Defining Practice Populations
For Primary Care:

Methods and Issues

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**Manitoba Centre for
Health Policy and Evaluation**
Department of Community Health Sciences
Faculty of Medicine, University of Manitoba

Verena Menec, PhD
Charlyn Black, MD, ScD
Noralou P Roos, PhD
Bogdan Bogdanovic, BComm, BA
Robert Reid, MD, PhD

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MCHPE undertakes several major research projects, such as this one, every year under contract to Manitoba Health. In addition, MCHPE researchers secure major funding through the competitive grants process. Widely published and internationally recognized, they collaborate with a number of highly respected scientists from Canada, the United States and Europe.

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EXECUTIVE SUMMARY

Introduction

Primary care has been described as the cornerstone of health care because it provides an entry point for individuals into the health care system. However, there is now increasing recognition in Canada that changes are called for in the funding of the primary care system which, for the most part, is based on a fee-for-service payment system (Advisory Committee on Health Services, 1995). Proposals for primary care reform have therefore stressed the need for alternative funding and payment models (capitation and blended), as being critical to improving the system.

A fee-for-service system is recognized as providing the wrong signals to physicians, given that more services provided translate into higher incomes. In contrast, capitation (population-based) funding is thought to place greater emphasis on patients and their needs and less on the services provided (Advisory Committee on Health Services, 1995). Under a capitation system, practice revenue is determined by the capitation fee (the amount paid per patient) and the size of the practice population, regardless of the quantity of services provided. Capitation may be supplemented with fee-for-service or salary components in a blended funding system.

For both of these alternative payment approaches (purely capitated or blended with a capitation component), the mechanism by which patients are assigned to practices, as well as the size of practice populations become important issues to consider. Similarly, the characteristics of these patients is critical and capitation formulae have to adjust for factors that reflect patients' differential need for health care services, such as their age and sex, to ensure equitable funding across practices.

Typically, capitation funding is being considered for patients who are enrolled, or rostered with a practice (Advisory Committee on Health Services, 1995). However, an alternative approach is to define practice populations on the basis of existing utilization patterns. A major advantage of this approach is that it does not require patients to register with one physician. Given Manitoba Health's interest in alternative funding models, the Manitoba

Centre for Health Policy and Evaluation was asked to examine some of the implications of using this second approach; that is, when patients are assigned to a practice population if they receive the majority of their care from the same clinic (e.g., if they receive 75% of their care from the same clinic). We refer to these individuals as the "assigned practice population" or "regular patients". The present report focuses on two major issues: 1) How do different criteria for defining assigned practice populations compare? For example, how many patients are assigned to a practice population if they receive 60% versus 75% of their care from that group? And 2) What are the characteristics of patients assigned to practice populations, in terms of gender, age, socioeconomic status and health status?

Methods and Results

The term "assigned practice populations" is used in this report to refer to patients who received the majority of their care from the same group of general/family practitioners. For example, a patient who made four ambulatory visits to general/family practitioners over the course of the three-year study period (1994-96), three of which were made to the same group, would be assigned to the practice population of that group when applying a 75% majority-of-care definition. We also refer to these patients as "regular patients". It is important to note here that we defined assigned practice populations exclusively on the basis of visits to general/family practitioners. Thus, visits to specialists did not affect whether a person was assigned to the practice population of a group of general/family practitioners.

We focused on large groups of general/family practitioners consisting of at least four full-time physicians, because in discussion with Manitoba Health it was felt that groups with less than four physicians might have difficulty providing continuous 24-hour service. Smaller groups and solo physicians would therefore be less likely to be considered for alternative funding mechanisms by Manitoba Health. Included in the study were 29 major groups, 14 in rural areas, and 15 in urban areas (Winnipeg and Brandon).

Criteria for Defining Practice Populations

Comparing Majority-of-Care Definitions

We started out by comparing the size of assigned practice populations using different percentage cut-offs for defining assigned practice populations. Changing the majority-of-care definition had quite a substantial impact on the size of practice populations. For example, while 1338 patients (per physician) of urban groups were classified as regular patients with a 50% definition (which means that they had to receive at least 50% of their care from the same group), only 911 were classified as such with an 80% definition (a 31.9% decrease). The size of the assigned practice populations also varied markedly across groups. With a 75% definition, for instance, assigned practice populations (per physician) ranged from 1378 to 544 patients.

We next examined what percentage of the total practice populations (that is, all patients visiting the 29 groups over the three-year period) were regular patients. Clearly evident across all majority-of-care definitions was a large difference between rural and urban groups: With a 75% definition, for example, 59.9% of the total practice population were regular patients for rural groups, as compared to 38.3% for urban groups. Again, a great deal of variability was also found across groups, with 68.1% to 14.9% of the total practice population being regular patients, using a 75% majority-of-care definition.

Does the Size of Practice Populations Vary by Number of Years of Data?

How many years of data should be used in defining assigned practice populations? We addressed this question by comparing assigned practice populations based on one year, two years, and three years of data. Using only two years, as compared to three years of data, did not change the number of regular patients (per physician) much. However, using only one year of data reduced the assigned practice populations (per physician) quite substantially, especially for rural groups, indicating that the results are unstable when using less than two years of data.

The Impact of Low-Users

Low-users, that is individuals who have only one, two, or three physician contacts over a given time period require special consideration, as the majority-of-care definitions do not conveniently apply to them. If a person makes only one visit, for instance, she or he is *ipso facto* classified as a regular patient of that group. Over a three-year period, 18.5% of the patients visiting the 29 groups were low-users. These low-users were more likely to be classified as regular patients than patients with four or more physician contacts. Low-users tended to be male, younger and healthier than high-users

Characteristics of Assigned Practice Populations

The patient mix of assigned practice populations differed quite considerably across groups. While some assigned practice populations consisted of many older patients, others had large proportions of young patients below the age of 18. Some groups had large proportions of regular patients from poor neighbourhoods, whereas others consisted mostly of patients from wealthy neighbourhoods. Similarly, the assigned practice populations of some groups were composed of mostly healthy patients, while others had a substantial proportion of sick patients.

In addressing the question of what factors predict whether an individual received the majority of care from the same group, we found that older patients, individuals from wealthier neighbourhoods, and healthier patients were more likely to be regular patients. For rural groups, female patients were also more likely to be regulars than male patients.

Discussion and Recommendations

Practice populations for capitated systems (or blended funding systems with a capitation component) are typically defined in terms of patients who formally register with a physician or physician group. Less common is the approach taken in the present report whereby practice populations are defined on the basis of utilization patterns. Should Manitoba Health pursue the issue of alternative funding schemes for primary care, the relative advantages and disadvantages of defining practice populations on the basis of utilization patterns versus a formal rostering system therefore need to be carefully considered. The findings of the

present report are useful as they highlight several critical issues when assigning practice populations based on utilization.

- The percentage cut-off used to assign patients to a practice (e.g., a 60% versus a 75% majority-of-care definition) had a substantial effect on the size of assigned practice populations. A final recommendation about what percentage cut-off is most appropriate cannot be made based on this study. This decision should be based on a clearer understanding of the kind of alternative funding system being pursued. However, our findings indicate that several issues should be carefully considered:

  - Overall, assigned practice populations were relatively small. This suggests that few of the large provider groups could easily move toward a funding system solely based on capitation. Thus, a blended funding system that combines capitation with other funding components seems most appropriate, given existing utilization patterns.

  - The 29 major groups examined in the present study differed markedly in terms of the size of assigned practice populations. Development of alternative funding approaches will therefore require consideration of the potential impact of blended funding formulae on different provider groups, as well as assessment of the minimum size assigned practice populations should be to make a clinic financially viable. These issues should be examined in light of potential system-level effects of moving toward blended funding systems for primary care practices.

  - Clear rural/urban differences emerged in some of our analyses. It would appear critical to consider these differences when developing alternative funding schemes. For example, an adjustment for the location of the practice (rural versus urban) might be applied to the capitation formula.

- How many years of data should be considered in defining assigned practice populations? We recommend that at least two years of data be used. Two years may be preferable over a greater number of years for two reasons: First, it requires less administrative data, and

second, the populations would be based on recent data and would be more sensitive to changes in practices that encourage or discourage patients to become regular users.

- A substantial proportion of patients visiting the 29 major groups were low-users. Should these low-users be excluded from assigned practice populations? We do not recommend this approach. But we suggest that in modeling alternative funding formulae, attention be paid to the extent to which assigned practice populations are composed of low-users.

- Furthermore, patient differences should be taken into account when developing capitation formulae, as uniform capitation fees, or capitation fees adjusted for age and gender only, would be biased. To ensure equitable funding, the capitation component of a blended funding formula should consider age, gender, socioeconomic status and health status.

- Finally, we recommend that, for the purpose of data collection, a code be introduced that identifies whether a physician is affiliated with a group.

1.0   INTRODUCTION

Primary care has been described as the cornerstone of health care because it provides an entry point for individuals into the health care system. However, there is now increasing recognition that changes are needed in the way the primary care system is funded, as well as in the way health care is delivered. Provincial governments, physicians and academics alike have called for a reform of the primary care systems, with primary reform proposals emphasizing the need for alternative funding and payment models, that is alternatives to the current fee-for-service system, and a shift towards multi-disciplinary team practices. In such practices, a variety of health care providers (e.g., nurse practitioners, physical therapists) would work along-side physicians, thereby increasing access to and integration of services.

Several recent reports have particularly focused on alternative payment and funding models,[1] including capitation, as being critical to improving the primary health care system. The Barer - Stoddart (1991) report, for example, emphasized that: "Although there is no single best way to pay physicians in all circumstances, too little use is made of alternatives to fee-for-service as a payment method in Canada." The call for capitation as an alternative funding model was further explored in the "Kilshaw report" (Advisory Committee on Health Services, 1995) and the College of Family Physicians of Canada (1995) advocates blended payment mechanisms that would potentially involve a capitation component.

Most physicians in Canada are paid on a fee-for-service basis in that they receive a particular fee per service provided. However, the fee-for-service payment method has been criticized for providing the wrong signals to physicians, as income depends on the number of services provided, regardless of who receives the services and what consequences they have for patients' health (Birch, Goldsmith, & Makela, 1994). Moreover, fee-for-service payment has been identified as being incompatible with promoting the most productive use of the time and skills of physicians.

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[1] Funding refers to how the medical care budget is allocated to physicians, whereas payment relates to how physicians are actually paid. In Canada's predominantly fee-for-service system the two are interchangeable. However, with alternative funding models, a group practice may receive capitation funding, but could pay physicians (and other providers) by salary, capitation, fee-for-service, or a blended payment method. In the present report, we use the term capitation funding while acknowledging that capitation may also be used for physician payment.

Capitation (population-based) funding differs from the fee-for-service system in that it is thought to place greater emphasis on patients and their needs and less on the number of services provided (Advisory Committee on Health Services, 1995). Moreover, it presumably fosters physician-initiated care, such as health promotion activities. Under a capitation system, practice revenue[2] is determined by the capitation fee (the amount paid per patient) and the size of the practice population, regardless of the quantity of services provided. Capitation may be combined with fee for service, salary, payments for achieving specified outcomes or other components in a blended funding system.

In a capitated system (whether it be purely capitated or a component of a blended funding approach), the mechanism by which patients are assigned to practices and the size of practice populations become important issues to consider. Similarly, the characteristics of these patients is critical and capitation formulae have to adjust for factors that reflect patients' differential need for health care services, such as patients' age and gender, to ensure equitable funding of practices for similar responsibilities and to minimize under- or over-payment for patients needing either more or less care.

Two major approaches to defining practice populations have been considered. The most commonly used method is to roster patients to physicians or physician groups, and the discussion on capitation has, therefore, become intimately tied to the issue of patient rostering (Lomas, Abelson, & Hutchison, 1995). Rostering is typically defined as the process by which individuals formally register with a chosen health care provider or a group of health care providers. The Advisory Committee on Health Services (1995), for example, recommended that capitation funding should be limited to primary care organizations with rostered patient populations.

Capitation associated with patient rostering has been in use in a number of European countries for many years (e.g., Denmark, the UK, and the Netherlands). In Canada, the

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[2] The term practice revenue is used here to reflect the fact that a group practice may receive capitation funding, but internally decides how physicians and other members of the team practice are paid.

Health Service Organizations (HSO) in Ontario have almost three decades of experience with a capitation payment system and rostering (Rachlis, 1997). Other provinces have more recently followed suit by introducing pilot projects, with Saskatchewan for example starting three pilot clinics involving capitation and formal rostering. Similarly, Alberta, Ontario, Quebec and Nova Scotia have, or are about to launch pilot projects that will incorporate a capitation-based funding scheme and rostering (Rich, 1998; Wanamaker, 1998).

While patient rostering represents the most common method to define the populations to which a capitation fee is applied, an alternative approach that is being considered in Manitoba is to define practice populations on the basis of existing health care utilization patterns. This approach has been examined in conjunction with the Assiniboine Clinic pilot project, a 14 family physician clinic located in Winnipeg. As part of this pilot, Manitoba Health has looked at the potential for a blended funding system where the capitation portion would be allocated for patients who are "assigned" to the clinic if they received at least 75% of their services from that clinic.

Both a formal rostering system and a system whereby patients are assigned to practices on the basis of existing utilization patterns have their advantages and disadvantages. For example, while rostering formalizes the relationship between patients and providers (or provider groups), thereby promoting patient/provider accountability and responsibility, it may also supply an incentive for trying to attract predominantly healthy patients to a practice. Indeed, this problem arose in Ontario where the rostered patients of the Health Services Organizations were healthier than average (Rachlis, 1997). Perhaps the greatest challenge to introducing a formal rostering system is the perception that registering with a provider or provider group infringes on individuals' right to choose their physician. A major advantage of defining practice populations on the basis of existing utilization patterns is, therefore, that patients are not required to register with one physician or clinic.

Given Manitoba Health's interest in alternative funding models (capitation and blended), the Manitoba Centre for Health Policy and Evaluation was asked to examine some of the implications of defining practice populations based on existing utilization patterns; that is, when patients are assigned to a practice population if they receive the majority of their care from the same clinic (e.g., if they receive 75% of their care from the same clinic). We refer to the individuals who receive a designated proportion of their care from the same clinic as the "assigned practice population". More specifically, the present report tries to answer the following questions:

- How do different criteria for assigning patients to practice populations compare? For example, how many patients are assigned to a practice population if they receive 60% versus 75% of their care from that group?
- To what extent do assigned practice populations vary when they are based on three years, two years, or only one year of data?
- What proportion of patients assigned to a practice population are low-users (e.g., individuals who have only one physician contact over a three-year period) and should these low-users be included in the assigned practice populations?
- Does the size of assigned practice populations differ for urban versus rural groups of physicians?
- What are the characteristics of patients who receive the majority of their care from the same provider group (in terms of gender, age, socioeconomic background, and health status)?

2.0   METHODS

2.1   Defining Assigned Practice Populations

Practice populations were examined over a three-year period (fiscal years 1994/95, 1995/96, 1996/97)[3] using the Manitoba Health Research database. The focus of the report was specifically on large groups of general/family practitioners and visits to general/family practitioners, which took place in an office, personal care home, and emergency room. That is, all contacts with general/family physicians except those that occurred when an individual was a patient in a hospital – we refer to these as ambulatory visits (see Appendix 1 for details).[4]

We differentiate in the present report between *total* practice populations, which involve all the patients who visited a group of physicians at least once during the study period, and *assigned* practice populations, or individuals who received the majority of their care from the same group. To determine the size of assigned practice populations, we first had to establish where each patient received primary care services. If a given level of ambulatory visits (e.g., 75%) was incurred from the same group of general/family practitioners, the patient was assigned to the practice population of that group.

For example, if a patient made four ambulatory visits in total over the course of the three-year study period and three times went to the same group, then she or he was assigned to the practice population of that group when applying a 75% majority-of-care definition. The term "regular patients" is used throughout this report to refer to individuals who received the majority of their care from the same provider group and, hence, were members of the assigned practice population.

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[3] The fiscal year starts on April 1 and ends on March 31.
[4] We defined practice populations in terms of visits, rather than services (e.g., laboratory tests), as patients who receive a large number of services from the same provider could be assigned to the practice population of one group, even though most of their visits were incurred at another group.

