, which are at the lower end of the population spectrum. In this sample, we did not find any differences in unmet demand by population or population characteristics. That might be the case because, at lower levels of population, the unmet demand for pharmacists might be unaffected by variation in population size or characteristics of the population. We might have seen a difference had our sample included pharmacies from all counties in Wisconsin, including sites in metropolitan counties (which typically have much higher populations).

Since pharmacist FTE requirement proved to be a significant predictor of vacancy in the multivariate model, correlations of external variables with pharmacist FTE requirement were explored to identify external factors that might be related to the pharmacist FTE requirement of a site. Though not significant, total FTE requirement of a site was found to have a mild positive correlation with population of the county (0.15), senior population of county (0.16), and per capita income of the county (0.14). However, the FTE requirement

of a site did show a significant negative correlation (-0.21) with the USDA-RUCC of the county in which the pharmacy was located and a significant positive correlation (0.21) with the population per pharmacy ratio of the site's county. This is consistent with the result that as the rurality of a county increases, the population per pharmacy ratio for the county decreases (r = -0.42). Thus, we can conclude from these results that the less rural (i.e. more urban) a place, the more likely it is to have a higher population per pharmacy ratio, and a higher pharmacist FTE requirement, which, in turn, was significantly associated with pharmacist vacancy.

Improvements in Theoretical Model

Based on the results, the conceptual model used for this study was evaluated to determine whether any changes would be necessary to conduct similar research in the future. Pharmacist compensation in terms of gross hourly wage was significantly different across sites with and without vacancy, although the direction of association was contrary to what was expected by the researcher. As demonstrated earlier, this effect of wage on vacancy was probably confounded by setting. In the future, compensation may turn out to be a particularly important variable in a study that includes both metropolitan and non-metropolitan pharmacies. Rural areas (which form one extreme of the non-metropolitan continuum) are typically known to offer lower wages than metropolitan areas. It would be interesting to explore whether metropolitan pharmacies are using higher compensation to attract pharmacists away from non-metropolitan areas.

Several of the variables measured as part of work aspects of the pharmacy were shown to be significantly associated with vacancy. Probably, the most important finding

from the study was that the FTE pharmacist requirement of a site was the strongest predictor of whether or not there was a vacancy at the site. Since this variable can be logically assumed to be a reflection of the various work related aspects of the site, it can be used as a summary measure in the future when brevity of the instrument is important.

None of the work culture variables were shown to be significantly associated with vacancy. There is some past research on the importance of these variables in pharmacists' decision-making process about where to work. Hence, it is recommended that they be continued in the model until repeatedly shown to be unassociated with vacancy. Also, there is some reason to expect that they might prove to be better at predicting vacancy in metropolitan pharmacies, where different factors might be at work.

Again, it was a little surprising that none of the external factors were shown to be associated with vacancy. There is good theoretical reasoning behind why some of them may be important predictors of vacancy, and hence they must be explored further before discarding. There is empirical evidence from past research which shows that demand for pharmacists is typically higher in high population places. It is necessary to test the hypothesis that unmet demand for pharmacists is also higher in high population areas, especially in a sample that includes metropolitan pharmacies. Although rurality and population per pharmacy did not prove to be significantly associated with vacancy, they were significantly correlated with the total pharmacist FTE requirement of a site. In this researcher's opinion, total population, population per pharmacy, and rurality are three important external variables that should definitely be included in future conceptual models studying unmet pharmacist demand.

Implications for Future Research

This study attempted to measure the unmet demand for pharmacists in non-metropolitan, community pharmacies in Wisconsin. Future projects will attempt to expand this study to metropolitan pharmacies as well as non-community pharmacies such as hospitals and clinics.

Other external variables that may influence the unmet demand of pharmacists (both supply and demand factors) can be included in future studies. Factors that may influence the demand for pharmacists include the number of prescriptions dispensed within a county, health of a county's population, the proportion of people in the county that have prescription drug coverage, etc. Factors that are generally known to influence families' decision to live in a particular place e.g. quality of school system, crime rate, etc. may influence a county's ability to maintain the required supply of pharmacists.

Pharmacist FTE requirement of a site proved to be a strong predictor of vacancy in this study. This idea has not been explored before. Future multivariate analyses using these data have been planned to help better understand factors that are associated with the pharmacist FTE requirement of a site.

One of the things that struck the researcher based on the comments in the survey was that there seems to be an increasing tendency for pharmacy managers to hire pharmacists from relief agencies on a semi-regular basis. This affects the way we think about pharmacists and pharmacy shortage in a couple of ways. First, some pharmacists may be working for these relief agencies exclusively. Although they may work *in* community pharmacies, they may not be *hired by* community pharmacies; hence future surveys should reflect this by including extra categories to accommodate them. Secondly, some pharmacies

may report a vacancy, although they might be getting relief pharmacists to work for them fairly frequently, and hence may not be actively looking to fill the vacancy. This is very different from a pharmacy that is short-staffed due to a vacancy and is actively trying to recruit. Future studies should try and measure the extent to which this phenomenon has become common in community pharmacies.

Limitations

This research has limitations, as with all research, and those limitations must be kept in mind when interpreting the results. The data for this study were collected by surveying pharmacy managers. As a result, there may be potential for social desirability bias in reporting some aspects associated with their pharmacy or their pharmacists' work environment. In effect, the pharmacy managers may want their site to appear as better than it actually is. However, it was necessary to involve pharmacy managers in data collection efforts because information related to vacancy and compensation could only be obtained from someone in a managerial position.

Since the survey did not specifically ask about relief pharmacists working at the sites, it may be that some sites with vacant positions are using pharmacists from relief agencies on a regular basis to fill in until they find a permanent replacement. Future surveys may take this into account and ask about relief pharmacists working at pharmacy sites.

Compensation for staff pharmacists was measured only in terms of salary or wages and sign-on bonus. Other benefits such as annual bonus were not measured.

Another limitation deals with the generalizability of the study. Only community pharmacies in non-metropolitan counties of Wisconsin were included in the study. Hence,

these results should be interpreted with caution in a population that goes beyond these boundaries.

Also, the county level may or may not be the best level to measure the external variables. However, it gives a balanced picture of the location; going beyond the boundaries of a county gives too broad of a perspective to judge an individual site, where as, information on a level smaller than a county is harder to collect.

VI. CONCLUSIONS

The goals of this study were to measure and describe the level of unmet demand for pharmacists in non-metropolitan Wisconsin counties, and to explore internal and external pharmacy characteristics that are associated with the level of unmet pharmacist demand at a site. The study was conducted using a mailed survey sent to pharmacy managers of community pharmacies in non-metropolitan Wisconsin counties.

The results suggest that up to one-third of the respondent pharmacy sites had at least one vacant pharmacist position at the time the survey was completed. For the sites that hired a new pharmacist within the past 12 months, over 40% took between 1 and 6 months to hire the new pharmacist. Almost one-fifth of these sites that hired a pharmacist within the past 12 months took over a year to find the new pharmacist. The relatively high number of pharmacies faced with a vacant pharmacist position, coupled with the prolonged period required by some sites to find a new pharmacist, paints the picture of a serious pharmacist shortage in non-metropolitan Wisconsin counties.

Results show that sites that have a vacancy are more likely to dispense higher numbers of prescriptions per day, have longer hours of operation on Saturdays, offer three or more patient care services or disease management programs, and have a higher number of dispensing related technologies at the site. The sites with vacancy also are more likely to pay a higher gross hourly wage to their pharmacists and more likely to make it difficult or very difficult for their pharmacists to take planned time off for vacation. The results also show that the greater the number of pharmacist FTEs required at a site, the greater is the

possibility of having a pharmacist vacancy at the site. The high requirement of pharmacists may be due to higher prescription volume, more patient services provided, or longer hours of operation on weekends.

In this population of non-metropolitan pharmacies, none of the external factors measured including population, population per pharmacist, population per pharmacy, senior population, seniors per pharmacist, seniors per pharmacy, pharmacists per pharmacy, percent population comprised of seniors, and per capita income were shown to have a significant difference between sites with and without vacancy. However, results did show that the less rural (i.e. more urban) an area, the more likely it is to have a higher population per pharmacy ratio, and a higher pharmacist FTE requirement, which, in turn, was significantly associated with pharmacist vacancy. Thus, although not shown conclusively by this study's results, the role of rurality and population per pharmacy of a county in influencing pharmacist vacancy at a site should be considered in future studies.

Overall, it appears that for non-metropolitan, community pharmacies in Wisconsin, any change at the site that significantly increases the pharmacist FTE requirement for the site, is likely to increase the probability of a vacant pharmacist position at the site. Factors that typically affect pharmacist FTE requirement at a site include prescription volume, hours of operation, and number of patient care services provided. Pharmacy managers who are contemplating offering extra services or longer hours should examine whether they will be able to support such activities with a sufficient level of pharmacist staffing. Aging of the American population is likely to increase the demand for health care services in the future, and this may worsen the pharmacist shortage situation by increasing the requirement for pharmacists. Also, if the profession of pharmacy intends to move toward a more patient-

oriented practice, it will likely require a greater supply of pharmacy practioners in the state to support such an initiative.

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Appendix A:

Invitation Letter and Participation Form

University of Wisconsin-Madison
School of Pharmacy
Social and Administrative Sciences

777 Highland Ave
Madison, WI 53705-2222
608-265-9268

October, 2005

Dear Pharmacy Manager:

Wisconsin currently is facing an **imbalance between the supply and demand of registered pharmacists**. The demand for pharmacists is likely to increase in the future because of the aging patient population and the consequent increase in drug use. This is of special concern to pharmacy managers because of the **time spent and cost incurred in recruiting new pharmacists.** We are conducting a state-wide study to identify pharmacy site-specific factors that are associated with various levels of demand for pharmacists. Our goal is to estimate the current level of demand for pharmacists, identify areas in Wisconsin with the highest demand, and help pharmacy managers recruit and retain pharmacists.

Your help is needed. Your pharmacy was selected at random from the roster of all licensed pharmacies in Wisconsin. You were identified as the key informant for this pharmacy. **Whether or not your pharmacy faces a shortage of pharmacists, your response is valuable.** Agreement to participate in the study will require you to fill out a survey form that contains questions about your pharmacy site, and will take about 20 minutes to complete. Your response is **confidential** and only aggregate responses will be reported.

Please answer the questions below related to your willingness to participate in this research project. If you agree to participate, we will send you a survey form upon receipt of the "Participation Form" attached below. **Even if you are not willing to participate, please answer the questions below and return the form to us**. This will help us confirm that our mailing reached the intended subjects. If you have any questions, please contact Dr. Mott at 608-265-9268 or email him at damott@pharmacy.wisc.edu. For questions about rights of research subjects please contact the University of Wisconsin Social and Behavioral IRB at 608-263-2320 or email dcjanke@ls.admin.wisc.edu.

Sincerely,

David A. Mott, RPh, PhD

Abhijit S. Gadkari

↓ ↓ ↓ Detach and return bottom portion ↓ ↓ ↓

2005 Wisconsin Pharmacist Demand Survey
Participation Form

1. Willingness to participate (please check one):

   ___I am willing to participate in this study. Contact person's name:_____
   ___I am willing to participate in this study but have questions for the researchers. Please call me. Name/Phone: _____
   ___I am not willing to participate in this study.

2. Please check the one item that best describes your pharmacy setting.
   ____ Independent community pharmacy ____ Chain community pharmacy
   ____ Mass Merchandiser pharmacy ____ Supermarket pharmacy
   ____ Hospital / Health system ____ Other _____

3. What is the average number of prescriptions dispensed at your pharmacy per day?
   _____ Rxs

4. How many Full Time Equivalent pharmacists or FTEs (40 hours a week) does your site employ currently? (E.g. if you have 2 pharmacists working 20 hrs/week each, that constitutes 1 FTE) _____ FTEs.

5. Do you currently have a vacant pharmacist position at your site?
   ____ No ____ Yes (If yes, how many FTE positions are vacant? _____ FTE positions)

6. How many pharmacists left your employment within the past 12 months? Please think of the **total number** of pharmacists, **not** in terms of how many **FTE** positions they accounted for.
   _____ pharmacists.

7. What is your age? _____

8. If you have decided not to participate in this study, please provide us with a reason. (check all that apply)
   _____ Do not have time to participate
   _____ My employer discourages participation in research projects
   _____ Other (please specify): _____

To return this form, fold so the business reply return address shows on the outside, tape closed and drop in the US mail. Thank you.

Appendix B:

Cover Letter

November 2005

Dear Pharmacy Manager

Thank you for agreeing to participate in our project designed to better understand the association of pharmacy-specific factors with the level of demand for pharmacists. Included with this letter you should find a survey form and a postage paid return envelope you can use to return your completed survey from. The survey should take about 20 minutes to complete. **We appreciate you taking time from your busy schedule to help us with this project!**

Your response is **confidential** and only aggregate responses will be reported. Only members of the research team will see completed survey forms and no individual information will ever be shared with anyone. The identification number on the return envelope will help us avoid re-contacting respondents with follow-up reminders. Results of the study will be submitted to pharmacy organizations, policy makers, and pharmacy journals for publication.

Thank you for helping us gather this important information. We believe that the results will be useful for identifying areas in Wisconsin with a high demand for pharmacists, and also help pharmacy managers recruit and retain staff. If you have any questions about this study, please feel free to contact Dr. Mott. For questions about the rights of research subjects, please contact the University of Wisconsin Social and Behavioral Sciences IRB at 608-263-2320 or e-mail dcjahnke@ls.admin.wisc.edu.

Sincerely,

David A. Mott, RPh, PhD
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Appendix C:

Survey Form

2005 Wisconsin Pharmacist Demand Survey

INSTRUCTIONS:

Please either check or fill in the appropriate blanks. Return your completed survey in the enclosed postage paid return envelope. Your responses will remain **confidential** and only will be reported in aggregate form. Thank you!

Your participation is essential for the accuracy of our results. If any question is not applicable to you or your pharmacy, please write the letters NA next to the question.

Section I: Demand for Pharmacists

The questions in this section cover some specific details about the balance between supply and demand for pharmacists at your site. Please answer the questions in reference to the pharmacy site you manage. (If you manage multiple sites, then answer for the site whose name appears on the mailing label).

1. In total, how many licensed pharmacists (including you) currently are employed at your pharmacy?
   _____ pharmacists

2. Please answer the following questions regarding the gender, age, and work status of the pharmacists at your site.

	Number (#) of pharmacists	# that work Part-time (≤ 30 hours / week)	# that are less than age 30	# that are older than age 50
Males				
Females				

When answering the next 3 questions, consider a pharmacist who works **40 hours a week** as equal to **1 Full-time-equivalent (FTE) position**.

Formula for calculating FTE positions at your pharmacy:

$$\text{No. of FTEs} = \frac{\text{Hours/week for Pharmacist \#1} + \text{Hours/week for Pharmacist \#2} + \cdots\cdots}{40}$$

3. How many FTEs (40 hours a week) does the number of pharmacists at your site represent?
   _____ FTEs

4. Ideally, if there were no financial or recruiting constraints, how many FTE pharmacists would you like to have at your site? _____ FTE pharmacists

5. a) How many FTE pharmacist positions currently are vacant?
   _____ FTE pharmacist positions

   b) Vacant positions can be due to the addition of new positions or due to old positions being vacant. If you reported vacant pharmacist positions in 5a, how many vacant FTE positions are newly created ones (due to expansion) and how many are ones that were previously occupied by other pharmacists?

   Total number of **vacant** FTE pharmacist positions =

   _____ Newly created (expansion) positions

   \+

   _____ Old, previously occupied FTE positions

Pharmacist turnover is an important issue for most pharmacies. Questions 6 and 7 ask about the pharmacists that left your employment within the past 12 months.

6. How many pharmacists left your employment within the past 12 months? Please think in terms of the **total number** of pharmacists, not in terms of how many FTE positions they accounted for.
   _____ pharmacists

7. For each pharmacist who left within the past 12 months, please report the following information.

Pharmacist who left	Age	Sex	Time worked at the pharmacy before leaving	Hours worked per week	Primary reason for leaving
1			____ mos / ____ yrs		
2			____ mos / ____ yrs		
3			____ mos / ____ yrs		
4			____ mos / ____ yrs		
5			____ mos / ____ yrs		
6			____ mos / ____ yrs		

8. Given the current workforce situation, hiring pharmacists can be difficult and can take a considerable amount of time. This question asks about recent pharmacist hires at your site.

   a) In the past 12 months, did your pharmacy hire any new pharmacist(s)?
   _____No (If No, proceed to Qn. 9)
   _____Yes

   b) How many pharmacists (actual people) did your pharmacy hire within the past 12 months?
   _____ Pharmacists

   c) On average, for the pharmacists hired within the past 12 months, approximately how long did it take to hire a pharmacist from the time that the position became available?

   _____ days **OR** _____ months **OR** _____ years

9. This question relates to your opinion about the demand for pharmacists. Use the scale given below to report your level of agreement with each statement based on your experience at the pharmacy site that you manage or supervise. Circle the answer that best represents your opinion.

Strongly Disagree SD	**Disagree D**	**Neither Disagree nor Agree N**	**Agree A**	**Strongly Agree SA**

a. It would be very easy for pharmacists at my site to find employment with other employers in the community, if they were so inclined.	SD D N A SA
b. It is very difficult for me to find a relief pharmacist when a regular pharmacist is planning to take time off for a vacation.	SD D N A SA
c. My site could match any offer from other employers in the community in terms of salary for pharmacists.	SD D N A SA
d. Compared to other pharmacy sites, we are able to retain our pharmacists.	SD D N A SA
e. There is fierce competition between pharmacy employers in this community for hiring pharmacists.	SD D N A SA
f. It was very difficult to fill the most recently hired pharmacist position at my site.	SD D N A SA
g. My site could match any offer from other employers in the community in terms of work schedule flexibility for pharmacists.	SD D N A SA
h. Pharmacist turnover is a problem at this site.	SD D N A SA
i. I am concerned about pharmacists leaving my site for other employers in the community.	SD D N A SA
j. It is very difficult for me to find a relief pharmacist on short notice (e.g. when a pharmacist calls in sick).	SD D N A SA

Section II: Pharmacy Characteristics

The questions in this section deal with working as a pharmacist at your site, including compensation, work activities (dispensing and non-dispensing patient-care activities), work environment, and work culture at the site. These aspects of a pharmacy are important since they may influence pharmacists' decisions to stay at or leave a particular site.

Questions 10-12 relate to the **most recently hired** pharmacist at your site.

10. When was the last (most recent) pharmacist hired to work at your pharmacy?

    __ __ mm __ __ __ __ yyyy

11. Please report the **current base** compensation (hourly wage or salary) for the pharmacist **most recently hired** to work at your pharmacy.