It is important to note here that the study focussed only on visits to general/family practitioners. Thus, visits to specialists did not enter into the picture and did not affect whether a person was assigned to the practice population of a group of general/family practitioners. For example, an individual may have made a total of two visits to a general/family practitioner over the three-year study period, both times to the same group of physicians. This person was assigned to the practice population of that provider group even if she or he also made three visits to a specialist. Details regarding the methods used in this report and a glossary of terms are presented in Appendix 1.

2.2   Identifying Provider Groups

We focussed in the present report on large provider groups because in discussion with Manitoba Health it was felt that groups with less than four physicians might have difficulty providing continuous, 24-hour-a-day service. Smaller groups and solo physicians would therefore be less likely to be considered for alternative funding models by Manitoba Health. Consistent with this, the Advisory Committee on Health Services (1996) recommended that patients formally roster with a group of physicians rather than solo practitioners.

There is currently no simple way for Manitoba Health to identify physician groups, as there is no group identifier available that indicates whether a physician is affiliated with a group or is working in a solo practice. In order to identify physicians who were practicing out of the same practice location, we therefore used a special code that many physicians now use to file claims electronically. Physicians affiliated with the same group have the same code, as they file claims from the same location (see Appendix 1 for further details). While this method cannot capture physicians who still file paper claims and therefore do not have such an identifier, we were able to link a major proportion of physicians to groups if indeed they were practicing in a group setting (see below for details).

Three major selection criteria were applied to select provider groups for the present study: First, there had to be four or more general/family practitioners (individuals) in the group. Second, in order to take into account that some physicians did not work in the same group practice setting for the entire study period and that some worked only part-time, the group

had to have at least four full-time equivalent (FTE) general/family practitioners. For the present purposes, we calculated an FTE measure based on the average workload of a general/family practitioner (see Appendix 1 for details). Third, in order to allow meaningful comparisons, we included only groups for which we had at least 24 months of data.

Twenty-nine groups met all three criteria. As Table 1 shows, we included 15 urban groups (13 in Winnipeg and two in Brandon) and 14 rural groups (11 Southern and three Northern). A total of 528,905 patients visited these groups at least once during the three-year study period, representing about half of the population of Manitoba. On average, rural groups had 12.1 general/family practitioners, and urban groups 15.1 physicians. This count is based on *all* the physicians who worked in the group over the three-year study period, including those who worked only part-time and those who moved from one group to another during the three-year period. As a consequence, the average number of FTEs per group is considerably smaller: 8.1 for rural clinics and nine for urban ones. Overall, urban groups had a considerably larger patient load (356,335 discrete patients) than rural groups (194,612).[5]

About half of the groups (15) were composed of general/family practitioners only. The remaining groups also had specialists. However, for the purpose of the present study we focussed only on ambulatory visits to the general/family practitioners in the groups. Only one of the 29 groups consisted mainly of salaried physicians, whereas all the other groups were paid almost exclusively with a fee-for-service system.[6]

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[5] As noted in Table 1, the number of discrete patients for rural and urban groups do not add up to the total number of patients because some individuals (22,042) visited both rural AND urban groups.

[6] It should be noted here that four of the 15 urban groups function primarily as walk-in clinics. Although these clinics would be expected to have smaller assigned practice populations than non-walk-in clinics, they were included in the present study to allow examination of a wide range of physician groups.

Table 1: Provider Groups and Study Population

	Rural	Urban	All
Number of Groups	14	15	29
Average no. of physicians/group	12.1	15.1	13.7
Average no. of FTEs/group	8.1	9.0	8.6
Total no. of patients	194,612	356,335	528,905[a]

Note: Urban groups include 13 Winnipeg and two Brandon groups; rural groups include 11 Southern and three Northern groups. [a]22,042 patients went to both urban and rural groups; the number of patients for urban and rural groups therefore does not add up to the patients for all the groups.

As Figure 1 shows, by focussing on these 29 large groups, we ended up describing the practice populations of approximately one third of Manitoba's general/family practitioners (representing 249.4 FTEs). Note that we essentially excluded about one third of general/family practitioners (270 FTEs) as they lacked an identifier that indicated whether they worked in a group setting or solo practice. An additional 307.3 FTEs had an identifier, but were either affiliated with a large group not included in the study (primarily because they had less than 24 months of data) or with groups too small to meet our selection criteria or they worked in a solo practice. Nevertheless, as was displayed in Table 1, by including 29 large groups we captured approximately half of the population of Manitoba.

Figure 1: How Many General/Family Practitioners Are We Capturing? (In Full-Time Equivalents)

Unknown (physicians without group identifier) 270 FTEs

Affiliated with 29 groups in study 249.4 FTEs

Groups/solo GPs not included in study 307.3 FTEs
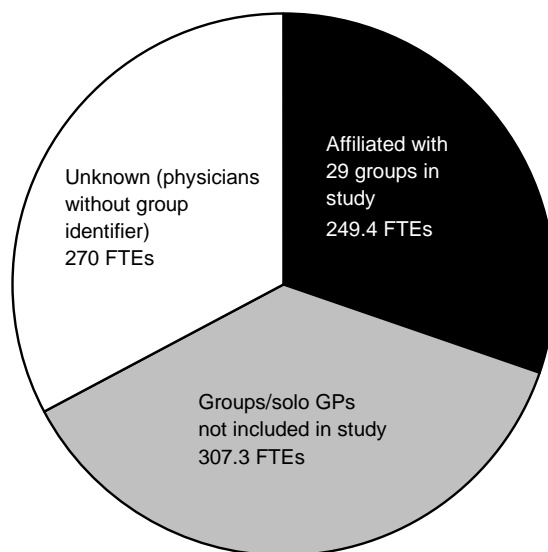
3.0   RESULTS AND DISCUSSION

3.1   Comparing Criteria for Defining Assigned Practice Populations

Comparing Majority-of-Care Definitions

We started out by comparing the size of assigned practice populations using different percentage cut-offs for defining who should be considered a regular patient – we refer to these different cut-offs as majority-of-care definitions. If patients have to obtain 80% of their visits from the same group in order to be assigned to a practice population then its size would be expected to be much smaller than if a 50% criterion is applied, whereby individuals only have to receive at least half of their visits from the same group.

Saskatchewan, in setting up a pilot project involving capitation payment, initially considered a 75% definition, according to which a patient is classified a regular patient of a group if at least 75% of visits are obtained from that clinic.[7] Following Saskatchewan's example, Manitoba Health also adopted a 75% definition in the context of the Assiniboine Clinic pilot project. Yet no research to date has systematically examined the effects of different majority-of-care definitions on the size of assigned practice populations.

Figure 2 shows a comparison of assigned practice populations using different majority-of-care definitions (50%, 60%, 65%, 70%, 75% and 80%), aggregated across rural and urban groups. As groups varied greatly in size, that is the number of affiliated physicians, we defined assigned practice populations in terms of the number of regular patients per FTE physician in that group.

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[7] Saskatchewan started out by defining the practice populations of their pilot projects on the basis of utilization patterns, but then moved to a formal rostering system.

**Figure 2: Assigned Practice Populations (per Physician)
Given Different Majority-of-Care Definitions**
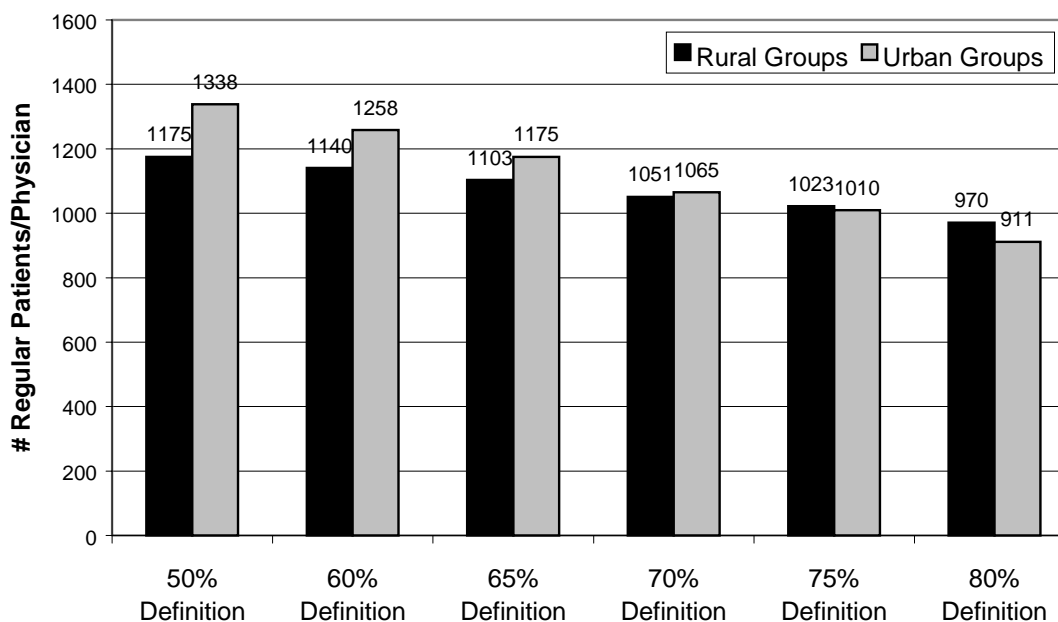
Changing the majority-of-care definition had quite a substantial impact on the size of assigned practice populations. While 1338 patients of urban groups (per physician) were classified as regular patients with a 50% definition, only 911 were classified as such with an 80% definition (a 31.9% decrease). The impact was not as large for rural groups: on average 1175 patients (per physician) received the majority of care from the same group with a 50% definition, as compared to 970 with an 80% definition (a 17.4% decrease).

This discrepancy in the effect of different majority-of-care definitions for rural versus urban groups can be explained in terms of the greater availability of physicians in urban areas. While using a more stringent definition over a more lenient one would have a relatively small effect in rural areas where physicians have a "captive" clientele, the effect would be larger in urban areas where patients can and do choose among many physicians and physician groups.

**Figure 3: Assigned Practice Populations (per Physician)
Using 60% and 75% Majority-of-Care Definitions**
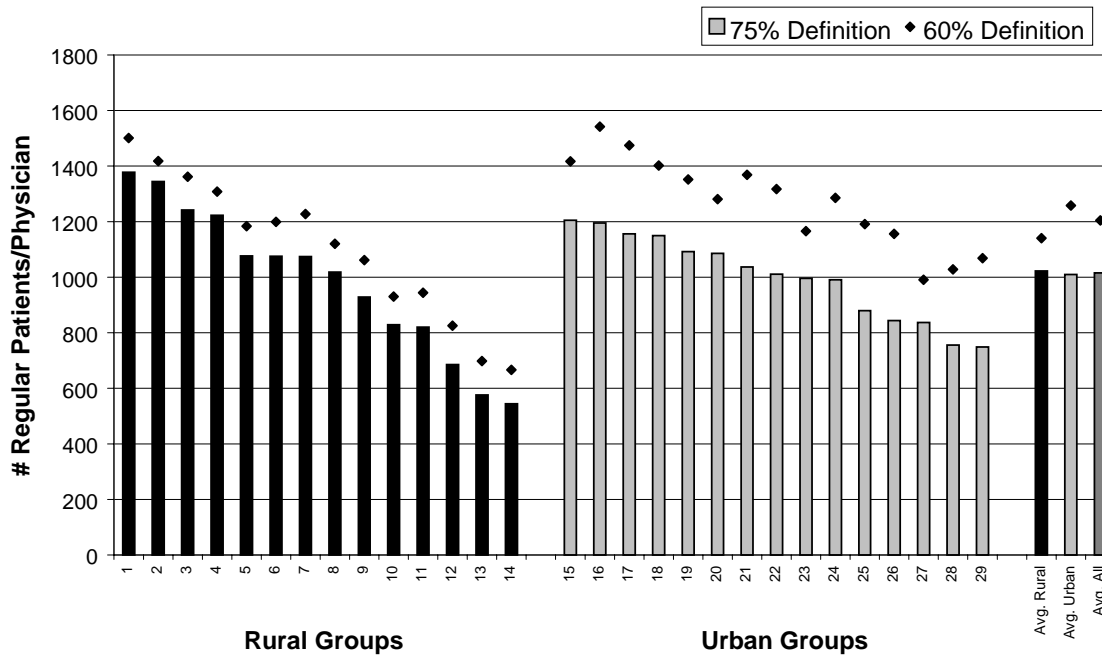
In order to examine the variability in size of assigned practice populations across groups, Figure 3 shows the assigned practice populations (per physician) for each of the 29 groups. In Figure 3, 75% versus 60% majority-of-care definitions are graphed for illustrative purposes. Not only is the number of regular patients relatively small on average (the overall average was 1016 with a 75% definition versus 1204 with a 60% definition), but assigned practice populations varied markedly for the 14 rural groups: With a 75% definition, rural Group 1 with the largest assigned practice population had 1378 regular patients (per physician), whereas Group 14 with the smallest assigned practice populations had only 544 patients (per physician) who received the majority of their care from that group. Similarly, for the 15 urban groups, assigned practice populations ranged from 1205 to 748 patients per physician.

If we take a practice population of 1000 patients per FTE physician as a standard, for example, we find that changing the majority-of-care definition had little effect on rural groups. While eight rural groups had practice populations of at least 1000 patients with a

75% definition, only one additional group reached the 1000 patient standard with a 60% definition. In contrast, for urban groups, ten groups had practice populations of approximately 1000 patients with a 75% definition; with a 60% definition all 15 groups reached this standard. The effect is even larger when we take 1200 regular patients as a standard in that only two urban groups had assigned practice populations of about 1200 patients with a 75% definition, but ten groups attained that benchmark with a 60% definition.

Nevertheless, the assigned practice populations (per physician) are quite small, even with the most lenient 50% majority-of-care definition (see Figure 2).[8] The question of what size assigned practice populations "should" be to allow transition to a capitation or blended funding model is not easily answered. In the United Kingdom where patients formally register with physicians, the issue of what is an appropriate list size has been debated for some time. One recommendation was that list sizes would ideally consist of 1700 patients per physician, the assumption being that smaller list sizes are linked to better health care (General Medical Services Committee, 1983). In contrast, some individuals have argued that there is no reason why the number of patients on each general practitioners list should not be about 4000, which is well above actual list sizes in the United Kingdom which tend to be under 2000 patients (Marsh, 1991).

A target maximum number of patients on a roster list is also evident in other countries. In the Netherlands, reduced fees are applied for publicly insured patients in excess of 1600 per general practitioner (Hutchison, Hurley, Birch et al., 1997). A pilot project in Norway involving formal rostering and capitation ended up with an average roster size of 1650 patients per physician, with some having as many as 2700 patients rostered and some fewer than 1000 (Østbye & Hunskaar, 1997). The recommendation of the Norwegian Medical Association was to cap roster lists at 2000 patients. In Canada, Ontario has limited the rosters to a maximum of 2500 patients per full-time equivalent physician working for Health Service Organizations (Hutchison, Birch, & Gillet, 1996).

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[8] Assigned practice populations (per FTE physician) were quite small for both rural and urban groups even though our methodology takes into account that rural physicians in general have substantially fewer patients per year on average than urban practitioners (see Appendix 1 for details).

All these maximum numbers are well above the size of the assigned practice populations found in the present study. However, it is important to point out that the assigned practice populations (per physician) shown in Figures 2 and 3 capture only part of the patient care delivered by these physician groups. All of the groups also provided services to a large number of patients who also received care from other practitioners and were, therefore, not considered part of the groups' assigned practice populations. For example, while the assigned practice populations for rural groups ranged from 1378 to 544 patients (per physician), the total practice populations for these groups was much larger, ranging from 2259 to 1705 patients (per physician).[9]

Although the question of the *maximum* number of patients on physicians' rosters has been the centre of much debate, it is noteworthy that less attention has been focussed on the *minimum* number of patients required for a viable practice. As capitation-based funding is directly linked to the size of assigned practice populations (and the capitation fee) it would seem important to consider the number of regular patients provider groups can reasonably expect to serve. When the size of the assigned practice population falls below a certain threshold, capitation funding may pose too great a financial risk for provider groups.

We next examined assigned practice populations expressed in terms of a percentage of the total practice population. That is, if 100 patients contacted a particular group during the three-year study period, constituting the total practice population, and 50 of these patients received the majority of their care (e.g., 75%) from that group, then the group would be described as having 50% of its patients receiving the majority of their care from the group.

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[9] A summary table of total and assigned practice populations using different majority-of-care definitions is provided in Table A1 – Appendix 2.

Comparisons among assigned practice populations (in percentages), given different majority-of-care definitions are provided in Figure 4. Clearly evident across all majority-of-care definitions is the large difference between rural and urban groups. For example, with a 60% definition, 66.8% of the total practice population were regular patients for rural groups, as compared to 47.8% for urban groups. With a 75% definition, the percentages drop down to 59.9% versus 38.3% for rural and urban groups, respectively.

**Figure 4: Assigned Practice Populations (in %)
Given Different Majority-of-Care Definitions**
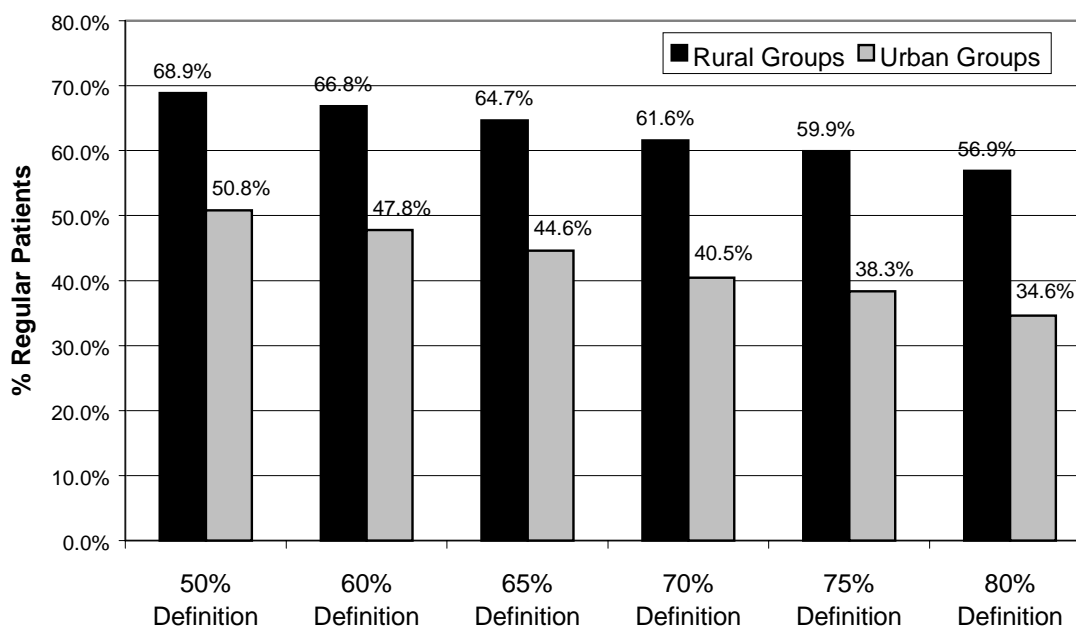
As we saw earlier in terms of the number of regular patients per physician, changing definitions had a slightly larger effect on urban than rural groups. That is, the percentage of regular patients decreased by 12% for rural groups when comparing a 50% versus an 80% majority-of-care definition, but decreased by 16.2% in the case of urban groups. However, it is noteworthy that even with the most lenient 50% definition, whereby patients have to receive at least half of their care from the same group to be considered regular patients, only 51% of patients visiting the urban groups were classified as such.[10]

To allow comparison across the individual groups, Figure 5 shows the percentage of regular patients using 60% and 75% definitions. Note that throughout this report, the groups are presented in the same order to allow comparison across figures and tables.
Group 1, for example, which had the highest number of patients who were regulars with a 75% majority-of-care definition (see Figure 2), emerged only as the fifth highest in terms of the percentage of regular patients (61%).

Striking again is the variability across groups, regardless of whether we use a 75% or a 60% majority-of-care definition, particularly in the case of urban groups. For several urban groups (Groups 21, 26, 28, and 29), less than 20% of patients were regular patients with a 75% definition. Using a 60% majority-of-care definition did not change the results substantially in that still less than 25% of the clinics' patients were regulars.

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[10] Included in the 15 urban groups were four groups that function primarily as walk-in clinics (Groups 21, 26, 28, and 29). Walk-in clinics would be expected to have a smaller percentage of regular patients than other provider groups. However, even when these clinics are excluded from the calculations, only 55.4% of patients were regulars with a 50% definition, 42.6% with a 75% definition.

**Figure 5: Assigned Practice Populations (in %)
Using 60% and 75% Majority-of-Care Definitions**
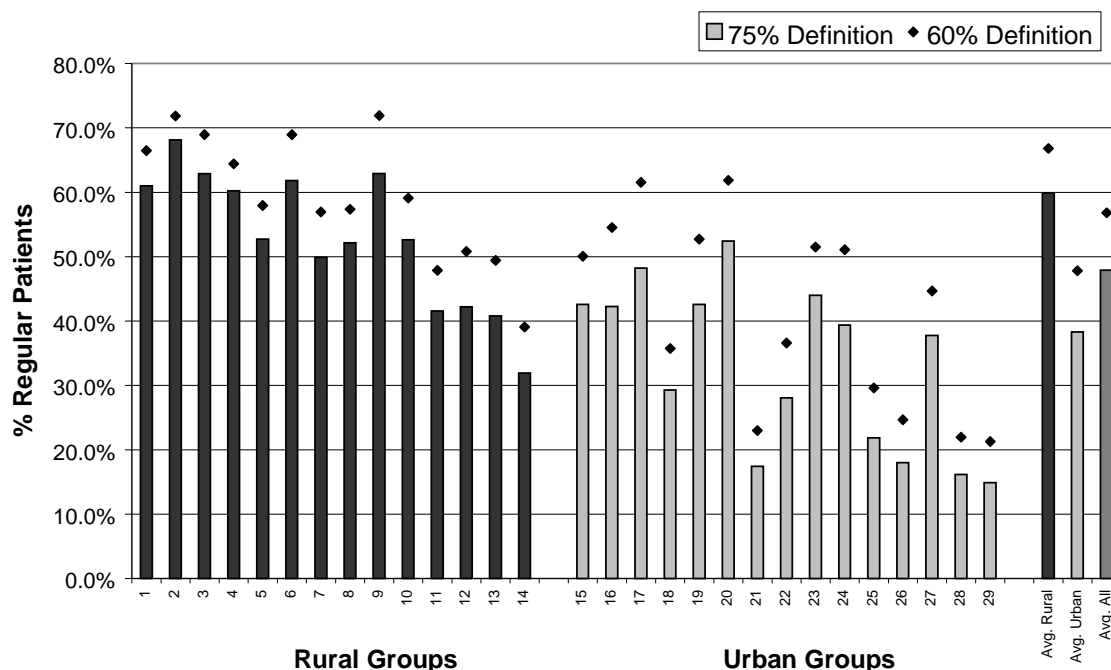
Groups are sorted in the same order as in Figure 1, that is in descending order by the number of regular patients per physician.

Does the Size of Practice Populations Vary by Number of Years of Data?

How many years of data should be used in defining assigned practice populations? To answer this question we compared assigned practice populations based on one year, two years, and three years of data. As Figure 6 shows, the size of assigned practice populations (per FTE physician) does not change much when using three years versus two years of data for either rural or urban groups (e.g., 1023 vs. 1004 patients for rural groups). However, the numbers drop quite substantially when only one year of data are considered, particularly for rural groups (down to 880 patients, representing a 14% decrease over the three-year figures). Thus, assigned practice populations based on only one year of data are quite unstable and at least two years of data are needed for stable results.

Figure 6: Assigned Practice Populations (per Physician) by Number of Years of Data (75% Majority-of-Care Definition)

The Impact of Low-Users

Low-users, that is individuals who have only one, two, or three physician contacts over a given time period require special consideration, as the majority-of-care definitions do not conveniently apply to them. If a person makes only one visit she or he is *ipso facto* classified as a regular patient of that group, regardless of which majority-of-care definition is used. Similarly, individuals who incur only two visits, both at the same group, are assigned to that group, irrespective of the majority-of-care definition used. As a result, these low-users are more likely to be assigned to practice populations than high-users. Patients with only three visits are problematic using a 75% majority-of-care definition, which only really starts to make sense for patients with four visits; only individuals who make three out of four visits to the same group can clearly be assigned to that group.

Figure 7 shows the percentage of all patients who contacted the 29 groups who made one visit, two visits, three visits, or four or more visits. Over a three-year period, 18.5% of the total practice population incurred only one to three visits during the three years. The percentage increased to 29.3% when we considered a two-year time period and over a one-year period, 51% of patients made only one to three visits.

Figure 7: The Percentage of Low-Users by Years of Data
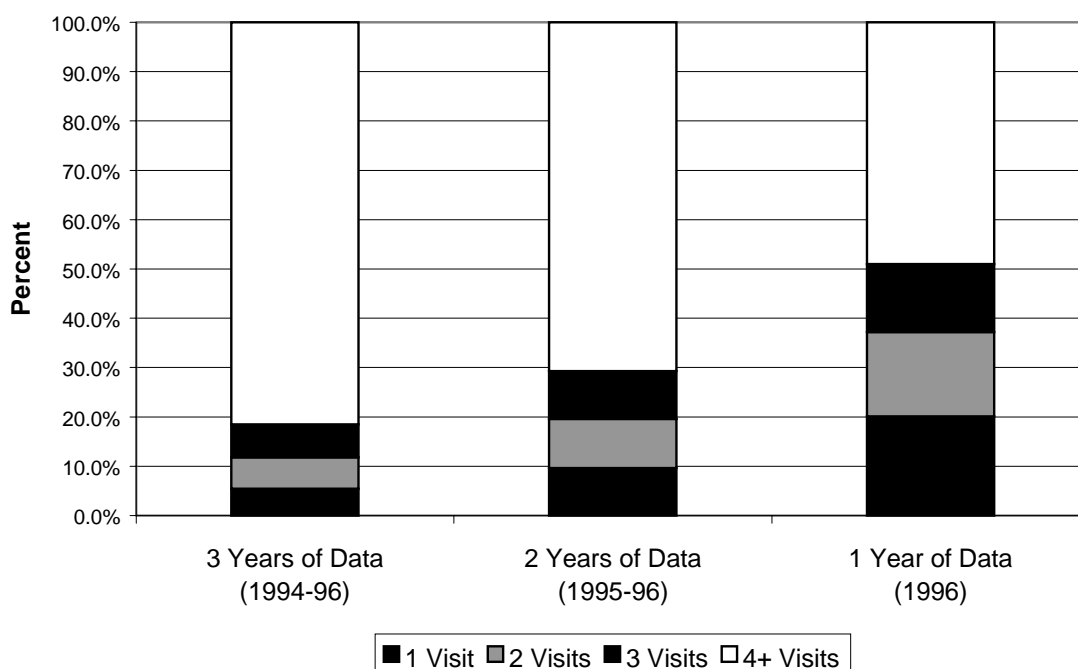
Low-users were more likely to be classified as regular patients than high-users. Using a 75% majority-of-care definition and a three-year period as an example, we calculated the percentage of regular patients among individuals who made one, two, three or four or more visits over three years, respectively. All patients with only one physician contact (that is, 100%) are classified as regular patients.[11] Among patients who made only two visits during the three years, 58% were classified as such and among those who made three visits 45.4%. Among those with four or more visits, 43.9% were classified as regular patients.

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[11] Of course, this would also be the case for any other majority-of-care definition as 100% of visits (one out of one) are made to the same group.

In Figure 8, the number of low-users among the assigned practice populations is presented for each group (per physician), using again a 75% majority-of-care definition. For Group 1, for example, 136 patients (per FTE physician in that group) made only one visit during 1994-96; as this visit was to Group 1 they were classified as regular patients of that group. An additional 120 regular patients made only two visits over the course of the three-year study period, both to Group 1, and 111 regular patients incurred only three visits, all to Group 1. The remaining 1011 regular patients made four or more visits; only to these patients does the 75% majority-of-care definition truly apply. These findings are based on three years of data; with two years of data the number of low-users would be even higher.

**Figure 8: Assigned Practice Populations (per Physician)
by Number of Visits
(Using a 75% Majority-of-Care Definition)**
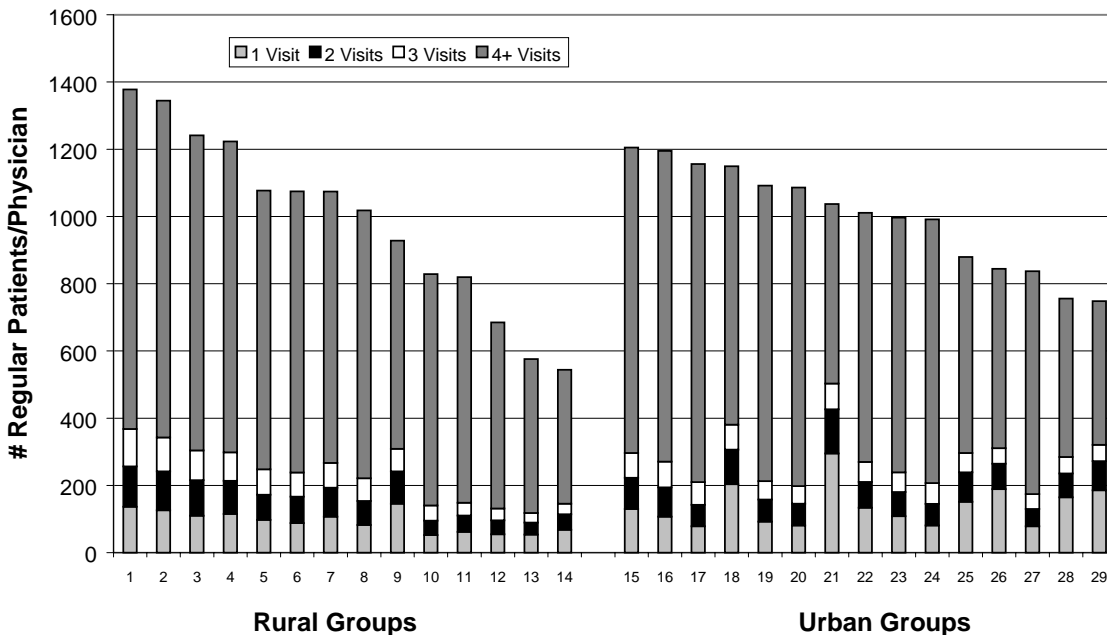
In Figure 9, low-users are expressed in terms of percentages (as calculated from the total assigned practice population) in order to provide a better understanding of the extent to which assigned practice populations were based on low-users. For Group 1, the 136 patients who made only one visit represent 9.9% of the overall assigned practice population (1378 patients), whereas the 1011 individuals with four or more visit represent 73.3%. For seven groups (one rural, six urban), the assigned practice population consisted of more than 30% low-users. Of these, two groups, both walk-in clinics, had more than 40% low-users. For four groups (Groups 21, 26, 28, and 29), the percentage of the assigned practice population that incurred only one visit was also large – over 20%.