If the person's pay is based on an hourly wage	If the person is salaried
report the **gross hourly wage:** $ _____ per hour **OR**	report **gross earnings per pay period** $ _____ per (check only 1) ____ week ____ two weeks ____ twice a month ____ month

12. Again, for the most recently hired pharmacist, did you compensate the person with any kind of **sign-on bonus** when they were hired?

    _____ Yes _____ No _____ Don't know

    If the sign-on bonus was given in a monetary form, please report the amount of money that was given. $_____

    If the sign-on bonus was given in a form other than monetary, please describe the **kind** of bonus and the **quantity** given, if applicable.

    _____

    _____

13. Please report the hours that your pharmacy's prescription department is open during a typical week.

    Hours of operation: Mon to Fri: _____

    Sat: _____

    Sun: _____

14. Are all staff pharmacists hired at your pharmacy **required** to work on weekends?

    _____ Yes _____ No

15. On average, what is the total number of prescriptions dispensed at your pharmacy per day?

    _____ Rxs/day.

16. Approximately what **proportion of prescriptions** dispensed at your pharmacy are for:

Medicaid recipients	: _____ %
Patients covered by Private Third Party payers	: _____ %
Self-pay patients (Uninsured)	: _____ %

17. Typically, how many people in the following categories are on duty in the prescription department during the busiest portion of a workday?

_____ Pharmacists
_____ **Non-certified** pharmacy technicians
_____ **Certified** pharmacy technicians
_____ Pharmacy residents
_____ Pharmacy interns
_____ Clerks

18. Pharmacists spend their time doing various activities. For a **typical staff pharmacist** working at your site, please report the **average** percent of time that the person devotes to the activities listed below during a typical week.

Professional Activity	% of Time spent by pharmacist
Consultation: Consulting and communicating with patients about prescription medications; interacting/communicating with other health professionals on patient's behalf (via phone, face-to-face, email, fax, etc.); patient-provider education	
Drug use management: Assessing and evaluating patient medication-related needs; monitoring and adjusting treatment to attain desired outcomes	
Business management: Managing pharmacy personnel, finances, and systems; processing and reconciling third-party claims; other business management activities	
Medication Dispensing: Preparing, dispensing, distributing, and administering medications (traditional dispensing and medication distribution activities)	
Other : Teaching, precepting, , etc.	
TOTAL	**100%**

19. Please answer the following questions related to pharmacists at your site taking time off from work. Use the scale given below to answer each question. Circle the answer that best represents your opinion.

Very difficult **VD** | **Difficult** **D** | **Easy** **E** | **Very easy** **VE**

Realistically, how difficult is it for a pharmacist at your site to:

a. take planned time off for a vacation	VD	D	E	VE
b. take a scheduled break of about 30-60 minutes for lunch	VD	D	E	VE
c. leave the workplace for a short time during working hours to run a personal errand (e.g. taking an hour off to drop a child at school)	VD	D	E	VE

20. Which of the following types of equipment are used at your pharmacy? (check all that apply)

___ Automated dispensing system (e.g. Scriptpro)	___ Electronic prescription order system
___ Automated patient refill-request system	___ Computerized Pharmaceutical care profile/ Documentation system
___ Bar coding for prescriptions	
___ Tablet / Capsule counter (e.g. Baker cell)	___ Other _____

21. Please answer the following questions related to the quality of care provided to patients at your site. Using the scale given below, circle the answer that best represents your opinion.

Excellent	Very Good	Good	Fair	Poor
E	V	G	F	P

In general, how would you describe:

a. the amount of time spent by pharmacists at your site in contact with patients	E	V	G	F	P
b. the quality of care provided by pharmacists at your site to patients	E	V	G	F	P
c. the opportunity for pharmacists at your site to solve drug therapy problems	E	V	G	F	P
d. the opportunity for pharmacists at your site to reduce potential errors	E	V	G	F	P

22. In addition to prescription dispensing, which of the following patient-care services and/or disease management programs are being offered at your practice site? (Check all that apply).

Patient-care Services:	Disease State Management Programs:
____ Specialty compounding	____ Diabetes
____ Immunization	____ Hyperlipidemia
____ Health screening	____ Hypertension
____ Wellness Screening	____ Asthma
____ Smoking cessation	____ Cancer
____ Medication therapy management	____ AIDS
____ Weight loss/control	____ Anticoagulation clinic
____ Other (specify) _____	____ Pain management
	____ Other (specify) _____

If you did NOT check any of the patient-care services OR disease management programs in Qn. 22, please proceed to Qn. 27

For questions **23-26**, please reflect on the time spent by your pharmacists in providing **patient-care services and/or disease management programs** (such as those mentioned above in Qn. 22)

23. On average how many hours per week do pharmacists at your site spend providing patient-care services and/or disease management programs?
_____ hours / week / pharmacist

24. Is any of the time spent in providing patient-care services and/or disease management programs scheduled (i.e. the pharmacist has time set aside **only** for these activities)?
_____ Yes _____ No

25. When a pharmacist spends time providing patient-care services and/or disease management programs, is a majority of this time during a period when there is at least one other pharmacist on duty?

_____ Yes _____ No

26. Is your pharmacy being paid for providing any patient-care services and/or disease management programs?

_____ Yes _____ No

27. Please report the level of **input** that a **staff pharmacist** at your site has in making the following decisions. Using the scale given below, circle the answer that best represents your opinion.

No input **1** **Moderate input** **2** **High input** **3**

Level of input that a staff pharmacist has in:			
a. choosing which hours he/she works at the pharmacy (i.e. when to work and how many hours to work)	1	2	3
b. determining their time spent in dispensing vs. non-dispensing patient care activities	1	2	3
c. offering patient-care services and/or disease management programs at the pharmacy	1	2	3
d. deciding on the number of pharmacists working alongside them	1	2	3
e. deciding on the number of interns and/or clerks working alongside them	1	2	3
f. delegating responsibilities to support staff	1	2	3
g. deciding on drugs that are stocked at the pharmacy	1	2	3
h. deciding on the pharmacy-related equipment or technology that is used at the site	1	2	3
i. selecting reference manuals or drug information software used at the site	1	2	3
j. developing management policies that affect the pharmacists	1	2	3

28. Please use the scale given below to report the emphasis that your site places on the following items.

No empahsis **1** **Moderate emphasis** **2** **High emphasis** **3**

Emphasis my site places on:			
a. the volume of work performed	1	2	3
b. the quality of care provided to patients	1	2	3
c. the professional development of pharmacists	1	2	3
d. the financial performance of the site	1	2	3
e. pharmacists' efforts to balance work and non-work activities	1	2	3
f. making sure pharmacists are heard by management	1	2	3
g. recognition of pharmacists for excellent performance	1	2	3
h. adopting new technology	1	2	3
i. developing new services	1	2	3

29. Pharmacists are exposed to different work environments at different pharmacy sites. Following are a group of statements about the work environment at your site. Using the scale given below, report your level of agreement with each statement. Circle the answer that best represents your opinion.

Strongly Disagree SD	Disagree D	Neither Disagree nor Agree N	Agree A	Strongly Agree SA

a. Our pharmacy uses innovative ideas and technology to facilitate the process of dispensing.	SD	D	N	A	SA
b. Our pharmacy uses innovative ideas and technology to provide non-dispensing patient-centered services.	SD	D	N	A	SA
c. Our pharmacy uses innovative techniques in recruiting staff.	SD	D	N	A	SA
d. Our pharmacy uses innovative techniques in retaining staff.	SD	D	N	A	SA
e. Pharmacists at my site are informed by management about what needs to be done to accomplish organizational goals.	SD	D	N	A	SA
f. Pharmacists at my site have routine, direct contact with members of management.	SD	D	N	A	SA
g. Pharmacists at my site approach management about new practice ideas.	SD	D	N	A	SA
h. Pharmacists at my site are given feedback by management about their performance.	SD	D	N	A	SA
i. Pharmacists at my site are highly motivated to dispense prescriptions as fast and as accurately as possible.	SD	D	N	A	SA
j. Pharmacists at my site are highly motivated to move beyond traditional dispensing roles towards more patient-care services and/or disease management programs.	SD	D	N	A	SA
k. If pharmacists at my site wanted to spend all of their time just dispensing drugs, there would be a real opportunity for them to do so.	SD	D	N	A	SA
l. If pharmacists at my site wanted to spend all of their time just dispensing drugs, management would be supportive of their desire to do so.	SD	D	N	A	SA
m. If pharmacists at my site wanted to move beyond dispensing drugs towards more patient care-type activities, there would be a real opportunity for them to do so.	SD	D	N	A	SA
n. If pharmacists at my site wanted to move beyond dispensing drugs towards more patient care-type activities, management would be supportive of their desire to do so.	SD	D	N	A	SA
o. Pharmacists at my site are satisfied with the environment they work in.	SD	D	N	A	SA
p. Pharmacists at my site want to continue working here.	SD	D	N	A	SA

THANK YOU!

Please return your completed survey in the enclosed postage paid return envelope.

Appendix D:

Question Deleted From the Survey Instrument During Review

Qn. Answer the question below if your site is providing disease state management program(s). In the top right hand column cell, write the disease state that your site manages. Is you have a program for more than one disease state, enter the disease that your site deals with the most. In the right hand column, put a check mark for each component of the program that your site provides.