Figure 9: The % of Low-Users Among Assigned Practice Populations (Using a 75% Majority-of-Care Definition)
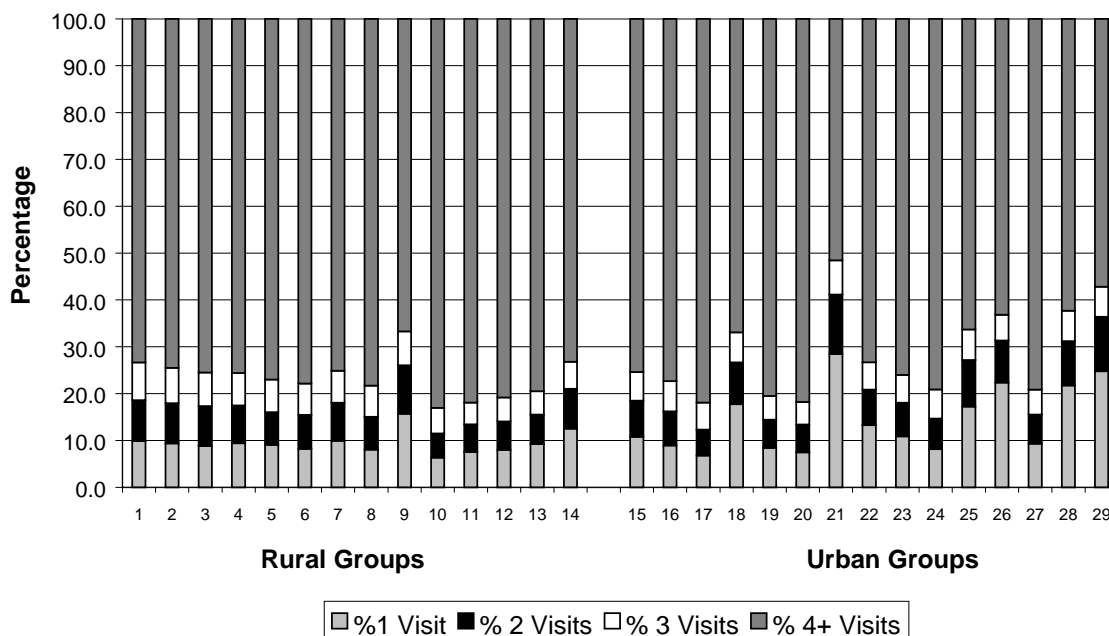
What happens if low-users were excluded from the calculations (using again a 75% majority-of-care definition)? Figure 10 indicates that when patients who made only one visit during the three-year study period were excluded from the analyses, the size of the assigned practice population dropped to 926 patients for rural groups and 880 patients for urban groups (a 9.5% decrease for rural groups vs. a 12.9% decrease for urban groups, relative to the practice size when all patients were included). Excluding patients with only one or two visits decreased the size of assigned practice populations further and so did excluding patients with only one to three visits. When individuals with one to three visits were excluded, the assigned practice populations dropped to 776 and 743 patients for rural versus urban groups (an approximately 25% decrease compared to when they were included).

Figure 10: Assigned Practice Populations (per Physician) Excluding Low-Users (75% Majority-of-Care Definition)
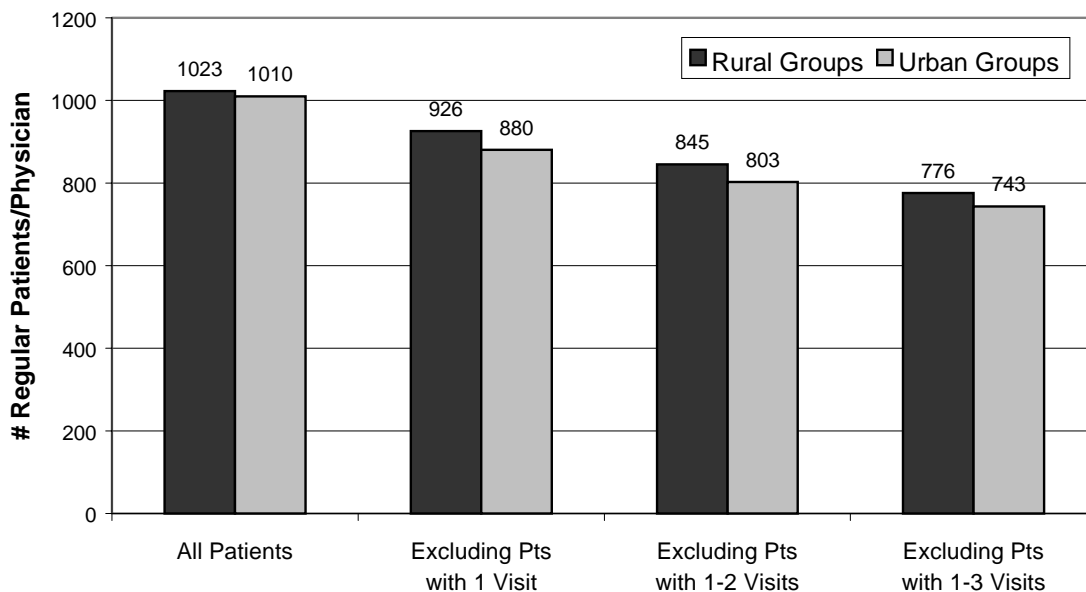
The effect of excluding low-users was particularly large when only one year of data was considered, as displayed in Figure 11. While excluding low-users reduced the assigned practice size to 776 patients (per physician) for rural groups when considering three years of data, for two years of data the practice size dropped to 642 patients. Based on only one year of data, with low-users being excluded, the practice size was down to 388 regular patients (per physician) for rural versus 413 for urban groups. Clearly, whether low-users are included or excluded has a major impact on the size of the practice population for both rural and urban groups.

Figure 11: Assigned Practice Populations (per Physician) Excluding Low-Users: By Number of Years of Data
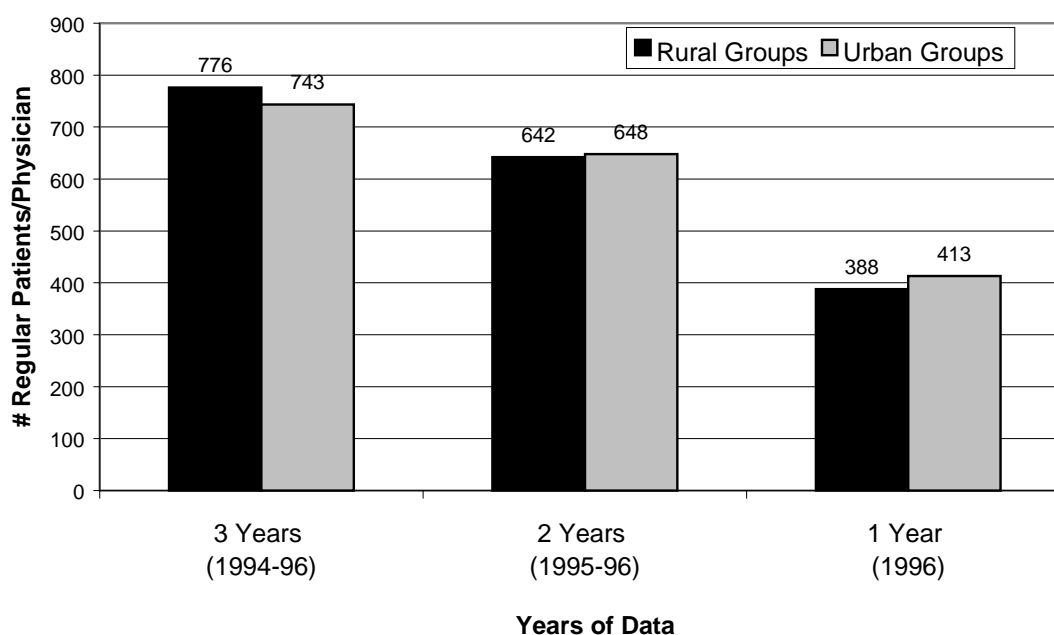
3.2   Taking a Closer Look at Assigned Practice Populations Using a 75% Majority-of-Care Definition

We next examined more closely the total and assigned practice populations using the 75% majority-of-care definition considered by Manitoba Health for the Assiniboine Clinic pilot project. Table 2 shows the total number of patients who visited each of the groups at least once over the three-year study period (that is, the total practice populations). For example, 15,745 patients visited Group 1 at least once during the three-year study period - 2,259 per physician (FTE). Of the total practice population, 9607 received the majority of their care from that group (1378 patients per physician). Evident in Table 2 are the walk-in clinics (e.g., Group 21) which had large numbers of patients per physician, but relatively small numbers of regular patients.

The number of visits incurred by regular patients (third last column) also differed substantially across groups. The largest number of visits (per FTE physician) was obtained by Group 20 (13,056 visits), while Group 29 had the lowest number (4,765 visits per physician). The average number of visits (per FTE) over the three years by regular patients was slightly higher for rural than urban groups (10,340 vs. 9,526). Table 2 (second last column) also shows the number of visits that regular patients made, on average, over the course of one year. It is important to note that the number of visits per regular patient only captures visits at that group, but not visits incurred at other groups.   For example, a patient might have made four visits in total, three of which were obtained from the same group. Only the three visits would be included in Table 2, in order to provide an indication of the intensity of services provided to regular patients at a particular group. As Table 2 shows, Group 10 was quite high with an average of 4.5 contacts per regular patient, whereas Group 21 with its 1.7 visits was considerably lower than the other groups, suggesting that these groups differ systematically in terms of their patient mix or physician practice patterns.

Table 2. Total and Assigned Practice Populations
(75% Majority-of-Care Definition, 1994-96)

Groups	Total No. Discrete Patients	Total No. Pts/GP	No. Regular Patients	No. RP/GP	No. RP Visits/GP	Visits/RP	% Regular Patients
Rural Groups							
1	15,745	2,259	9,607	1,378	11,573	2.8	61.0%
2	15,188	1,973	10,349	1,344	12,470	3.1	68.1%
3	28,194	1,975	17,726	1,242	11,571	3.1	62.9%
4	8,889	2,031	5,353	1,223	11,751	3.2	60.2%
5	9,568	2,043	5,045	1,077	10,840	3.4	52.7%
6	32,302	1,739	19,973	1,075	11,162	3.5	61.8%
7	13,921	2,154	6,943	1,075	10,592	3.3	49.9%
8	22,961	1,954	11,968	1,018	10,893	3.6	52.1%
9	16,936	1,475	10,656	928	8,140	2.9	62.9%
10	8,187	1,574	4,308	828	11,067	4.5	52.6%
11	9,958	1,971	4,141	820	10,064	4.1	41.6%
12	10,052	1,624	4,242	685	8,943	4.3	42.2%
13	6,706	1,412	2,736	576	6,952	4.0	40.8%
14	11,254	1,705	3,591	544	6,266	3.8	31.9%
Urban Groups							
15	24,955	2,830	10,625	1,205	11,626	3.2	42.6%
16	14,401	2,828	6,085	1,195	10,315	2.9	42.3%
17	11,075	2,397	5,340	1,156	11,057	3.2	48.2%
18	37,635	3,923	11,028	1,150	9,991	2.9	29.3%
19	44,949	2,564	19,139	1,092	11,507	3.5	42.6%
20	24,471	2,071	12,830	1,086	13,056	4.0	52.4%
21	56,392	5,951	9,827	1,037	5,363	1.7	17.4%
22	15,291	3,601	4,292	1,011	8,308	2.7	28.1%
23	40,221	2,265	17,692	996	9,852	3.3	44.0%
24	25,464	2,516	10,030	991	10,261	3.5	39.4%
25	27,009	4,026	5,901	880	7,094	2.7	21.8%
26	20,385	4,688	3,671	844	6,552	2.6	18.0%
27	31,687	2,218	11,965	837	9,249	3.7	37.8%
28	30,720	4,678	4,962	756	5,700	2.5	16.2%
29	21,907	5,019	3,266	748	4,765	2.1	14.9%

Note: Total No. Pts/GP refers to the total number of patients visiting a group per FTE physician. No. RP/GP refers to the number of regular patients per FTE physician. No. RP Visits/GP refers the total number of visits incurred by regular patients (per FTE physician) at a given group. It is important to note that this includes visits of regular patients at that group only, but not the visits regular patients made at some other group. Visits/RP refers to the number of visits each regular patient incurred on average in one year.

Lastly, assigned practice populations are expressed in terms of the percentage of regular patients out of the total practice population (see also Figure 5). As Table 2 shows (last column), and as was apparent in Figure 5, the percentage of regular patients varied markedly across groups, ranging from 68.1% to 14.9%.

How Many Patients Are We Capturing Using a 75% Majority-of-Care Definition?

To gain an understanding of how many patients received the majority of their care from the same group (using a 75% majority-of-care definition) and how many did not, we next differentiated between four types of individuals: those who received the majority of their care from one of the 29 major groups included in the study; patients who received the majority of their care from groups *not* included in the study (groups and solo physicians that did not meet our selection criteria); patients who split their care among several provider or provider groups - the not regular patients; and patients we do not know anything about because they received the majority of their care from physicians without a group identifier.[12] It is important to emphasize that patients classified as not regular patients split their care among several providers or provider groups. In other words, these are truly individuals who were not regular patients of either the 29 groups included in the study, nor of the smaller groups or solo physicians not included in the study (see Appendix 1 for further details).

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[12] Given that some physicians did not have a group identifier, we underestimate the actual number of regular and not regular patients. That is, among the patients who received the majority of care from physicians without an identifier and whom we assigned to the "unknown" category, some may in fact be regular patients of a provider or provider group and some may be not regular patients (see Appendix 1 for details).

Table 3 shows a breakdown of all the patients (528,905 individuals) who visited the 29 major groups at least once during the three-year study period into these four patient categories. Of these individuals, 116,638 patients (59.9%) received the majority of their care from the same rural group, and 136,653 patients (38.3%) received the majority of their care the same urban group. In addition, we know that a total of 18,969 patients, although they had a least one contact with one the 29 large groups, received the majority of their care from solo physicians or groups that were not included in the study. 41.8% of patients (220,887 individuals) were identified as not regular patients. The status of an additional 6.8% was unknown.[13]

Table 3. How Many Patients Does the 75% Majority-of-Care Definition Capture?

	Rural Groups		Urban Groups		All 29 Groups	
	No.	%	No.	%	No.	%
Regular patients (29 major groups in the study)	116,638	59.9	136,653	38.3	253,291	47.8
Regular patients (groups or solo physicians not in study)	7,403	3.8	17,508	4.9	18,969	3.6
Not regular patients	59,881	30.8	176,377	49.6	220,887	41.8
Unknown (physicians without identifier)	10,690	5.5	25,797	7.2	35,758	6.8
Total	194,612	100.0	356,335	100.0	528,905	100.0

Note: The figures for rural and urban groups do not add up (except for regular patients of the major groups) because some patients visited both rural and urban groups, thereby leading to double-counting.

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[13] These patients received the majority of their care from physicians who did not have a group identifier (see Appendix 1).

In order to obtain an understanding of how many patients in general received the majority of their care from the 29 major groups and were, therefore, assigned to practice populations, we next examined a breakdown of *all* patients in Manitoba, including those who never visited the 29 large groups. Figure 12 shows that of all the patients who made at least one ambulatory visit to a general/family practitioner over the three years (1,098,139 individuals), 23.1% received the majority of their care from one of the 29 major groups examined in the study, and 17.9% were classified as regular patients of solo physicians or groups not included in the study. Thus, in combination, 41% of patients received 75% or more of their care from the same provider or provider group. In contrast, 34.7% of patients were not regular patients of either a provider or provider group. For a substantial number of patients (24.3%) it could not be determined whether they received the majority of their care from the same group or solo physician as the physician lacked a group identifier. Implementation of a code that identifies whether physicians are part of a group could therefore quite substantially enhance our ability to examine assigned practice populations.

Figure 12: How Many Patients Overall Received the Majority of Care From the Same Group? (75% Majority-of-Care Definition)

Unknown (Physicians without identifier) 24.3% (266,644)

Regular Patients (29 major groups in study) 23.1% (253,291)

Regular Patients (Solo GPs/groups not in study) 17.9% (196,930)

Not Regular Patients 34.7% (381,274)
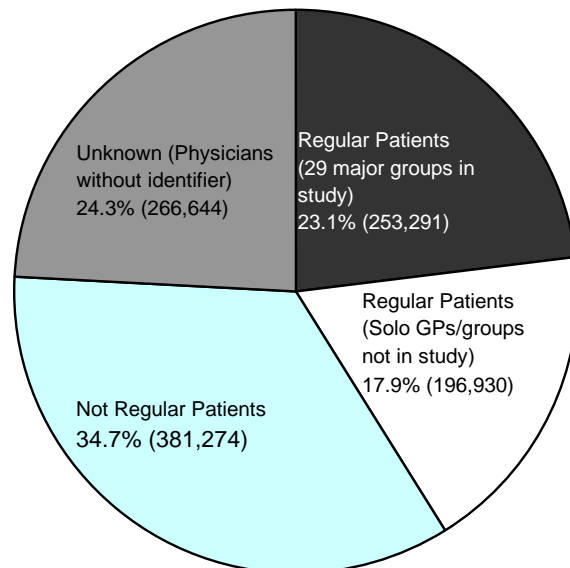
3.3   Characteristics of Assigned Practice Populations

Are some groups particularly likely to attract older patients? Are patients who receive the majority of their care from the same group younger and healthier than patients who do not? Or are they perhaps older and sicker? The next sections address these questions. Throughout this section we use a 75% majority-of-care definition.

The Patient Mix Among Regular Patients

We first examined the patient mix among regular patients in terms of gender, age, income group, and health status. The assigned practice populations of the 29 groups were composed of a roughly equal number of female and male patients (52% female patients, averaged across all groups), with one notable exception: the assigned practice population of one urban group consisted of 82.2% female patients who received the majority of care from that group.

Some differences, as displayed in Figure 13, emerged when comparing rural versus urban groups in terms of age, in that more regular patients were under the age of 18 for rural than urban groups (30.5% vs. 19.8%). Again, some variation was found across individual groups: for three urban groups (Groups 22, 24, and 28) less than 10% of the assigned practice populations were below 18 years of age. Correspondingly, two of these groups (Groups 22 and 24) also had relatively large proportions of older patients (approximately 30%). Two urban groups (Groups 25 and 29) and one rural group (Group 9) had around 40% of regular patients below ages 18, well above the overall average.

We next examined the socioeconomic characteristics of assigned practice populations, as defined by the relative affluence of the neighbourhood in which patients lived (see Appendix 1 for details). Figure 14 shows that the groups differed considerably in terms of the socioeconomic status of the neighbourhood of residence of patients. This is an important finding because we know that socioeconomic status is related to health status (e.g., Haan, Kaplan, and Camacho, 1987). Thus, any variation in the socioeconomic mix of patients across clinics can have a considerable impact on the relative need of patients for health care.

Figure 13: Assigned Practice Populations by Age Groups
(75% Majority-of-Care Definition)

Rural Groups   **Urban Groups**

■ % Age 0-17 □ % Age 18-64 ▨ % Age 65+
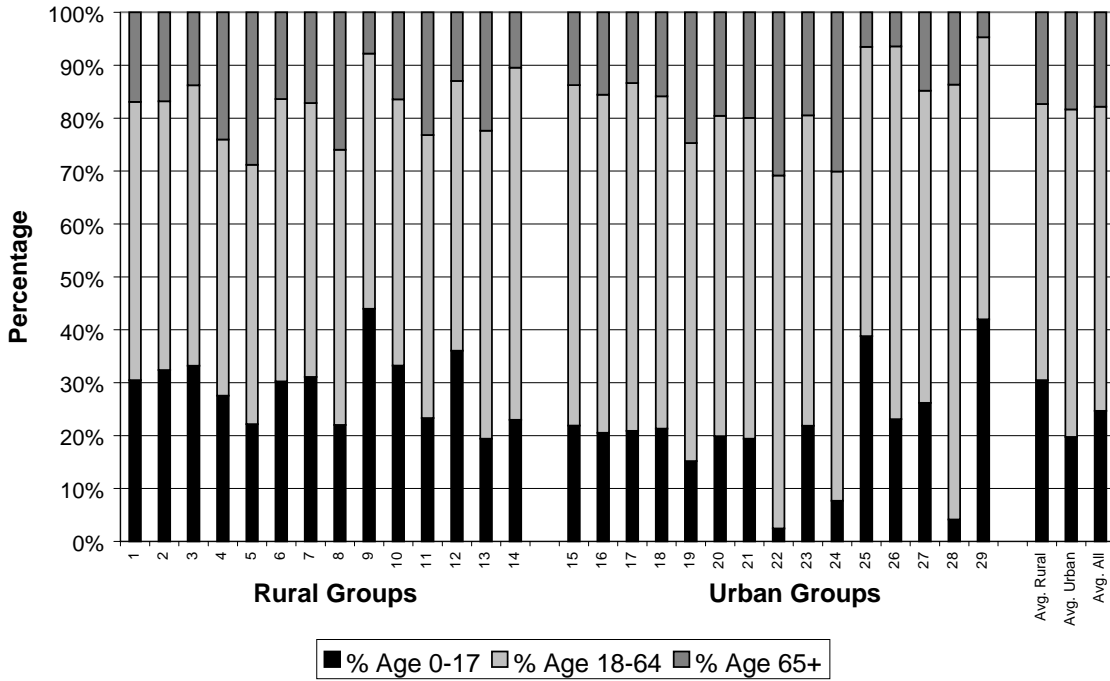
Figure 14: Assigned Practice Populations by Income
Groups: Urban Groups
(75% Majority-of-Care Definition)

■ Q1 - Poorest □ Q2 □ Q3 ▨ Q4 ■ Q5 - Wealthiest
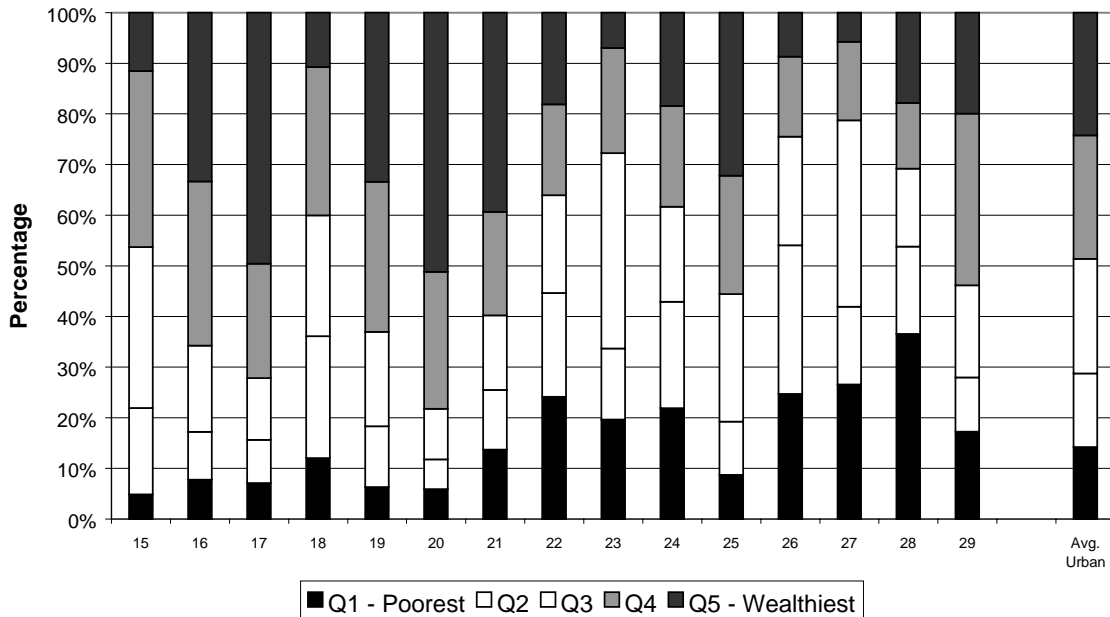
Note that income groups are only displayed for urban groups, as they are less meaningful for individuals living in rural areas.[14] While about 50% of regular patients of Groups 17 and 20 were drawn from the wealthiest neighbourhoods, Groups 22, 26, 27 and 28 had large proportions of patients living in the poorest neighbourhoods - approximately 25% in the case of the former three groups, and 36.5% for Group 28.

The health status of assigned practice populations was measured with the Ambulatory Diagnostic Grouper (ADG), a case-mix measure developed at Johns Hopkins University (e.g., Starfield, Weiner, Mumford, & Steinwachs, 1991). The ADG is a method to classify people based on the health conditions they have experienced over a period of one year, with each patient being assigned an ADG score (see Appendix 1 for details). Patients were then classified into four groups, ranging from those who essentially had no health problems, to those with serious problems. Four ADG categories were created based on ADG scores: ADG1 - the sickest (the bottom 10% of the distribution), ADG2 - those moderately sick (the next 15%), ADG3 - those moderately healthy (the next 25%), and ADG4 - the healthiest patients (the upper 50% of the distribution).

Some variation across groups is apparent in the health status of assigned practice populations, as displayed in Figure 15. For example, the practice population of Group 24 was composed of 12% of the sickest patients, but only 39% of the healthiest patients. Group 29, in contrast, consisted of 2% of the sickest patients and 68% of the healthiest patients.

In sum, the 29 groups differed considerably in terms of the patient mix of assigned practice populations, particularly in terms of the age groups served, relative affluence of neighbourhood of residence, and health status of regular patients - all factors related to need for health care. In developing a capitation formula, these factors would therefore have to be adjusted for in order to ensure equitable funding across physician groups.

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[14] Individuals seeking care from urban groups who could not be classified into income groups (rural patients, Aboriginals, etc.) have been omitted from the calculations in Figure 14.

Figure 15: Assigned Practice Populations by Health Status (75% Majority-of-Care Definition)
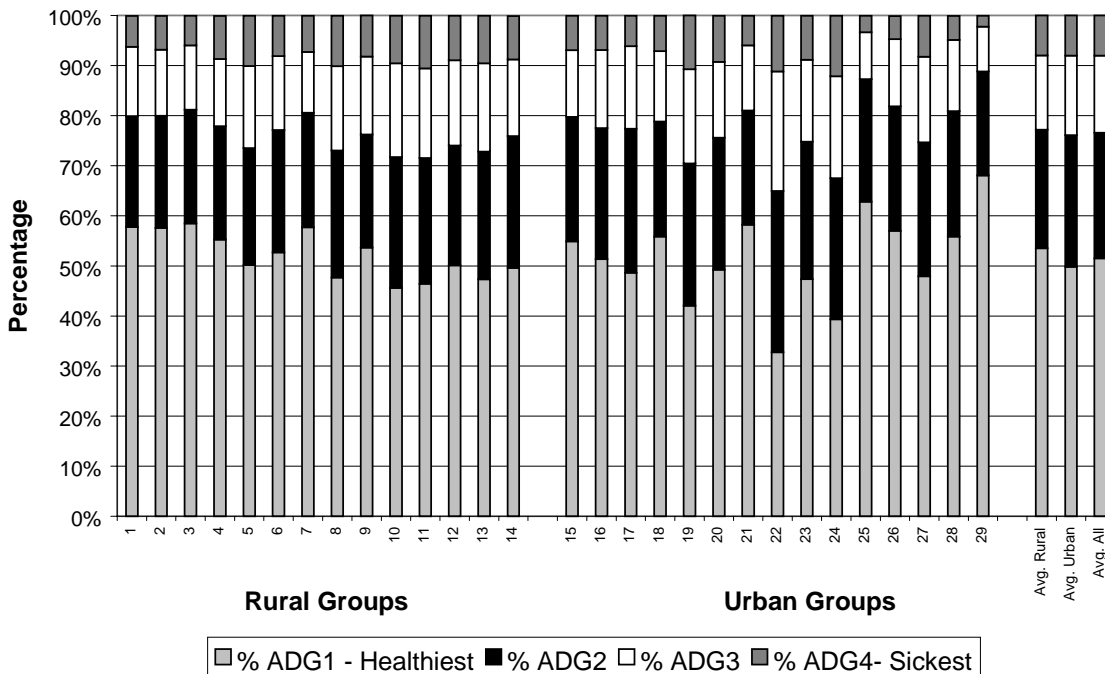
Comparing Regular to Not Regular Patients

In Table 4 we make it possible to compare the characteristics of patients who received the majority of their care from one of the 29 major groups (using a 75% majority-of-care definition) to those who split their care among several providers or provider groups (the not regular patients).[15] As well, patients who visited one of the 29 major groups were compared to all patients in Manitoba in order to examine whether the patients visiting the 29 groups differed in any way from what basically constitutes the Manitoba population.

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[15] Regular patients of solo physicians or groups not included in the study are not shown in Table 4; nor are patients we could not classify as regular or not regular patients because they received the majority of their care from physicians without a group identifier.

Table 4: Total and Assigned Practice Populations by Patient Characteristics (75% Majority-of-Care Definition, 1994-96)

	All Patients Manitoba		All Patients 29 Major Groups		Regular Patients 29 Major Groups		Not Regular Patients Anywhere	
	No.	%	No.	%	No.	%	No.	%
Female Patients	569,271	51.8	284,773	53.8	131,700	52.0	120,666	54.6
Age 0-17	269,831	24.6	122,542	23.2	62,540	24.7	49,020	22.2
Age 18-64	663,028	60.4	332,096	62.8	145,512	57.4	150,988	68.4
Age 65+	165,280	15.1	74,267	14.0	45239	17.9	20,879	9.5
Q1 - Poorest	157,846	20.1	50,909	17.0	16,782	14.2	27947	18.9
Q2	162,455	20.7	48,212	16.1	17,114	14.5	24,882	16.8
Q3	159,204	20.2	62,653	20.9	26,651	22.6	29,203	19.8
Q4	154,974	19.7	69,045	23.0	28,793	24.4	32,515	22.0
Q5 - Wealthiest	152,167	19.3	69,131	23.0	28,547	24.2	33,181	22.5
ADG1 - Sickest	88,268	8.1	45,034	8.6	19,999	8.0	18,941	8.6
ADG2	178,216	16.4	92,018	17.6	38,404	15.4	41,270	18.8
ADG3	286,885	26.4	144,870	27.7	62,631	25.1	64,914	29.4
ADG4 - Healthiest	532,162	49.0	241,899	46.2	128,652	51.5	94,938	43.1

Note: Regular patients of small groups and solo physicians, as well as patients who could not be classified are not shown in the Table. The number of regular and not regular patients therefore does not add up to the total number of patients visiting the 29 groups. Income quintiles are shown for patients living in urban areas only. At the Manitoba level (Column 1) this includes Winnipeg, Brandon and other larger towns; when we examine the 29 large groups, only Winnipeg and Brandon are included. Some patients could not be classified into ADG groups; these patients do not appear in the Table.

The column to the far left of Table 4 describes the characteristics of all the individuals in Manitoba who made at least one ambulatory visit over the three-year study period, broken down by sex, age, income quintiles, and health status. Relative affluence of neighbourhood of residence (income quintiles) is provided only for individuals living in urban areas.[16] Overall, 51.8% of patients in Manitoba were female. Moreover, about a quarter of patients were less than 18 years of age, with the majority being between the ages of 18 and 64; 15.1% were 65 and older. Note that for income groups, patients were deliberately classified into five groups of equal size, hence the approximately equal percentages of patients in each neighbourhood income group. Similarly, the percentages for the four health status (ADG) groups reflect our classification of patients into four categories (sickest 10%, moderately sick 15%, moderately healthy 25%, and healthiest 50%).

Using the Manitoba patients as a standard to which to compare the patients who contacted the 29 groups during the three-year study period (second column in Table 4), we find that although there are some differences, overall the two groups of patients are quite similar. Small differences emerged for neighbourhood income: While 39% of Manitoba patients lived in the two wealthiest urban neighbourhoods, 46% of the patients receiving care from the 15 urban groups were in these two income groups. As indicated earlier, income groups are shown for urban groups only, as they are less meaningful for rural patients.

Turning to the characteristics of regular patients, we compared patients who received the majority of their care from the 29 major groups, using a 75% majority-of-care definition, to patients who split their care among providers or provider groups, that is the not regular patients (Table 4, columns 3 and 4). It is important to note again that patients classified as not regular patients were not regulars anywhere, neither with one of the 29 major groups included in the study, nor with a solo physician or group not included in the study.[17]

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[16] For the purpose of defining income groups, urban areas include Winnipeg and Brandon and other larger towns.

[17] See Appendix 1 for details as to how "not regular patients" were defined.

As Table 4 shows, regular patients were somewhat older than not regular patients, with an average age of 38.5 versus 33.2 years. Moreover, as shown in Table 4, regular patients lived in more affluent neighbourhoods, with 28.7% of patients in the lowest two income groups and 48.6% in the uppermost two groups. This is in contrast to not regular patients who consisted of 35.7% of patients from the poorest neighbourhoods and only 44.5 % of patients from the two wealthiest neighbourhoods. We further find that regular patients were somewheat healthier than not regular patients: 51.5% of regular patients were in the healthiest category, compared to 43.1% of not regular patients.