Specialty Service Components	**Disease State** _____
a) Provide education to the patients about their disease state	
b) Provide individual training to patients for use of monitoring devices	
c) Schedule appointments with individual patients to monitor progress and/or solve therapy problems	
d) Report findings and therapy change recommendations (if any) to the patient's physician	
e) Co-ordinate special programs with other healthcare professionals (e.g. dieticians)	
f) Work with local area support groups	
g) Other _____	
h) Other _____	

Appendix E:

Cover Letter for 2nd Survey Mailing

November 2005

Dear Pharmacy Manager

We are writing to remind you about the 2005 Wisconsin Pharmacist Demand Survey that you agreed to participate in. If you have already received the survey and responded to it, please disregard this reminder. If you have not responded, we hope that you will read on and respond.

Thank you for agreeing to participate in our project designed to better understand the association of pharmacy-specific factors with the level of demand for pharmacists. Included with this letter you should find a survey form and a postage paid return envelope you can use to return your completed survey from. The survey should take about 20 minutes to complete. **We appreciate you taking time from your busy schedule to help us with this project!**

Your response is **confidential** and only aggregate responses will be reported. Only members of the research team will see completed survey forms and no individual information will ever be shared with anyone. The identification number on the return envelope will help us avoid re-contacting respondents with follow-up reminders. Results of the study will be submitted to pharmacy organizations, policy makers, and pharmacy journals for publication.

Thank you for helping us gather this important information. We believe that the results will be useful for identifying areas in Wisconsin with a high demand for pharmacists, and also help pharmacy managers recruit and retain staff. If you have any questions about this study, please feel free to contact Dr. Mott. For questions about the rights of research subjects, please contact the University of Wisconsin Social and Behavioral Sciences IRB at 608-263-2320 or e-mail dcjahnke@ls.admin.wisc.edu.

Sincerely,

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Appendix F:

Key to Item Codes for Multi-item Measures

Code	Item
WKEFF 1	19 b. take a scheduled break of about 30-60 minutes for lunch
WKEFF 2	19 c. leave the workplace for a short time during working hours to run a personal errand (e.g. taking an hour off to drop a child at school)
INPUT 1	27 a. choosing which hours he/she works at the pharmacy (i.e. when to work and how many hours to work)
INPUT 2	27 b. determining their time spent in dispensing vs. non-dispensing patient care activities
INPUT 3	27 c. offering patient-care services and/or disease management programs at the pharmacy
INPUT 4	27 d. deciding on the number of pharmacists working alongside them
INPUT 5	27 e. deciding on the number of interns and/or clerks working alongside them
INPUT 6	27 f. delegating responsibilities to support staff
INPUT 7	27 g. deciding on drugs that are stocked at the pharmacy
INPUT 8	27 h. deciding on the pharmacy-related equipment or technology that is used at the site
INPUT 9	27 i. selecting reference manuals or drug information software used at the site
INPUT 10	27 j. developing management policies that affect the pharmacists
EMPHA 1	28 a. the volume of work performed
EMPHA 2	28 b. the quality of care provided to patients
EMPHA 3	28 c. the professional development of pharmacists
EMPHA 4	28 d. the financial performance of the site
EMPHA 5	28 e. pharmacists' efforts to balance work and non-work activities
EMPHA 6	28 f. making sure pharmacists are heard by management
EMPHA 7	28 g. recognition of pharmacists for excellent performance
EMPHA 8	28 h. adopting new technology
EMPHA 9	28 i. developing new services

INNOV 1	29 a. Our pharmacy uses innovative ideas and technology to facilitate the process of dispensing.
INNOV 2	29 b. Our pharmacy uses innovative ideas and technology to provide non-dispensing patient-centered services.
INNOV 3	29 c. Our pharmacy uses innovative techniques in recruiting staff.
INNOV 4	29 d. Our pharmacy uses innovative techniques in retaining staff.
COMMU 1	29 e. Pharmacists at my site are informed by management about what needs to be done to accomplish organizational goals.
COMMU 2	29 f. Pharmacists at my site have routine, direct contact with members of management.
COMMU 3	29 g. Pharmacists at my site approach management about new practice ideas.
COMMU 4	29 h. Pharmacists at my site are given feedback by management about their performance.
ORIENT 1	29 i. Pharmacists at my site are highly motivated to dispense prescriptions as fast and as accurately as possible.
ORIENT 2	29 j. Pharmacists at my site are highly motivated to move beyond traditional dispensing roles towards more patient-care services and/or disease management programs.
ORIENT 3	29 k. If pharmacists at my site wanted to spend all of their time just dispensing drugs, there would be a real opportunity for them to do so.
ORIENT 4	29 l. If pharmacists at my site wanted to spend all of their time just dispensing drugs, management would be supportive of their desire to do so.
ORIENT 5	29 m. If pharmacists at my site wanted to move beyond dispensing drugs towards more patient care-type activities, there would be a real opportunity for them to do so.
ORIENT 6	29 n. If pharmacists at my site wanted to move beyond dispensing drugs towards more patient care-type activities, management would be supportive of their desire to do so.
RPHSAT 1	29 o. Pharmacists at my site are satisfied with the environment they work in.
RPHSAT 2	29 p. Pharmacists at my site want to continue working here.

Appendix G:

Correlation Matrices

Table 23.1

Correlation Matrix for presence of vacancy, setting, pharmacist turnover, and new pharmacist hires related variables

	Vacancy	Type of setting	RPh Left	RPh hired	Number of RPh left	Number of RPh hired	Months to hire
Vacancy	1	-0.133	.323**	-0.018	.373**	0.09	.370*
Independent setting	-0.133	1	-.256**	.240**	-.265**	-.253**	0.093
RPh left	.323**	-.256**	1	-.292**	.850**	.311**	-0.321
RPh hired	-0.018	.240**	-.292**	1	.255**	-.912**	a
Number RPh left	.373**	-.265**	.850**	-.255**	1	.387**	-0.243
Number RPh hired	0.09	-.253**	.311**	-.912**	.387**	1	-0.12
Months to hire	.370*	0.093	-0.321	a	-0.243	-0.12	1
Sign-on bonus given	0.177	-.406**	.267**	0.073	.273**	-0.096	0.031
Gross hourly wage	.232*	-.294**	0.164	-0.065	0.107	0.014	0.072
Work weekends	-0.023	-.289**	-0.033	-0.069	0.034	0.096	0.098
Easy/v.easy vacation	-.189*	.194*	-0.097	-0.012	-0.079	0.03	0.015
Hours weekdays	.183*	-.269**	0.143	-.254**	.270**	.256**	0.109
Hours Saturdays	.231*	-.240**	0.175	-0.146	.206*	0.152	0.134
Hours Sundays	0.096	-.268**	0.042	-.214*	0.182	.212*	0.028
Workload breaks scale	0.014	0.154	0.027	-0.066	-0.004	0.088	0.061
Rxs/day	.222*	0.145	.234*	-0.002	.311**	0.105	-0.011
Rxs/day/disp staff	0.044	.282**	-0.116	0.064	-0.088	-0.039	0.049
Rxs/day/RPh	0.136	0.146	0.026	0.124	0.026	-0.11	0.127
Rxs pvt. 3rd party	-0.081	-0.023	.188*	-0.07	.208*	0.109	-0.129
Tech / 100 Rxs	-0.007	-.203*	0.113	-0.064	0.075	0.027	0.005
Supp staff / 100 Rxs	0	-.189*	0.11	-0.057	0.072	0.021	0.005
Disp. aiding tech.	.293**	-.235*	.187*	-0.08	.193*	0.081	-0.094

Table 23.1 contd...

Correlation Matrix for presence of vacancy, setting, pharmacist turnover, and new pharmacist hires related variables

	Vacancy	Type of setting	RPh Left	RPh hired	Number of RPh left	Number of RPh hired	Months to hire
RPh time consult	0.041	-0.026	-0.013	-0.146	-0.017	0.141	0.141
RPh time med. disp.	-0.016	0.11	0.015	0.088	0.003	-0.121	-0.247
PCS/DSM offered	-0.025	0.172	-0.058	-0.03	-0.082	0.028	-0.307
3 or more PCS/DSM offered	0.16	0.057	-0.096	0.004	-0.138	-0.023	-0.124
Scheduled time	0.081	0.063	0.009	0.004	-0.02	0.054	-0.015
PCS/DSM when 2 RPh	-0.065	0.178	0.002	-0.029	0.058	0.082	-0.355
Pcy paid for PCS/DSM	0.015	0.234	0.085	0.018	0.011	-0.006	0.004
Hrs/pcy in PCS/DSM	0.11	0.18	-0.249	0.137	-0.201	-0.046	0.423
FTE RPhs reqd.	.504**	0.074	0.163	-0.097	.306**	.202*	0.317
Input in pcy oper. Scale	-0.108	.349**	-0.085	0.055	-0.147	-0.081	-0.263
Input in prof. role scale	-0.082	.212*	-0.082	0.054	-0.098	-0.054	-0.16
Emphasis people scale	-0.068	.376**	-0.118	0.083	-0.175	-0.075	0.206
Emphasis innov. scale	0.105	.224*	0.053	0.021	0.006	-0.051	0.108
Emphasis business scale	0.083	-.376**	0.141	-0.093	.192*	0.107	0.181
Innovativeness scale	0.056	0.179	-0.084	0.123	-0.105	-0.106	-0.17
Communication scale	-0.07	.312**	-0.17	0.082	-.303**	-0.106	0.014
Service orientation scale	-0.107	.335**	-.217*	0.143	-.240**	-0.142	0.122
Dispensing orientation scale	-0.009	-0.093	0.042	0.006	0.059	-0.008	-0.052
RPh satisfaction scale	-0.173	.437**	-0.165	0.136	-.305**	-.207*	0.018

Table 23.1 contd…

Correlation Matrix for presence of vacancy, setting, pharmacist turnover, and new pharmacist hires related variables

	Vacancy	Type of setting	RPh Left	RPh hired	Number of RPh left	Number of RPh hired	Months to hire
Population	0.098	-0.183	.221*	-0.144	.191*	0.183	0.074
Population / RPh	0.078	-0.017	-0.168	-0.032	-0.134	0.04	-0.255
Population / pharmacy	0.108	-.191*	0.041	-.216*	0.076	.211*	-0.08
Population / physician	-0.166	0.161	-0.1	0.039	-0.102	-0.045	-0.135
Senior population	0.118	-0.165	.210*	-0.121	0.18	0.162	0.1
Seniors / RPh	0.078	0.007	-.193*	0.013	-0.154	-0.011	-0.208
Seniors / pharmacy	0.094	-0.109	-0.069	-0.144	-0.009	0.13	-0.084
Seniors / physician	-0.143	0.16	-0.107	0.056	-0.104	-0.063	-0.138
RPhs / pharmacy	0.111	-.203*	.203*	-0.124	.188*	0.104	0.231
Proportion seniors	-0.048	0.129	-0.154	0.122	-0.12	-0.136	0.03
Per capita income	0.073	-0.136	.229*	-0.139	0.16	0.153	0.105
Rurality	-0.097	0.064	-.208*	0.036	-.204*	-0.036	-0.105

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

a Cannot be computed because at least one of the variables is constant.