Predictors of Being a Regular Patient

We next performed more formal, multivariate analyses (logistic regressions) to determine which factors predict whether a patient received the majority of care from the same group. The outcome variable in these analyses was, therefore, whether patients were regulars or not regulars (i.e. columns 3 vs. 4 in Table 4). Table 5 shows the results of the analyses for rural and urban groups, respectively. Note that the analysis for rural groups includes only gender, age, health status and physician utilization[18] as predictors, because patients could not be classified into income groups. The results of the regressions essentially confirm the conclusions we reached above: For rural groups, being female, older, and healthier predicted whether patients were regulars. For urban groups, patients between the ages of 18 and 64 were less likely to receive the majority of their care from the same group than children, whereas being older (patients 65+ years old), living in wealthier neighbourhoods, and being healthier individuals increased the likelihood of being a regular. Figure 16 plots these findings for urban groups.

These findings therefore indicate that younger, poorer and sicker individuals were more likely to split their care among more than one general/family practitioner than older patients,

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[18] Physician utilization was controlled for in these analyses, as it is related to the likelihood of being classified as a regular patient.

patients living in more affluent areas and healthier patients. Female patients visiting rural groups were more likely than male patients to be regular patients.

Table 5. Predictors of Being a Regular Patient
Logistic Regression Results for Rural and Urban Groups

Predictors	Parameter Estimate	Odds Ratio	95% Confidence Interval	
			Lower	Upper
Rural Groups				
Female (vs. Male)	0.10*	1.11	1.09	1.13
Age 18-64 (vs. Age < 18)	-0.02	0.98	0.95	1.00
Age 65+ (vs. Age < 18)	1.11*	3.04	2.92	3.16
ADG2 (vs. ADG1 - Sickest)	.14*	1.15	1.1	1.2
ADG3 (vs. ADG1 - Sickest)	.22*	1.24	1.19	1.3
ADG4 - Healthiest (vs. ADG1)	.45*	1.57	1.5	1.64
1 - 3 visit (vs. 4 - 12 visits)	0.45*	1.57	1.52	1.61
13+ visits (vs. 4 - 12 visits)	-0.33	0.72	0.7	0.74
Urban Groups				
Female (vs. Male)	-0.02	0.98	0.96	0.99
Age 18-64 (vs. Age < 18)	-0.05*	0.95	0.93	0.97
Age 65+ (vs. Age < 18)	0.95*	2.58	2.50	2.66
Q2 (vs. Q1 - Poorest)	0.13*	1.13	1.10	1.17
Q3 (vs. Q1 - Poorest)	0.42*	1.52	1.48	1.56
Q4 (vs. Q1 - Poorest)	0.40*	1.49	1.45	1.53
Q5 - Wealthiest (vs. Q1 - Poorest)	0.36*	1.43	1.40	1.47
ADG2 (vs. ADG1 - Sickest)	0.08*	1.08	0.05	1.12
ADG3 (vs. ADG1 - Sickest)	0.17*	1.18	1.14	1.22
ADG4 - Healthiest (vs. ADG1)	0.33*	1.39	1.34	1.43
1 - 3 visit (vs. 4 - 12 visits)	0.62*	1.86	1.82	1.90
13+ visits (vs. 4 - 12 visits)	-0.19*	0.82	0.81	0.84

Note: * significant at p<.0001. Odds ratios smaller than one indicate a reduced likelihood of being a regular patient, odds ratios larger than one indicate an increased likelihood.

**Figure 16: Relative Likelihood of Being a Regular Patient:
Urban Groups**
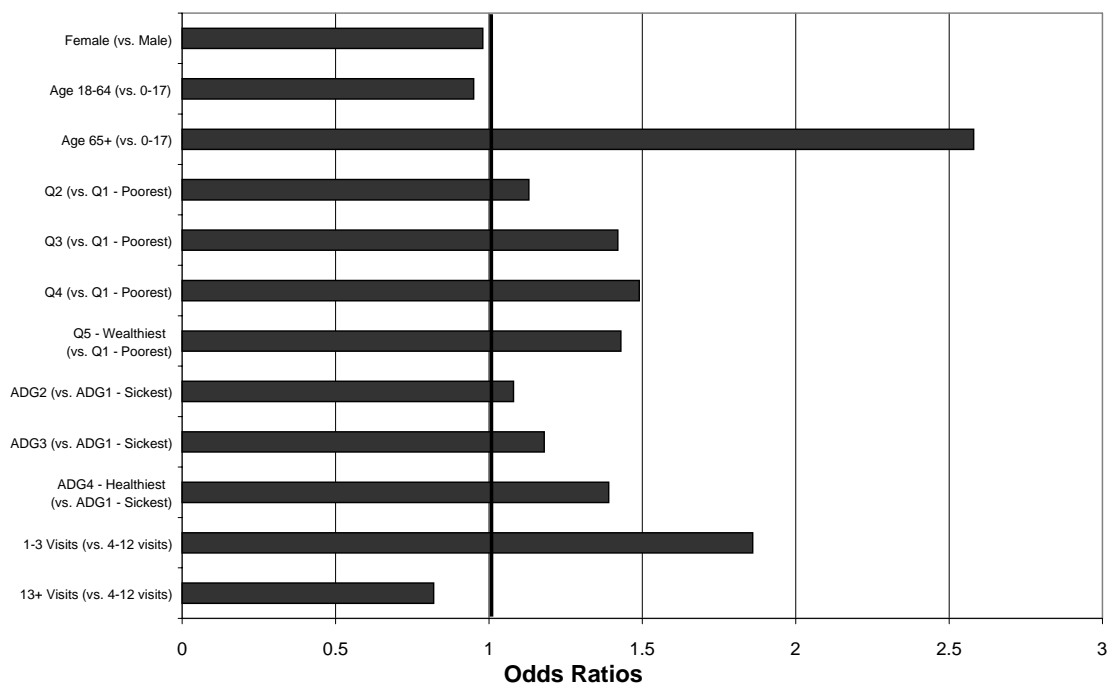
Odds ratios below one indicate a decreased likelihood of being a regular patient, odds
ratios above one an increased likelihood.

The finding that older patients and patients from wealthier neighbourhoods were more likely
to receive the majority of their care from the same group than younger and poorer individuals
is consistent with previous research (Hemingway, Saunders, & Parsons, 1997; Mustard,
Mayers, Black, & Postl, 1996; Pilotto, McCallum, Raymond et al., 1996; Weiss & Blustein,
1996). The evidence for the relation between health status and continuity of care (defined in
different ways in the literature) is not as consistent. While one study shows that individuals
who reported being in better health had more long-standing ties to a physician (Weiss &
Blustein, 1996), other studies show that good self-rated health is linked to *less* continuity of
care (Hayward, Bernard, Freeman, & Corey, 1991; Pilotto, McCallum, Raymond et al.,
1996).

Unlike in the present report, however, in which regular patients were defined on the basis of
whether they received the majority of care from the same group, Hayward et al. (1991)
simply asked patients whether they had a regular source of care. Pilotto et al. (1996) defined
continuity in terms of whether patients made two consecutive visits to the same physician, a

definition that is clearly different from ours. A strength of the present study is that regular patients were defined based on existing care seeking patterns. Thus, even though individuals may *report* having a regular source of care, they may nevertheless routinely contact other physicians as well, placing some doubt on whether they can really be described as having a continuous care seeking pattern.

In general, however, our finding that female patients (in the case of rural groups), older persons, patients living in wealthier neighbourhoods and healthier individuals were more likely to be assigned to practice populations has implications for developing a capitation formula. Such a formula should adjust for gender, age, socioeconomic status, and health status, to ensure equity in funding and reduce the possibility of over- or underpayment of physicians for the patients they serve.

Low-Users Revisited

Earlier (see Figure 9) we saw that some groups had large proportions of low-users, that is individuals who made only one visit, two visits, or three visits over the three-year study period. In Table 6 we show the characteristics of low-users versus high-users among regular patients. Among regular patients who made only one visit in total, 60.8% were male. The proportion of males decreased steadily as the number of visits increased, with only 39.2% of regular patients making 11 or more visits being male. In terms of age, 32.3% of regular patients who made only one visit were aged 0-17 and 8.3% were 65 years and older. In contrast, among patients who made 11 or more visits, 18% were aged 0-17 and 29.8% were 65 years and above.

The proportion of regular patients in each of the five income groups did not show much variation across the number of visits incurred. For example, 14.2% of regular patients who made one visit lived in the poorest neighbourhood, compared to 16.5% of regular patients who made 11 or more visits. Health status, however, was systematically related to the number of physician contacts: Low-users were healthier than high-users.

Table 6. Regular Patients by Number of Visits
Characteristics of Low-Users vs. High-Users (In Percent)

	Number of Visits Made Over a Three-Year Period				
	1 Visit	2 Visits	3 Visits	4-10 Visits	11+ Visits
Female	39.2	40.5	43.7	50.8	60.8
Male	60.8	59.5	56.3	49.2	39.2
Age 0-17	32.3	30.3	28.7	26.2	18.0
Age 18-64	59.4	61.2	61.0	61.4	52.2
Age 65+	8.3	8.6	9.3	12.4	29.8
Q1 - Poorest	14.2	13.5	12.4	12.4	16.5
Q2	15.0	13.3	13.7	13.6	15.7
Q3	21.1	22.5	22.3	22.7	23.2
Q4	24.0	24.2	25.3	25.5	23.4
Q5 - Wealthiest	25.7	26.6	26.3	25.8	21.1
ADG1 - Sickest	2.6	2.8	2.8	3.9	16.2
ADG2	4.5	4.9	5.8	10.1	33.9
ADG3	10.1	14.5	15.4	24.7	28.4
ADG4 - Healthiest	82.7	77.8	75.9	61.2	21.5

Note: This breakdown of patient characteristics is based on all the visits regular patients made, i.e. visits to the groups they were assigned to as well as visits to other groups or solo physicians. Income quintiles are presented for urban areas only.

Thus, low-users tended to be male, younger and healthier than high-users. A capitation formula that takes these factors into account should, therefore, to some extent adjust for the presence of low-users. For instance, to the extent that a clinic receives less money for a young, healthy, male patient than a less healthy, female, older patient, the differential need for health care of these two individuals is taken into account. However, the relation between visits and patient characteristics should be examined more systematically in future research.

4.0   LIMITATIONS

Several limitations of the present report should be acknowledged. First, the majority-of-care definition used here to identify regular patients does not take into account that patients may have moved during the three-year study period. That is, individuals who moved might quite reasonably change physician as well. Using a majority-of-care rule, these patients might be classified as not regular patients when, in fact, they sequentially had a regular source of care. Tracking patient movement over the three years and determining majority-of-care use at each new place of residence was beyond the scope of this report.

Moreover, given our focus on physician groups, we also did not examine whether physicians moved. That is, because we focused on provider groups, rather than individual physicians within these groups, patients who followed a physician to a new location would be classified as not regular patients, when in fact they continued to see the same physician.

A data limitation relates to identifying provider groups. As there is currently no easy way to determine whether physicians are affiliated with a group, for approximately one third of general/family practitioners we could not determine whether they worked in a group setting or solo. This meant that 7% of the patients of the 29 groups could not be classified as either regulars or not regulars. Moreover, we assumed that physicians with the same code were part of a group. However, it is possible that some physicians shared the same location and administrative services, but effectively had a solo practice with their own patients.

5.0   CONCLUSIONS AND RECOMMENDATIONS

Practice populations for capitated systems (or blended funding systems with a capitation component) are typically defined in terms of patients who formally register with a physician or physician group. Such patient rostering has been used in various European countries, as well as in several provinces (e.g., Ontario and Saskatchewan). Less common is the approach taken in the present report whereby practice populations are defined on the basis of utilization patterns, although this method is being considered in Manitoba. Should Manitoba Health pursue the potential of alternative funding schemes for primary care, the relative advantages and disadvantages of defining practice populations on the basis of utilization patterns versus a formal rostering system would have to be carefully considered.

The findings of the present report speak to issues that arise in assigning practice populations based on existing utilization, which have implications for developing alternative funding models. More specifically, our comparison of different criteria to define assigned practice populations shows that subtle differences in the methods used have a considerable impact on the size of assigned practice populations.

Majority-of-Care Definitions

The percentage cut-off used to assign patients to a practice (e.g., a 60% versus a 75% majority-of-care definition) had quite a substantial effect on the size of assigned practice populations, expressed both in terms of the number of regular patients (per physician) or the percentage of the total practice population that was assigned to the practices. For example, with a 60% definition, according to which patients have to receive at least 60% of their care from the same group to be classified as a regular patient, 1258 patients (per physician) were assigned to the practice population in the case of urban groups. With a 75% definition, 1010 patients (per physician) were assigned.

A final recommendation about what percentage cut-off is most appropriate cannot be made based on this report. This decision should be based on a clearer understanding of the kind of alternative funding mechanisms being pursued. However, our findings indicate that several issues should be carefully considered:

- Overall, assigned practice populations were relatively small, even with the most lenient definitions. With the most inclusive 50% majority-of-care definition, whereby patients have to receive at least 50% of their care from the same group to be assigned to the practice, only 1175 patients (per physician) were assigned to rural groups and 1338 to urban groups. Assigned practice populations were therefore well below the maximum list sizes recommended in the literature for formally rostered populations, which range from 1700 to 4000 patients per physician. Thus, it appears that few of the large provider groups could easily move toward a funding system solely based on capitation. Although a formal rostering system may increase the size of practice populations, and reduce the number of patients who split their care among several general/family practitioners, a blended funding model that combines capitation with some other funding components seems most appropriate given existing utilization patterns. Careful consideration would have to be given to the incentives produced by such blended funding models.

- The 29 major groups examined in the present study differed markedly in terms of the size of assigned practice populations. For example, with a 75% majority-of-care definition assigned practice populations ranged from 544 to 1378 patients (per physician) for the 14 rural groups and from 748 to 1205 patients (per physician) for the 15 urban groups. Because assigned practice populations are so variable, development of alternative funding approaches will require consideration of the potential impact of blended funding formulae on different provider groups. Moreover, attention will have to be paid to the minimum size assigned practice populations need to be to make a provider group financially viable. These issues should be examined in light of potential system-level effects of moving toward blended funding systems for primary care practices.

- Clear rural/urban differences were observed in that the percentage of regular patients was substantially higher for rural than urban groups. Moreover, less variability in the size of assigned practice populations emerged for urban as compared to rural groups, with the assigned practice populations of two rural groups being less than 600 patients per physician, using a 75% majority-of-care definition. It appears critical that such

urban/rural differences be considered when developing alternative funding schemes. For example, an adjustment for the location of the practice (rural versus urban) could be applied to the capitation formula.

How Many Years of Data Should Be Considered?

Although the size of assigned practice populations was similar for two years and three years of data, it decreased when only one year of data was used, indicating that the data are quite unstable when based on only one year. Our recommendation is to use at least two years of data when defining assigned practice populations. Two years may be preferable over a greater number of years for two reasons: First, it requires less administrative data, while at the same time providing adequate estimates of assigned practice populations, and second, the assigned practice populations would be based on recent data and would be more sensitive to changes in practices that encourage or discourage patients to become regular users.

The Issue of Low-Users

A substantial proportion (18.5%) of the total practice populations were low-users, that is individuals who had only one to three physician contacts over the three-year study period. Low-users tended to be male, younger, and healthier than high-users. A capitation formula that takes gender, age, and health status into account would therefore tend to adjust for some of these low-users. For example, a lower capitation fee would be applied to young, healthy males than older, less healthy females, thereby adjusting for relative need for health care. Nevertheless, because low-users are more likely to be assigned to practice populations than individuals who make four or more visits, we recommend that special attention be paid to the extent to which a given group's assigned practice population is composed of low-users.

Characteristics of Regular Patients

The present report further shows that the major groups examined differed substantially in terms of the patient mix of assigned practice populations. While some assigned practice populations consisted of a large proportion of older patients, some had large proportions of young individuals. Moreover, some groups had mostly patients from wealthy neighbourhoods, whereas others had large proportions of patients from poor areas. Similarly,

some groups provided services to many sick regular patients, others to mostly healthy regular patients.

Furthermore, our comparison of regular and not regular patients indicates that older patients, patients living in wealthier neighbourhoods, healthier patients, and female patients in the case of rural groups were more likely to be regulars. These patient characteristics are linked to the need for health care. Living in a poor neighbourhood, for example, is related to poor health (Roos & Mustard, 1997). Individuals from poor neighbourhoods also have higher rates of contact with general practitioners and are hospitalized at a higher rate than individuals from more affluent areas (Roos & Mustard, 1997). Similarly, older patients have greater health care needs than younger individuals and are thought to require more time to deal with appropriately.

Thus, these patient differences should be taken into account when developing capitation formulae, as uniform capitation funding, or funding adjusted for age and gender only, would be biased. To ensure equitable funding, the capitation component of a blended funding formula should consider at least age, gender, socioeconomic status and health status.

Identifying Provider Groups

We further recommend that, for the purpose of data collection, a code be introduced that identifies whether a physician is affiliated with a group. Such a code would ideally identify all provider groups in the province, large and small. Unlike the code that was used in the present study, which only tells us whether physicians worked in a group setting, it would be important to know whether physicians are indeed affiliated with a group practice or whether they essentially work as solo physicians in a shared space. Moreover, in deciding which groups are suitable for alternative funding mechanisms, Manitoba Health may want to consider smaller groups or solo physicians organized into physician call groups, as about half of the provider groups we were able to identify were too small to meet our four-physician selection criterion.[19]

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[19] See Appendix 2 for findings regarding the relationship between the size of assigned practice populations and group size.

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APPENDIX 1: METHODS

Study Period

This report is based on fiscal years 1994/95, 1995/96, and 1996/97. The fiscal year runs from April 1 to March 31. Data from the entire province were included in the analyses, with the report focusing specifically on general/family practitioners and ambulatory visits (see below for definition). Visits to specialists therefore did not play a role in defining assigned practice populations.

Identifying Provider Groups

Groups were identified from the Physician Services Claim Data of the Manitoba Health Research Data Base. As there is currently no simple way to link physicians to groups, we used a special code (site code) that physicians use to file medical claims electronically to identify groups. Physicians working within the same Clinic or Centre have the same code, and we therefore identified physicians with the same site code as belonging to one group. In some instances in which several physicians who initially had no site code acquired the same code in the same month, the plausible assumption was made that these physicians had worked together all along.

An unavoidable limitation of using the site code to identify groups is that physicians who still file paper claims and, therefore, did not have such a code could not be included in the analyses. In fact, 270 general/family practitioners (FTEs) did not have a site code (out of a total of 827). Whether these physicians worked for a group could therefore not be determined.

In selecting groups that had four or more physicians, we used both the number of physicians working for the group (heads), as well as the number of FTEs (see below for details) as selection criteria. Groups that ceased practice during the three-year study period were excluded, as were specialized groups such as a sports clinic. In all but one instance, groups with four or more physicians also had four or more FTEs (39 groups). Of those 39 groups, 11 failed to have a site code for the entire 36-month study period. A decision was therefore

made to include only those groups that had at least 24 months of data (i.e., the site code had been in use for at least 24 months). This was the case for one group, which had data for 33 months, bringing the total number of groups included in the study to 29.

Full-Time Equivalence

An FTE-like measure was derived to determine the number of "typical" general/family practitioners in a given group. For this purpose, we used a workload-based measure developed by Roos, Fransoo, Bogdanovic et al. (1996). These researchers, by examining practice data from all Manitoba physicians, determined the average workload of a general/family practitioner (the number of ambulatory visits per year) based on physicians who, in fiscal year 1993/94: 1) billed in all four quarters, 2) had total billings of at least $40,000, and 3) provided at least 400 ambulatory visits. In order to produce workload figures which fairly represented visit rates of typical physicians, they were computed on the basis of earnings between the 40th and 60th percentiles (1.0 full-time equivalent physicians using the Health Canada FTE method). The number of ambulatory visits for a typical general/family practitioner was found to be 5799 in Winnipeg, 4700 in the South, and 3504 in the North.

For each group, we divided the total number of ambulatory visits incurred over the three years by the typical workload in that region. The resulting figure was then adjusted for the study period (three years). For example, let us assume that a group in the South had a total of 70,500 ambulatory visits over the three-year study period. As the average workload per general/family practitioner in the South was 4700 visits per year, the number of FTEs would be five, that is (70,500/4,700)/3. In the case of the group with less than 36 months of data, we used the ambulatory visits for 1995 and 1996 to determine the number of FTEs.

While this FTE-like measure departs from the Health Canada method, it has the advantage that it is group-based, rather than physician-based. That is, instead of having to track each individual physician, some of which moved from group to group, and allocating FTEs (or portions of FTEs) to each group, our measure is based on the readily available total number

of ambulatory visits to a group. Information regarding the validity of our measure is presented below.

Validation of FTE Measure

In order to validate our FTE measure, we compared the number of full-time equivalent general/family practitioners obtained with our workload-based method to that using the Health Canada method. This comparison is shown graphically in Figure A1. The area below the dotted line represents the total number of FTEs calculated on the basis of the Health Canada method. Any physician whose income falls between the 40th and 60th percentile benchmarks is counted as 1.0 FTE. Physicians with total payments below the lower benchmark are counted as a fraction of one FTE, equal to the ratio of total payments to the lower benchmark. Physicians with payments above the upper benchmark are counted as 1.0 FTE plus the natural log of the ratio of payments to the upper bound. In the figure, this logarithmic function is drawn as a straight line to simplify presentation.

The total number of FTEs calculated based on our method, which is based on the average workload of a FTE general/family physician, is shown in the figure with the area below the heavy, solid line. Area "A" represents an underestimation of FTEs using the workload method, whereas area "-A", the mirror image of "A", represents an overestimation. As these areas cancel each other out, we are left with area "B" which reflects the fact that our workload-based method slightly overestimates the number of FTEs, relative to the Health Canada method.

Specifically, using the workload-based method we end up with 827 FTEs, in contrast to the Health Canada method, which gives us 796 FTEs. Therefore, we are overestimating the total number of FTEs by 31 (or 3.9%). The effect of this overestimation on our calculation of assigned practice populations is minimal. If we reduce the number of FTEs in the 29 major groups by 3.9% (ten FTEs), the average number of regular patients (per FTE physician) using a 75% majority-of-care definition is 1055, compared to the 1016 patients obtained in this report.

Figure A1: Comparing Full-Time Equivalent Measures

FTEs

Workload method

Health Canada method

1 FTE

-A

A

B

40th
Percentile

60th
Percentile

Workload/Income
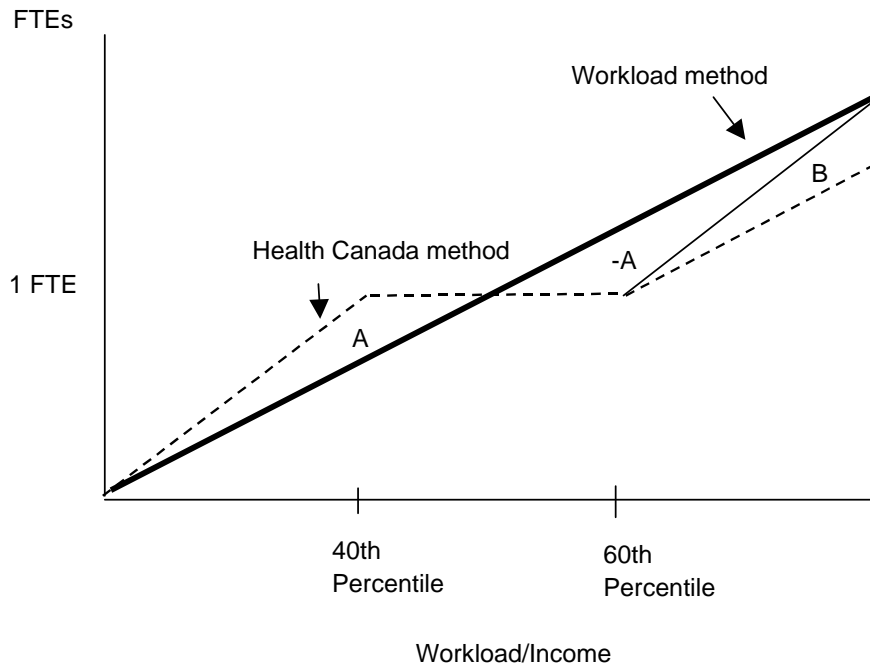
Defining Assigned Practice Populations

Table A1 provides examples of how we assigned patients to practice populations. For each patient, we determined where ambulatory visits were made, focussing exclusively on ambulatory visits to general/family practitioners. Patient 1, for example, made four visits to Group A, which happened to be one of the 29 groups included in the study. The patient also made a visit to Group B, for a total of five visits. As 80% of visits (four out of five) were made to the same group, the patient was assigned to the practice population of Group A when using a 75% majority-of-care definition.

Table A1. Assigning Patients to Practice Populations: An Example Using a 75% Majority-of-Care Definition

A = One of our 29 large groups

B = One of our 29 large groups

C = A small group not included in this study

D = All physicians without a group identifier

| | Number of Ambulatory Visits to: | | | | Total No. | |
	A	B	C	D	Visits	Classified as:
Patient 1	4	1	0	0	5	Regular patient of A
Patient 2	0	6	1	1	8	Regular patient of B
Patient 3	1	0	7	1	9	Regular patient of C
Patient 4	1	0	0	3	4	Unclassifiable
Patient 5	0	2	2	2	6	Not a regular patient

Patient 3 represents an example of an individual who received the majority of care from Group C, which we identified here as a small group not included in the study. While Patient 3 therefore is not assigned to one of our 29 large groups, she or he is nevertheless a regular patient (see e.g., Table 3). Patient 4 made one visit to Group A and three visits to D.   D represents *all* general/family practitioners without an identifier code (site code) that would indicate whether they practiced in a group setting or solo. Given that these physicians did not have a site code, we could not differentiate among them and, in effect, treated them as a single category. Patient 4, then, who received the majority of care from physicians without a site code could not be classified as either a regular or not regular patient because we could not differentiate among individual physicians in the D category.

Lastly, Patient 5 made an equal number of visits to Group B, Group C, and category D. This patient could therefore not be assigned to any practice population. It is important to note that

this patient is neither a regular patient of one of our large groups (Group B), *nor* of a smaller group (Group C). The patient also did not receive the majority of care from category D. This allows us to classify this individual as a not regular patient.

Group-Based vs. Aggregate Analyses

A distinction must be made between analyses at the individual physician group level and analyses at the aggregate level (e.g., rural versus urban groups). The following breakdown of the total number of patients receiving care from a group, let's call it Group A, will illustrate this point.

(1)		(2)		(3)		(4)		(5)
Total no. of patients visiting Group A	=	No. of regular patients of Group A	+	No. of regular patients of some other group	+	No. of not regular patients	+	No. of patients we cannot classify because they received the majority of their care from physicians without an identifier code (site code)

From this breakdown it follows that the same patient can be classified differently when determining the practice population of two different groups. For example, while the patient may be classified as a regular patient of Group A (2) when defining the practice population of Group A, she or he may appear under the category "regular patient of some other group" (3) when defining the practice population for Group B. In other words, a patient can be included in the total number of patients of several groups. Therefore, the total number of patients cannot simply be summed across groups. When conducting aggregate analyses, it therefore becomes necessary to take such "double-counters" into account.

The total number of discrete patients contacting the 29 major groups during the three-year period was 528,905, as reported in Table 1, with 356,335 patients visiting urban groups and 194,612 rural groups. The patients contacting the rural and urban groups do not add up to the total 528,905 individuals because 22,042 went both to urban *and* rural groups. The total number of patients excluding "double-counters" was used as the denominator in aggregate

analyses. For example, in calculating the percentage of patients who received the majority of their care from rural groups, the total number of regular patients for rural groups (116,638 individuals) was divided by the total number of patients visiting rural groups (194,612 patients).

Glossary of Terms

Ambulatory Diagnostic Grouper (ADG) and the Johns Hopkins Adjusted Clinical Group (ACG) Case-Mix Adjustment System

The Adjusted Clinical Group (ACG) system is a methodology to measure the "disease burden" of individuals and populations using diagnostic codes routinely collected in administrative data (Starfield, Weiner, Mumford, & Steinwachs, 1991; Weiner & Starfield, 1991; Weiner, Dobson, Maxwell, Coleman, Starfield, & Anderson, 1998; Stuart & Steinwachs, 1998). In the initial stage of the ACG classification process, ICD-9/ICD-9-CM diagnosis codes are grouped into 32 Ambulatory Diagnostic Groups (ADGs) based on expected consumption of health care resources and clinical outcomes. Using physician claims and hospital discharge abstracts, each individual is assigned one or more ADGs based on the constellation of ICD codes assigned over a defined time period, typically one year. For example, dermatitis (ICD-9 692) is assigned to ADG 01 (Time Limited: Minor) and pneumococcal pneumonia (ICD-9 481) to ADG 04 (Time Limited: Major - Primary Infections). If a patient makes four visits during the course of a year and receives only these two diagnoses, she or he will be assigned ADGs 01 and 04.

In our study, the disease burden of the study subjects was measured by assigning ADGs using ICD-9 codes from physician claims data and hospital discharge abstracts for each of the three study years. ADG-specific relative weights were obtained by regressing total health care costs consumed by the total Manitoba population in a given year (including ambulatory visits and hospital costs) onto the patient's age, gender and the 32 ADG categories. For each patient in the study, a single (weighted) ADG score for each year was calculated by summing the ADG regression coefficients to which they were assigned. An ADG morbidity index was then calculated by: 1) averaging the individual's scores across the three years; and 2) classifying patients into one of four categories: the lowest 10% representing the sickest

individuals, the next 15% who were moderately sick, the next 25% who were moderately healthy, and the upper 50% who represent the healthiest individuals.

Ambulatory Visits. Ambulatory physician visits included office visits, consultations, outpatient/emergency department visits, and visits to patients in personal care homes. Visits to hospital inpatients were excluded. Ambulatory care delivered as part of a global tariff, such as pre-natal and post-partum care visits, were also excluded, as we do not know how many such visits occurred.

Assigned Practice Population (per Physician). The number of patients identified as receiving the majority of their care from the same group (e.g., 75% of their care). For example, a patient who made four physician visits over the course of the three-year study period, three of which were incurred at the same group would be classified as a regular patient of that group. The resulting assigned practice population was then further divided by the number of physicians (FTEs) in the group, in order to allow meaningful comparison across groups of different sizes.

Assigned Practice Population (in %). Assigned practice populations were also described in terms of a *percentage* of all patients visiting a group. That is, if 100 patients visited a particular group during the three-year study period and 50 of these patients received 75% or more of their primary care services from that group, then the group would be described as having 50% of its patients as regulars.

Formal Rostering. The process whereby individuals formally register with a chosen health care provider or a group of health care providers by signing a contractual agreement.

Group Identifier Code (Site code). A code that physicians use to file claims electronically. The code was used in the present study to determine whether physicians worked in a group setting or solo. We started out by examining how many general/family practitioners shared the same site code. Having established the number of physicians (heads) as well as the number of FTEs associated with each site code, we then chose groups with four or more

physicians (heads) and four or more FTEs. Physicians without a site code were assigned a dummy code, "unknown", as we could not determine whether they were affiliated with a group.

Income Groups. Residents of urban Manitoba were divided into five equal-sized groups based on average neighbourhood household income data derived from the 1991 Canadian Census database. Census data were aggregated at the geographic unit of the enumeration area and each resident was linked to an enumeration area by residential postal code.   Based on mean household income, the postal codes were ranked from poorest to wealthiest and then grouped into five population quintiles, with each quintile containing 20% of the urban population. Thus, for each resident a quintile income rank was assigned, with Q1 being the poorest.

Patients Who Could Not Be Classified. Some patients could not be classified as either regular or not regular patients because they received the majority of their care from physicians without a group identifier code. As indicated above (see "Defining Assigned Practice Populations"), physicians without a site code were essentially combined into one category, as we could not differentiate among individual physicians. Thus, although we could generally determine whether patients received the majority of their care from these physicians, we could not assess whether they were regular patients of one particular physician or physician group.

Not Regular Patients. Patients who split their care among several physicians. These patients failed to receive the majority of their care from any one of the 29 major groups in the study, *nor* did they receive the majority of their care from groups not included in the study or solo physicians who could be identified by means of a site code (see "Defining Assigned Practice Populations" for further details).

Regular Patients. Patients who received the majority of their care from the same group of providers, given a particular percentage cut-off (e.g., 75% of their care).