Table 23.2
Correlation Matrix for compensation and work schedule related variables

	Sign-on bonus	Gross hourly wage	Work weekends	Easy/v.easy vacation	Hours weekdays	Hours Saturday	Hours sunday
Vacancy	0.177	.232*	-0.023	-.189*	.183*	.231*	0.096
Independent setting	-.406**	-.294**	-.289**	.194*	-.269**	-.240**	-.268**
RPh left	.267**	0.164	-0.033	-0.097	0.143	0.175	0.042
RPh hired	0.073	-0.065	-0.069	-0.012	-.254**	-0.146	-.214*
Number RPh left	.273**	0.107	0.034	-0.079	.270**	.206*	0.182
Number RPh hired	-0.096	0.014	0.096	0.03	.256**	0.152	.212*
Months to hire	0.031	0.072	0.098	0.015	0.109	0.134	0.028
Sign-on bonus given	1	0.142	0.178	-0.133	0.144	0.043	0.13
Gross hourly wage	0.142	1	-0.057	-0.184	0.073	0.122	0.127
Work weekends	0.178	-0.057	1	.246*	.280**	0.146	.320**
Easy/v.easy vacation	-0.133	-0.184	.246*	1	0.008	0.126	0.026
Hours weekdays	0.144	0.073	.280**	0.008	1	.642**	.819**
Hours Saturdays	0.043	0.122	0.146	0.126	.642**	1	.624**
Hours Sundays	0.13	0.127	.320**	0.026	.819**	.624**	1
Workload breaks scale	-0.196	-0.105	0.025	.288**	0.147	.223*	0.103
Rxs/day	-0.027	0.08	-0.058	0.118	.387**	.392**	.318**
Rxs/day/disp staff	-.216*	0.084	-0.022	0.143	0.067	0.125	0.112
Rxs/day/RPh	-0.063	0.18	0.002	0.052	0.113	0.069	0.128
Rxs pvt. 3rd party	-0.055	-0.143	0.138	.231*	0.157	0.108	0.106
Tech / 100 Rxs	0.109	-0.055	0.039	-0.054	-0.048	-0.083	-0.1
Supp staff / 100 Rxs	0.105	-0.063	0.038	-0.051	-0.052	-0.084	-0.106
Disp. aiding tech.	.208*	.232*	0.08	-0.051	.372**	.284**	.302**

Table 23.2 contd...

Correlation Matrix for compensation and work schedule related variables

	Sign-on bonus	Gross hourly wage	Work weekends	Easy/v.easy vacation	Hours weekdays	Hours Saturday	Hours sunday
RPh time consult	0.166	-0.039	0.063	-0.086	0.088	0.059	0.074
RPh time med. disp.	-.226*	-0.003	-.196*	0.079	-0.116	-0.119	-0.095
PCS/DSM offered	-0.156	0.004	-.210*	0.004	-0.082	0.069	-0.076
3 or more PCS/DSM offered	0.071	0.144	-.245*	-0.013	-0.067	0.028	-0.106
Scheduled time	-0.019	0.219	0.106	0.004	0.029	0.052	0.006
PCS/DSM when 2 RPh	-0.013	0.116	0.046	0.194	.255*	0.141	0.111
Pcy paid for PCS/DSM	-0.02	0.087	-0.01	0.096	0.001	-0.038	-0.074
Hrs/pcy in PCS/DSM	-0.136	-0.153	-0.198	0.001	-0.007	0.003	-0.1
FTE RPhs reqd.	0.027	0.03	0.03	0.08	.514**	.480**	.392**
Input in pcy oper. Scale	-0.095	-0.142	0.084	.286**	-.191*	-.201*	-.216*
Input in prof. role scale	-0.088	-0.135	0.037	0.174	0.052	-0.124	-0.04
Emphasis people scale	-0.068	-0.165	-0.024	0.11	-0.123	-0.129	-.222*
Emphasis innov. scale	-0.163	-0.079	0.046	0.062	0.107	0.087	0.007
Emphasis business scale	.289**	0.087	.251*	-0.05	0.167	0.099	.207*
Innovativeness scale	-0.095	0.109	-0.133	0.001	-0.057	0.103	-0.086
Communication scale	-0.112	-0.176	-0.087	-0.003	-0.131	-0.032	-0.167
Service orientation scale	-0.036	-0.121	-0.044	0.135	-0.035	-0.077	-0.078
Dispensing orientation scale	-0.042	0.14	0.107	0.045	0.114	0.086	0.167
RPh satisfaction scale	-.227*	-.203*	-0.13	.188*	-0.113	-0.033	-0.108

Table 23.2 contd…
Correlation Matrix for compensation and work schedule related variables

	Sign-on bonus	Gross hourly wage	Work Weekends	Easy/v. easy vacation	Hours weekdays	Hours Saturday	Hours Sunday
Population	0.102	-0.101	0.189	0.039	0.173	0.047	0.093
Population / RPh	0.132	-0.041	-0.004	-0.069	-0.119	-0.141	-0.113
Population / pharmacy	0.154	0.049	0.167	-0.066	.196*	0.037	0.147
Population / physician	-0.141	-.201*	-.200*	0.054	-0.146	-0.013	-0.128
Senior population	0.138	-0.086	0.184	0.032	0.157	0.049	0.084
Seniors / RPh	0.149	-0.015	-0.043	-0.054	-0.14	-0.106	-0.115
Seniors / pharmacy	.207*	0.084	0.067	-0.09	0.102	0.037	0.091
Seniors / physician	-0.104	-0.151	-.213*	0.05	-0.157	0.005	-0.128
RPhs / pharmacy	0.085	0.12	0.155	0.062	.248**	.214*	.264**
Proportion seniors	0.051	0.075	-0.148	-0.03	-0.141	-0.004	-0.08
Per capita income	0.097	-0.039	0.102	0.084	.210*	0.139	0.137
Rurality	-0.157	0.04	-0.12	-0.043	-0.176	-0.13	-0.105

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
a Cannot be computed because at least one of the variables is constant.

Table 23.3

Correlation Matrix for workload, support staff, and technology related variables

	Workload breaks scale	Rxs/day	Rxs/ day / disp staff	Rxs/ day/ RPh	Rxs pvt 3rd party	Tech/ 100 Rxs	Supp staff/ 100 Rxs	Disp aiding tech.
Vacancy	0.014	.222*	0.044	0.136	-0.081	-0.007	0	.293**
Independent setting	0.154	0.145	.282**	0.146	-0.023	-.203*	-.189*	-.235*
RPh left	0.027	.234*	-0.116	0.026	.188*	0.113	0.11	.187*
RPh hired	-0.066	-0.002	0.064	0.124	-0.07	-0.064	-0.057	-0.08
Number RPh left	-0.004	.311**	-0.088	0.026	.208*	0.075	0.072	.193*
Number RPh hired	0.088	0.105	-0.039	-0.11	0.109	0.027	0.021	0.081
Months to hire	0.061	-0.011	0.049	0.127	-0.129	0.005	0.005	-0.094
Sign-on bonus given	-0.196	-0.027	-.216*	-0.063	-0.055	0.109	0.105	.208*
Gross hourly wage	-0.105	0.08	0.084	0.18	-0.143	-0.055	-0.063	.232*
Work weekends	0.025	-0.058	-0.022	0.002	0.138	0.039	0.038	0.08
Easy/v.easy vacation	.288**	0.118	0.143	0.052	.231*	-0.054	-0.051	-0.051
Hours weekdays	0.147	.387**	0.067	0.113	0.157	-0.048	-0.052	.372**
Hours Saturdays	.223*	.392**	0.125	0.069	0.108	-0.083	-0.084	.284**
Hours Sundays	0.103	.318**	0.112	0.128	0.106	-0.1	-0.106	.302**
Workload breaks scale	1	.378**	0.054	-0.167	0.127	-.198*	-0.183	0.06
Rxs/day	.378**	1	.421**	.495**	0.13	-.254**	-.243**	.333**
Rxs/day/disp staff	0.054	.421**	1	.628**	0.054	-.715**	-.723**	0.027
Rxs/day/RPh	-0.167	.495**	.628**	1	0.051	-.281**	-.286**	0.164
Rxs pvt. 3rd party	0.127	0.13	0.054	0.051	1	-0.051	-0.05	0.051
Tech / 100 Rxs	-.198*	-.254**	-.715**	-.281**	-0.051	1	.998**	-0.022
Supp staff / 100 Rxs	-0.183	-.243**	-.723**	-.286**	-0.05	.998**	1	-0.007
Disp. aiding tech.	0.06	.333**	0.027	0.164	0.051	-0.022	-0.007	1