Total Practice Population. The total number of patients who made an ambulatory visit to a particular group of general/family practitioners. It is important to keep in mind that patients who visited one group, and were captured in the total number of patients for that group, may also have visited another group. In aggregating data across groups, we therefore also calculated a total number of discrete patients that does not contain such "double-counters" (see "Group-Based vs. Aggregate Analyses" for details).

Total Number of Visits. The total number of ambulatory visits (see definition above) to a particular group.

Total Number of Visits by Regular Patients.   The number of ambulatory visits to a particular group incurred by the assigned practice population. For example, if 1000 patients were classified as regular patients of a group, the total visits by these patients would be the sum of all visits these 1000 individuals made to that group. Included are therefore visits of regular patients only to the group to which they were assigned, but not visits they might have made to other groups.

Visits per Regular Patient. The total number of visits incurred by regular patients divided by the number of regular patients. In Table 2, the resulting number is further divided by three to obtain an annual estimate.

APPENDIX 2: ADDITIONAL FINDINGS

Criteria for Defining Assigned Practice Populations

Majority-of-Care Definitions

Table A1 shows the total and assigned practice population (per physician) for each group, given different majority-of-care definitions. Also shown is the percentage of patients visiting the groups who were classified as regular patients given different definitions. For example, with a 50% definition, 67.8% of the patients of Group 1 were assigned to the practice population, whereas with an 80% definition only 58.3% were assigned.

Number of Years of Data

Figure A2 shows the percentage of regular patients given three years, two years, and one year of data. The percentage of regular patients increases with fewer years of data, particularly when only one year of data is considered. The difference between rural and urban groups remains about the same regardless of how many years of data are examined.

Low-Users

Figure A3 shows that excluding low-users from the analyses has relatively little effect on the percentage of regular patients. This is because low-users are excluded both from the numerator (the assigned practice population) and the denominator (the total practice population).

The Impact of Group Size

We also examined the potential relation between the size of assigned practice populations and the size of the group (i.e., the number of FTE physicians in the group). To obtain a wider range of group sizes, we included not only the 29 groups of the present report, which all had group sizes of four or more FTEs, but also smaller groups with at least 1.5 FTE physicians (69 groups in total). Figure A4 shows the number of regular patients per physician for each of these groups, sorted in descending order by group size. The 29 large groups therefore do not appear in the same order as in the report.

Generally, there is a slight trend toward smaller groups having fewer regular patients. For example, 12 of 15 groups with 6.7 or more FTEs had around 1000 or more regular patients, whereas only six of 14 groups with four or more FTEs had assigned practice populations greater than 1000 patients. However, there is no clear difference between groups with four to approximately six FTEs and groups with less than four FTEs. The safest conclusion seems to be that groups with at least six FTEs tend to have larger assigned practice populations than smaller groups.

Appendix Table A2. Comparing Majority-of-Care Definitions

Group	Total PTs/GP	50% Definition		60% Definition		65% Definition		70% Definition		75% Definition		80% Definition	
		RP/GP	% RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP
						RURAL GROUPS							
1	2,259	1,531	67.8%	1,501	66.5%	1,466	64.9%	1,403	62.1%	1,378	61.0%	1,317	58.3%
2	1,973	1,435	72.7%	1,418	71.9%	1,397	70.8%	1,361	69.0%	1,344	68.1%	1,308	66.3%
3	1,975	1,392	70.5%	1,362	69.0%	1,325	67.1%	1,271	64.4%	1,242	62.9%	1,185	60.0%
4	2,031	1,338	65.9%	1,308	64.4%	1,279	63.0%	1,246	61.3%	1,223	60.2%	1,186	58.4%
5	2,043	1,217	59.6%	1,183	57.9%	1,146	56.1%	1,101	53.9%	1,077	52.7%	1,030	50.4%
6	1,739	1,239	71.2%	1,199	69.0%	1,158	66.6%	1,105	63.5%	1,075	61.8%	1,020	58.7%
7	2,154	1,266	58.8%	1,227	57.0%	1,182	54.9%	1,108	51.4%	1,075	49.9%	1,012	47.0%
8	1,954	1,152	58.9%	1,121	57.4%	1,087	55.6%	1,044	53.5%	1,018	52.1%	975	49.9%
9	1,475	1,091	73.9%	1,061	71.9%	1,027	69.6%	963	65.2%	928	62.9%	866	58.7%
10	1,574	965	61.3%	930	59.1%	899	57.1%	852	54.1%	828	52.6%	785	49.9%
11	1,971	989	50.2%	944	47.9%	900	45.7%	851	43.2%	820	41.6%	767	38.9%
12	1,624	877	54.0%	825	50.8%	782	48.1%	721	44.4%	685	42.2%	626	38.5%
13	1,412	738	52.3%	698	49.4%	654	46.4%	603	42.7%	576	40.8%	523	37.1%
14	1,705	705	41.4%	666	39.1%	626	36.7%	573	33.6%	544	31.9%	500	29.3%

Group	Total PTs/GP	50% Definition		60% Definition		65% Definition		70% Definition		75% Definition		80% Definition	
		RP/GP	% RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP

URBAN GROUPS

Group	Total PTs/GP	RP/GP	% RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP	RP/GP	%RP
15	2,830	1,482	52.4%	1,417	50.1%	1,349	47.7%	1,252	44.2%	1,205	42.6%	1,111	39.3%
16	2,828	1,656	58.6%	1,542	54.5%	1,427	50.4%	1,283	45.4%	1,195	42.3%	1,066	37.7%
17	2,397	1,586	66.2%	1,475	61.5%	1,368	57.1%	1,243	51.8%	1,156	48.2%	1,026	42.8%
18	3,923	1,471	37.5%	1,402	35.7%	1,317	33.6%	1,195	30.5%	1,150	29.3%	1,054	26.9%
19	2,564	1,431	55.8%	1,352	52.7%	1,267	49.4%	1,158	45.2%	1,092	42.6%	978	38.1%
20	2,071	1,337	64.6%	1,282	61.9%	1,219	58.9%	1,139	55.0%	1,086	52.4%	991	47.8%
21	5,951	1,467	24.7%	1,368	23.0%	1,259	21.2%	1,090	18.3%	1,037	17.4%	924	15.5%
22	3,601	1,422	39.5%	1,317	36.6%	1,207	33.5%	1,079	30.0%	1,011	28.1%	896	24.9%
23	2,265	1,221	53.9%	1,166	51.5%	1,110	49.0%	1,034	45.7%	996	44.0%	928	41.0%
24	2,516	1,384	55.0%	1,286	51.1%	1,183	47.0%	1,064	42.3%	991	39.4%	864	34.4%
25	4,026	1,297	32.2%	1,191	29.6%	1,081	26.8%	939	23.3%	880	21.8%	778	19.3%
26	4,688	1,259	26.9%	1,156	24.7%	1,051	22.4%	906	19.3%	844	18.0%	738	15.7%
27	2,218	1,046	47.2%	991	44.7%	939	42.4%	874	39.4%	837	37.8%	774	34.9%
28	4,678	1,121	24.0%	1,028	22.0%	935	20.0%	810	17.3%	756	16.2%	664	14.2%
29	5,019	1,182	23.5%	1,069	21.3%	955	19.0%	806	16.1%	748	14.9%	644	12.8%

Note: Total Pts/GP refers to the total practice population per full-time equivalent general/family practitioner. RP/GP refers to the number of regular patients per FTE physician; % RP refers to the percentage of regular patients as calculated from the total number of patients visiting a group (i.e. the total practice populations).

**Figure A2: Assigned Practice Populations (in %) by Number
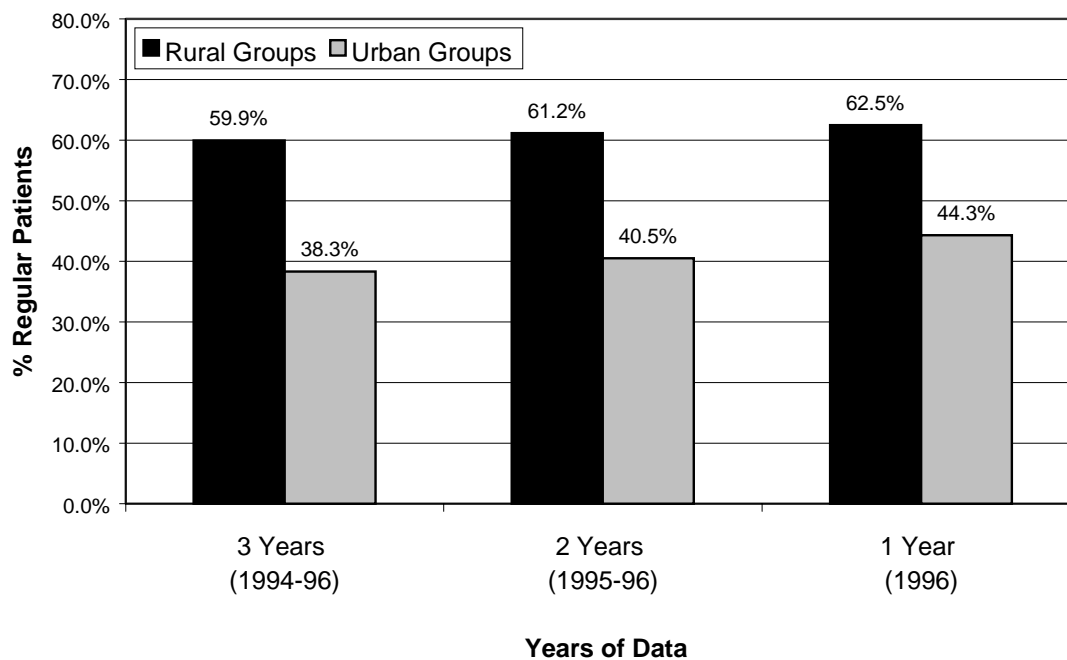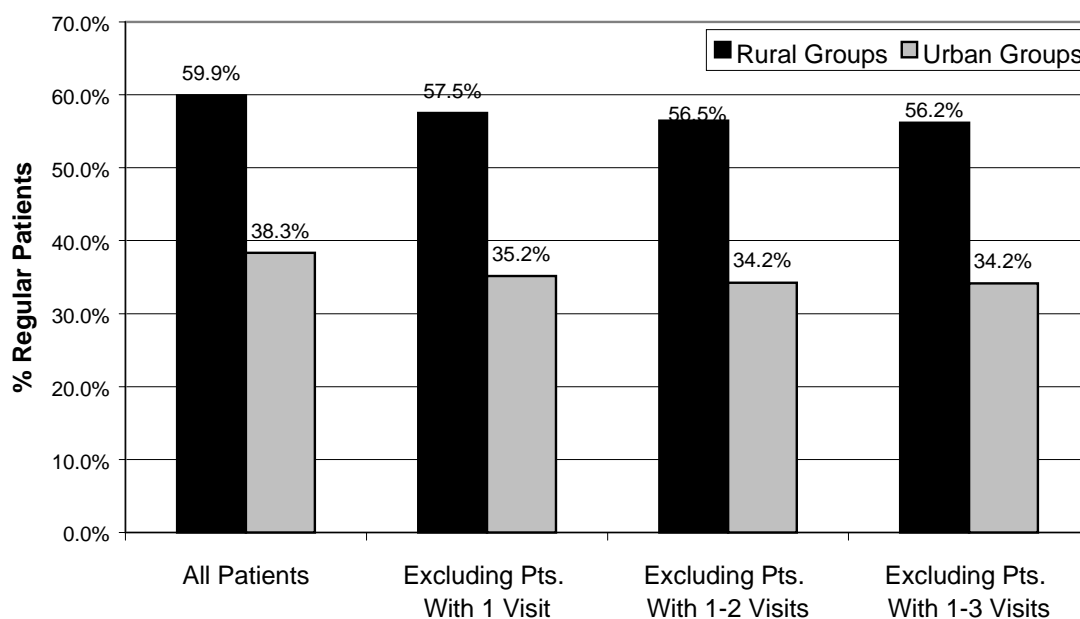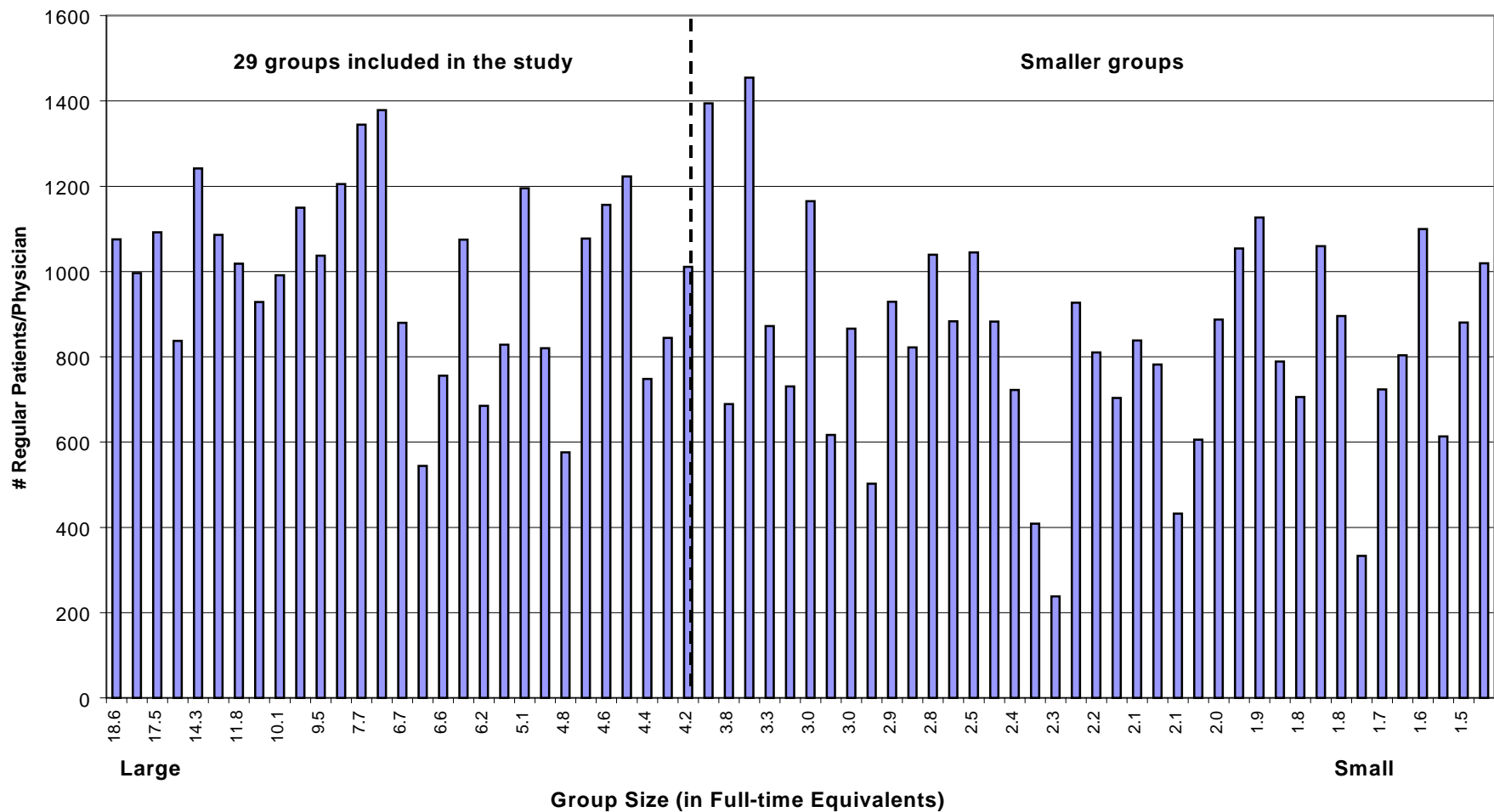of Years of Data (Using a 75% Majority-of-Care Definition)**

**Figure A3: Assigned Practice Populations (in %) Excluding
Low-Users (75% Majority-of-Care Definition)**

Figure A4: Assigned Practice Populations (per Physician) by Group Size
Sorted in Descending Order by Group Size

29 groups included in the study

Smaller groups

 # Regular Patients/Physician

Large

Small

Group Size (in Full-time Equivalents)

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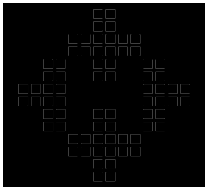
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