Table 23.3 contd…

Correlation Matrix for workload, support staff, and technology related variables

	Workload breaks scale	Rxs/day	Rxs/day/ disp staff	Rxs/day/ RPh	Rxs pvt. 3rd party	Tech / 100 Rxs	Supp staff / 100 Rxs	Disp. aiding tech.
RPh time consult	0.081	.300**	0.055	0.129	-0.033	-0.11	-0.101	.278**
RPh time med. disp.	-0.157	-.243**	-0.001	0.045	-0.036	0.048	0.038	-.281**
PCS/DSM offered	0.101	0.073	0.062	-0.019	.197*	-0.09	-0.08	0.033
3 or more PCS/DSM offered	0.095	0.162	0.137	0.109	-0.046	-0.087	-0.07	.250**
Scheduled time	0.21	0.225	-0.126	-0.07	0.09	0.022	0.094	.432**
PCS/DSM when 2 RPh	.516**	.525**	0.093	-0.248	0.048	-.321*	-.297*	0.166
Pcy paid for PCS/DSM	0.146	0.031	-.337**	-0.241	0.069	.273*	.309*	0.108
Hrs/pcy in PCS/DSM	0.17	0.22	0.045	-0.046	-0.238	-0.094	-0.064	0.071
FTE RPhs reqd.	.378**	.724**	0.162	0.129	0.082	-0.137	-0.119	.300**
Input in pcy oper. Scale	0.07	-0.024	-0.046	0.022	0.066	-0.013	-0.01	-.267**
Input in prof. role scale	0.092	-0.08	-0.13	-0.042	0.131	0.065	0.072	-0.095
Emphasis people scale	0.118	0.011	0.045	-0.003	0.088	-.194*	-.190*	-.218*
Emphasis innov. scale	0.022	.301**	0.093	0.136	0.025	-0.085	-0.071	.214*
Emphasis business scale	-0.049	0.086	-0.111	-0.026	0.033	0.136	0.134	0.011
Innovativeness scale	0.066	.244**	0.092	0.13	0.094	-0.162	-0.147	.349**
Communication scale	0.182	0.077	-0.069	-0.046	0.051	-0.046	-0.034	0
Service orientation scale	0.177	0.077	-0.072	-0.124	0.18	-0.034	-0.018	0.089
Dispensing orientation scale	-0.097	0.106	0.09	0.166	-0.145	0.093	0.087	0.136
RPh satisfaction scale	.264**	0.055	-0.059	-0.055	0.103	0.02	0.034	-0.069

Table 23.3 contd…

Correlation Matrix for workload, support staff, and technology related variables

	Workload breaks scale	Rxs/day	Rxs/day/ disp staff	Rxs/day/RPh	Rxs pvt. 3rd party	Tech / 100 Rxs	Supp staff / 100 Rxs	Disp. aiding tech.
Population	0.117	0.028	-.262**	-0.169	.420**	.244**	.253**	.281**
Population / RPh	-0.15	-0.147	0.039	-0.027	-0.119	-0.076	-0.074	-0.08
Population / pharmacy	0.077	0.066	-0.144	-0.18	0.106	0.041	0.044	.222*
Population / physician	-.212*	-.191*	0.046	-0.084	-0.003	-0.096	-0.098	-.279**
Senior population	0.075	0.05	-.260**	-0.124	.394**	.252**	.262**	.322**
Seniors / RPh	-.185*	-0.121	0.087	0.023	-0.171	-0.109	-0.109	-0.085
Seniors / pharmacy	-0.056	0.066	-0.053	-0.1	-0.063	-0.041	-0.039	.193*
Seniors / physician	-.215*	-0.164	0.05	-0.071	-0.024	-0.101	-0.103	-.260**
RPhs / pharmacy	.236*	.247**	-0.108	-0.05	0.175	0.063	0.062	.282**
Proportion seniors	-0.161	0.014	0.147	0.129	-.238*	-0.132	-0.136	-0.08
Per capita income	0.157	0.102	-0.102	-0.11	.392**	0.087	0.087	0.16
Rurality	-0.167	-0.123	0.104	0.049	-0.169	-0.129	-0.134	-.223*

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

a Cannot be computed because at least one of the variables is constant.

Table 23.4
Correlation Matrix for work activities and required pharmacists related variables

	RPh time consult	RPh time med. disp.	PCS/ DSM offered	3 or more PCS/DSM offered	Scheduled time	PCS/ DSM when 2 RPh	Pcy paid for PCS/ DSM	Hrs/ pcy in PCS/ DSM	FTE RPhs reqd.
Vacancy	0.041	-0.016	-0.025	0.16	0.081	-0.065	0.015	0.11	.504**
Independent setting	-0.026	0.11	0.172	0.057	0.063	0.178	0.234	0.18	0.074
RPh left	-0.013	0.015	0.058	-0.096	0.009	-0.002	0.085	-0.249	0.163
RPh hired	-0.146	0.088	0.03	0.004	0.004	0.029	0.018	0.137	-0.097
Number RPh left	-0.017	0.003	-0.082	-0.138	-0.02	0.058	0.011	-0.201	.306**
Number RPh hired	0.141	-0.121	0.028	-0.023	0.054	0.082	-0.006	-0.046	.202*
Months to hire	0.141	-0.247	-0.307	-0.124	-0.015	-0.355	0.004	0.423	0.317
Sign-on bonus given	0.166	-.226*	-0.156	0.071	-0.019	-0.013	-0.02	-0.136	0.027
Gross hourly wage	-0.039	-0.003	0.004	0.144	-0.219	-0.116	-0.087	-0.153	0.03
Work weekends	0.063	-.196*	-.210*	-.245*	0.106	0.046	-0.01	-0.198	0.03
Easy/v.easy vacation	-0.086	0.079	0.004	-0.013	0.004	0.194	0.096	0.001	0.08
Hours weekdays	0.088	-0.116	-0.082	-0.067	0.029	.255*	0.001	-0.007	.514**
Hours Saturdays	0.059	-0.119	0.069	0.028	0.052	0.141	-0.038	0.003	.480**
Hours Sundays	0.074	-0.095	-0.076	-0.106	0.006	0.111	-0.074	-0.1	.392**
Workload breaks scale	0.081	-0.157	0.101	0.095	0.21	.516**	0.146	0.17	.378**
Rxs/day	.300**	-.243**	0.073	0.162	0.225	.525**	0.031	0.22	.724**
Rxs/day/disp staff	0.055	-0.001	0.062	0.137	-0.126	0.093	-.337**	0.045	0.162
Rxs/day/RPh	0.129	0.045	-0.019	0.109	-0.07	-0.248	.241	-0.046	0.129
Rxs pvt. 3rd party	-0.033	-0.036	.197*	-0.046	0.09	0.048	0.069	-0.238	0.082
Tech / 100 Rxs	-0.11	0.048	-0.09	-0.087	0.022	-.321*	.273*	-0.094	-0.137
Supp staff / 100 Rxs	-0.101	0.038	-0.08	-0.07	0.094	-.297*	.309*	-0.064	-0.119
Disp. aiding tech.	.278**	-.281**	0.033	.250**	.432**	0.166	0.108	0.071	.300**

Table 23.4 contd....
Correlation Matrix for work activities and required pharmacists related variables

	RPh time consult	RPh time med. disp.	PCS/ DSM offered	3 or more PCS/DSM offered	Scheduled time	PCS/DSM when 2 RPh	Pcy paid for PCS/DSM	Hrs/pcy in PCS/DSM	FTE RPhs reqd.
RPh time consult	1	-.770**	-0.039	0.102	.339**	.266*	-0.024	0.239	.195*
RPh time med. disp.	-.770**	1	-0.011	-0.124	-.344**	-.260*	-0.061	-0.186	-.234*
PCS/DSM offered	-0.039	-0.011	1	.590**	a	a	a	a	0.056
3 or more PCS/DSM	0.102	-0.124	.590**	1	0.211	0.029	-0.012	.284*	0.148
Scheduled time	.339**	-.344**	a	0.211	1	.265*	.445**	0.234	.332**
PCS/DSM when 2 RPh	.266*	-.260*	a	0.029	.265*	1	.252*	.285*	.546**
Pcy paid for PCS/DSM	-0.024	-0.061	a	-0.012	.445**	.252*	1	0.2	.293*
Hrs/pcy in PCS/DSM	0.239	-0.186	a	.284*	0.234	.285*	0.2	1	.368**
FTE RPhs reqd.	.195*	-.234*	0.056	0.148	.332**	.546**	.293*	.368**	1
Input in pcy oper. Scale	-0.09	.226*	0.043	-0.036	-0.108	-0.07	0.099	0.036	0
Input in prof. role scale	-0.051	0.134	0.125	0.102	0.059	-0.074	0.203	0.104	0.01
Emphasis people scale	0.021	0.048	0.147	0.13	-0.054	0.06	0.179	0.215	0.047
Emphasis innov. scale	0.115	-0.064	0.031	0.071	.310*	0.11	.266*	0.236	.331**
Emphasis business scale	-0.05	-0.08	-0.098	-0.117	0.119	0.029	-0.065	-0.082	0.102
Innovativeness scale	.201*	-0.181	.295**	.382**	.312*	0.172	0.153	.311*	0.173
Communication scale	.194*	-0.129	0.082	.197*	.287*	0.227	.306*	0.25	0.061
Service orientation scale	0.152	-0.153	.241**	.248**	.323*	.305*	0.221	.373**	0.093
Dispensing orientation	-0.102	0.07	0.056	0.05	-0.121	-0.079	-0.061	-0.166	0.004
RPh satisfaction scale	-0.114	0.132	0.181	0.14	0.231	0.234	0.233	0.126	0.018

Table 23.4 contd...
Correlation Matrix for work activities and required pharmacists related variables

	RPh time consult	RPh time med. disp.	PCS/ DSM offered	3 or more PCS/DSM offered	Scheduled time	PCS/ DSM when 2 RPh	Pcy paid for PCS/DSM	Hrs/pcy in PCS/DSM	FTE RPhs reqd.
Population	0.091	-0.149	0.077	0	.372**	0.082	0.123	-0.131	0.151
Population / RPh	-0.031	0.053	0.097	.200*	0.005	-0.02	-0.078	-0.014	-0.078
Population / pharmacy	0.085	-0.052	0.068	0.137	0.137	.262*	-0.06	-0.096	.211*
Population / physician	-0.115	0.093	0.126	-0.041	-0.122	-0.031	0.107	-0.015	-0.116
Senior population	0.099	-0.159	0.057	0.016	.444**	0.052	0.171	-0.087	0.16
Seniors / RPh	-0.039	0.077	0.073	.206*	-0.025	-0.075	-0.076	0.07	-0.08
Seniors / pharmacy	0.066	0	0.032	.193*	0.098	0.152	-0.06	0.062	0.167
Seniors / physician	-0.113	0.108	0.105	-0.034	-0.115	-0.035	0.112	0.038	-0.111
RPhs / pharmacy	0.062	-0.032	-0.038	-0.046	0.036	0.191	-0.029	-0.111	.298**
Proportion seniors	-0.042	0.093	-0.069	0.04	-0.087	-0.166	-0.01	.348**	-0.071
Per capita income	0.131	-0.172	0.127	0.048	0.07	-0.019	-0.012	-0.06	0.139
Rurality	0.004	0.065	0.084	0.051	-0.228	-0.194	-0.096	0.231	-.228*

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
a Cannot be computed because at least one of the variables is constant.

Table 23.5
Correlation Matrix for work environment or work culture related variables

	Input in pcy oper. Scale	Input in prof. role scale	Emphasis people scale	Emphasis innov. scale	Emphasis business scale	Innovativeness scale	Communication scale	Service orientation scale	Dispensing orientation scale	RPh satisfaction scale
Vacancy	-0.108	-0.082	-0.068	0.105	0.083	0.056	-0.07	-0.107	-0.009	-0.173
Independent setting	.349**	.212*	.376**	.224*	-.376**	0.179	.312**	.335**	-0.093	.437**
RPh left	-0.085	-0.082	-0.118	0.053	0.141	-0.084	-0.17	-.217*	0.042	-0.165
RPh hired	0.055	0.054	0.083	0.021	-0.093	0.123	0.082	0.143	0.006	0.136
Number RPh left	-0.147	-0.098	-0.175	0.006	.192*	-0.105	-.303**	-.240**	0.059	-.305**
Number RPh hired	-0.081	-0.054	-0.075	-0.051	0.107	-0.106	-0.106	-0.142	-0.008	-.207*
Months to hire	-0.263	-0.16	0.206	0.108	0.181	-0.17	0.014	0.122	-0.052	0.018
Sign-on bonus given	-0.095	-0.088	-0.068	-0.163	.289**	-0.095	-0.112	-0.036	-0.042	-.227*
Gross hourly wage	-0.142	-0.135	-0.165	-0.079	0.087	0.109	-0.176	-0.121	0.14	-.203*
Work weekends	0.084	0.037	-0.024	0.046	.251*	-0.133	-0.087	-0.044	0.107	-0.13
Easy/v.easy vacation	.286**	0.174	0.11	0.062	-0.05	0.001	-0.003	0.135	0.045	.188*
Hours weekdays	-.191*	0.052	-0.123	0.107	0.167	-0.057	-0.131	-0.035	0.114	-0.113
Hours Saturdays	-.201*	-0.124	-0.129	0.087	0.099	0.103	-0.032	-0.077	0.086	-0.033
Hours Sundays	-.216*	-0.04	-.222*	0.007	.207*	-0.086	-0.167	-0.078	0.167	-0.108
Workload breaks scale	0.07	0.092	0.118	0.022	-0.049	0.066	0.182	0.177	-0.097	.264**
Rxs/day	-0.024	-0.08	0.011	.301**	0.086	.244**	0.077	0.077	0.106	0.055
Rxs/day/disp staff	-0.046	-0.13	0.045	0.093	-0.111	0.092	-0.069	-0.072	0.09	-0.059
Rxs/day/RPh	0.022	-0.042	-0.003	0.136	-0.026	0.13	-0.046	-0.124	0.166	-0.055
Rxs pvt. 3rd party	0.066	0.131	0.088	0.025	0.033	0.094	0.051	0.18	-0.145	0.103
Tech / 100 Rxs	-0.013	0.065	-.194*	-0.085	0.136	-0.162	-0.046	-0.034	0.093	0.02
Supp staff / 100 Rxs	-0.01	0.072	-.190*	-0.071	0.134	-0.147	-0.034	-0.018	0.087	0.034
Disp. aiding tech.	-.267**	-0.095	-.218*	.214*	0.011	.349**	0	0.089	0.136	-0.069

Table 23.5 contd...
Correlation Matrix for work environment or work culture related variables

	Input in pcy oper. Scale	Input in prof. role scale	Emphasis people scale	Emphasis innov. scale	Emphasis business scale	Innovativeness scale	Communication scale	Service orientation scale	Dispensing orientation scale	RPh satisfaction scale
RPh time consult	-0.09	-0.051	0.021	0.115	-0.05	.201*	.194*	0.152	-0.102	-0.114
RPh time med. disp.	.226*	0.134	0.048	-0.064	-0.08	-0.181	-0.129	-0.153	0.07	0.132
PCS/DSM offered	0.043	0.125	0.147	0.031	-0.098	.295**	0.082	.241**	0.056	0.181
3 or more PCS/DSM offered	-0.036	0.102	0.13	0.071	-0.117	.382**	.197*	.248**	0.05	0.14
Scheduled time	-0.108	0.059	-0.054	.310*	0.119	.312*	.287*	.323*	-0.121	0.231
PCS/DSM when 2 RPh	-0.07	-0.074	0.06	0.11	0.029	0.172	0.227	.305*	-0.079	0.234
Pcy paid for PCS/DSM	0.099	0.203	0.179	.266*	-0.065	0.153	.306*	0.221	-0.061	0.233
Hrs/pcy in PCS/DSM	0.036	0.104	0.215	0.236	-0.082	.311*	0.25	.373**	-0.166	0.126
FTE RPhs reqd.	0	0.01	0.047	.331**	0.102	0.173	0.061	0.093	0.004	0.018
Input in pcy oper. Scale	1	.523**	.605**	.456**	-0.099	.201*	.396**	.323**	-0.068	.401**
Input in prof. role scale	.523**	1	.573**	.395**	-0.144	.238*	.382**	.489**	-0.066	.259**
Emphasis people scale	.605**	.573**	1	.485**	-0.172	.444**	.614**	.533**	-.193*	.413**
Emphasis innov. scale	.456**	.395**	.485**	1	0.007	.463**	.411**	.423**	0.06	.317**
Emphasis business scale	-0.099	-0.144	-0.172	0.007	1	-.239*	-0.144	-0.162	-0.019	-.234*
Innovativeness scale	.201*	.238*	.444**	.463**	-.239*	1	.497**	.569**	-0.013	.362**
Communication scale	.396**	.382**	.614**	.411**	-0.144	.497**	1	.626**	-0.178	.527**
Service orientation scale	.323**	.489**	.533**	.423**	-0.162	.569**	.626**	1	-0.179	.497**
Dispensing orientation scale	-0.068	-0.066	-.193*	0.06	-0.019	-0.013	-0.178	-0.179	1	-0.009
RPh satisfaction scale	.401**	.259**	.413**	.317**	-.234*	.362**	.527**	.497**	-0.009	1

Table 23.5 contd…

Correlation Matrix for work environment or work culture related variables

	Input in pcy oper. Scale	Input in prof. role scale	Emphasis people scale	Emphasis innov. scale	Emphasis business scale	Innovativeness scale	Communication scale	Service orientation scale	Dispensing orientation scale	RPh satisfaction scale
Population	-0.014	0.113	-0.144	0.052	.205*	-0.033	0.042	.217*	-0.044	0.016
Population / RPh	0.069	0.098	0.116	-0.07	0.18	0.096	0.097	0.088	0.044	0.126
Population / pharmacy	0.042	.241*	0.046	0.141	.294**	0.132	0.105	.235*	0.089	0.066
Population / physician	0.098	0.013	0.171	-0.043	-0.105	0.009	0.156	0.024	-0.161	0.096
Senior population	0.017	0.103	-0.096	0.142	0.18	0.037	0.072	.206*	-0.051	0.008
Seniors / RPh	0.128	0.078	.188*	0.013	0.139	0.162	0.113	0.068	0.024	0.124
Seniors / pharmacy	0.145	.206*	.206*	.277**	.234*	.280**	0.179	.204*	0.065	0.077
Seniors / physician	0.122	-0.027	.198*	-0.015	-0.114	0.064	0.166	0.02	-0.154	0.103
RPhs / pharmacy	0.013	0.09	-0.036	.220*	0.109	0.098	-0.05	0.067	0.041	-0.007
Proportion seniors	0.14	-0.114	.240*	.206*	-0.152	.204*	0.071	-0.067	-0.05	-0.009
Per capita income	0.063	0.106	0.011	0.064	0.003	0.008	0.024	.250**	-0.176	0.059
Rurality	-0.008	-0.062	0.158	0.001	-0.064	0.115	0.027	-0.055	-0.02	-0.036

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

a Cannot be computed because at least one of the variables is constant.

Table 23.6
Correlation Matrix for external variables

	Population	Population / RPh	Pop/pcy	Pop/phy	Sen pop	Sen/rph	Sen/pcy	Sen/phy	RPhs / pcy	Prop sen	Per cap inc	Rurality
Vacancy	0.098	0.078	0.108	-0.166	0.118	0.078	0.094	-0.143	0.111	-0.048	0.073	-0.097
Ind setting	-0.183	-0.017	-.191*	0.161	-0.165	0.007	-0.109	0.16	-.203*	0.129	-0.136	0.064
RPh left	.221*	-0.168	0.041	-0.1	.210*	-.193*	-0.069	-0.107	.203*	-0.154	.229*	-.208*
RPh hired	-0.144	-0.032	-.216*	0.039	-0.121	0.013	-0.144	0.056	-0.124	0.122	-0.139	0.036
Number RPh left	.191*	-0.134	0.076	-0.102	0.18	-0.154	-0.009	-0.104	.188*	-0.12	0.16	-.204*
Number RPh hired	0.183	0.04	.211*	-0.045	0.162	-0.011	0.13	-0.063	0.104	-0.136	0.153	-0.036
Months to hire	0.074	-0.255	-0.08	-0.135	0.1	-0.208	-0.084	-0.138	0.231	0.03	0.105	-0.105
Sign-on bonus given	0.102	0.132	0.154	-0.141	0.138	0.149	.207*	-0.104	0.085	0.051	0.097	-0.157
Gross hourly wage	-0.101	-0.041	0.049	-.201*	-0.086	-0.015	0.084	-0.151	0.12	0.075	-0.039	0.04
Work weekends	0.189	-0.004	0.167	-.200*	0.184	-0.043	0.067	-.213*	0.155	-0.148	0.102	-0.12
Easy/v.easy vac	0.039	-0.069	-0.066	0.054	0.032	-0.054	-0.09	0.05	0.062	-0.03	0.084	-0.043
Hours weekdays	0.173	-0.119	.196*	-0.146	0.157	-0.14	0.102	-0.157	.248**	-0.141	.210*	-0.176
Hours Saturdays	0.047	-0.141	0.037	-0.013	0.049	-0.106	0.037	0.005	.214*	-0.004	0.139	-0.13
Hours Sundays	0.093	-0.113	0.147	-0.128	0.084	-0.115	0.091	-0.128	.264**	-0.08	0.137	-0.105
Wkld breaks scale	0.117	-0.15	0.077	-.212*	0.075	-.185*	-0.056	-.215*	.236*	-0.161	0.157	-0.167
Rxs/day	0.028	-0.147	0.066	-.191*	0.05	-0.121	0.066	-0.164	.247**	0.014	0.102	-0.123
Rxs/day/disp staff	-.262**	0.039	-0.144	0.046	-.260**	0.087	-0.053	0.05	-0.108	0.147	-0.102	0.104
Rxs/day/RPh	-0.169	-0.027	-0.18	-0.084	-0.124	0.023	-0.1	-0.071	-0.05	0.129	-0.11	0.049
Rxs pvt. 3rd party	.420**	-0.119	0.106	-0.003	.394**	-0.171	-0.063	-0.024	0.175	-.238*	.392**	-0.169
Tech / 100 Rxs	.244**	-0.076	0.041	-0.096	.252**	-0.109	-0.041	-0.101	0.063	-0.132	0.087	-0.129
Supp staff / 100 Rxs	.253**	-0.074	0.044	-0.098	.262**	-0.109	-0.039	-0.103	0.062	-0.136	0.087	-0.134
Disp. aiding tech.	.281**	-0.08	.222*	-.279**	.322**	-0.085	.193*	-.260**	.282**	-0.08	0.16	-.223*

Table 23.6 contd...
Correlation Matrix for external variables

	Population	Pop/rph	Pop/pcy	Pop/phy	Sen pop	Sen/rph	Sen/pcy	Sen/phy	Rps/pcy	Prop sen	Per cap inc	Rurality
RPh time consult	0.091	-0.031	0.085	-0.115	0.099	-0.039	0.066	-0.113	0.062	-0.042	0.131	0.004
RPh time med. disp.	-0.149	0.053	-0.052	0.093	-0.159	0.077	0	0.108	-0.032	0.093	-0.172	0.065
PCS/DSM offered	0.077	0.097	0.068	0.126	0.057	0.073	0.032	0.105	-0.038	-0.069	0.127	0.084
3 or more PCS/DSM	0	.200*	0.137	-0.041	0.016	.206*	.193*	-0.034	-0.046	0.04	0.048	0.051
Scheduled time	.372**	0.005	0.137	-0.122	.444**	-0.025	0.098	-0.115	0.036	-0.087	0.07	-0.228
PCS/DSM when 2 RPh	0.082	-0.02	.262*	-0.031	0.052	-0.075	0.152	-0.035	0.191	-0.166	-0.019	-0.194
Pcy paid for PCS/DSM	0.123	-0.078	-0.06	0.107	0.171	-0.076	-0.06	0.112	-0.029	-0.01	-0.012	-0.096
Hrs/pcy in PCS/DSM	-0.131	-0.014	-0.096	-0.015	-0.087	0.07	0.062	0.038	-0.111	.348**	-0.06	0.231
FTE RPhs reqd.	0.151	-0.078	.211*	-0.116	0.16	-0.08	0.167	-0.111	.298**	-0.071	0.139	-.228*
Input in pcy oper. sc	-0.014	0.069	0.042	0.098	0.017	0.128	0.145	0.122	0.013	0.14	0.063	-0.008
Input in prof. role scale	0.113	0.098	.241*	0.013	0.103	0.078	.206*	-0.027	0.09	-0.114	0.106	-0.062
Emphasis people scale	-0.144	0.116	0.046	0.171	-0.096	.188*	.206*	.198*	-0.036	.240*	0.011	0.158
Emphasis innov. scale	0.052	-0.07	0.141	-0.043	0.142	0.013	.277**	-0.015	.220*	.206*	0.064	0.001
Emphasis business sc	.205*	0.18	.294**	-0.105	0.18	0.139	.234*	-0.114	0.109	-0.152	0.003	-0.064
Inn sc	-0.033	0.096	0.132	0.009	0.037	0.162	.280**	0.064	0.098	.204*	0.008	0.115
Comm scale	0.042	0.097	0.105	0.156	0.072	0.113	0.179	0.166	-0.05	0.071	0.024	0.027
Service orientation sc	.217*	0.088	.235*	0.024	.206*	0.068	.204*	0.02	0.067	-0.067	.250**	-0.055
Disp or scale	-0.044	0.044	0.089	-0.161	-0.051	0.024	0.065	-0.154	0.041	-0.05	-0.176	-0.02
Rph sat scale	0.016	0.126	0.066	0.096	0.008	0.124	0.077	0.103	-0.007	-0.009	0.059	-0.036

Table 23.6 contd…
Correlation Matrix for external variables

	Population	Population / RPh	Population / pharmacy	Population / physician	Senior population	Seniors / RPh	Seniors / pharmacy	Seniors / physician	RPhs / pharmacy	Proportion seniors	Per capita income	Rurality
Population	1	-.219*	.437**	-.205*	.958**	-.368**	0.045	-.280**	.503**	-.638**	.694**	-.599**
Population / RPh	-.219*	1	.418**	.195*	-.262**	.947**	.560**	.201*	-.527**	0.077	-.286**	.290**
Population / pharmacy	.437**	.418**	1	-0.051	.336**	.267**	.789**	-0.087	.422**	-.418**	.197*	-.285**
Population / physician	-.205*	.195*	-0.051	1	-.222*	.224*	0.057	.979**	-.295**	0.157	-0.107	0.151
Senior population	.958**	-.262**	.336**	-.222*	1	-.341**	0.085	-.265**	.498**	-.433**	.641**	-.570**
Seniors / RPh	-.368**	.947**	.267**	.224*	-.341**	1	.595**	.277**	-.530**	.373**	-.344**	.401**
Seniors / pharmacy	0.045	.560**	.789**	0.057	0.085	.595**	1	0.113	.226*	.209*	-0.077	0.014
Seniors / physician	-.280**	.201*	-0.087	.979**	-.265**	.277**	0.113	1	-.291**	.310**	-0.153	.237*
RPhs / pharmacy	.503**	-.527**	.422**	-.295**	.498**	-.530**	.226*	-.291**	1	-.271**	.493**	-.450**
Proportion seniors	-.638**	0.077	-.418**	0.157	-.433**	.373**	.209*	.310**	-.271**	1	-.403**	.538**
Per capita income	.694**	-.286**	.197*	-0.107	.641**	-.344**	-0.077	-0.153	.493**	-.403**	1	-.344**
Rurality	-.599**	.290**	-.285**	0.151	-.570**	.401**	0.014	.237*	-.450**	.538**	-.344**	1

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)
a Cannot be computed because at least one of the variables is constant.