



ARTHRITIS COMMUNITY RESEARCH & EVALUATION UNIT (ACREU)

Patterns of primary and specialist care for arthritis and related conditions in ontario, 1996/97: an analysis of the OHIP dataset

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EXECUTIVE SUMMARY

- This is one of two reports prepared by the Arthritis Community Research and Evaluation Unit which begins to address the recommendation of the Ministry of Health and Long Term Care Arthritis Strategy Working Group related to the importance of identifying geographic, gender, age, and socioeconomic barriers to arthritis services and professionals across Ontario. Arthritis is a major cause of morbidity, disability and health care utilization in Ontario. With the aging of the baby boomer population, current estimates suggest that the number of people with arthritis will more than double by the year 2020.
- Current practice guidelines for the management of arthritis point to the importance of both primary and specialist care. Very little is known about patterns of care for people with arthritis, particularly specialist care. It is unknown what proportion of patients with arthritis are seen by what type of specialist and with which diagnoses.
- This report builds on the preliminary findings reported in *Patterns of Health Care in Ontario: Arthritis and Related Conditions*, which used data from the OHIP database to show that arthritis and related conditions are a major reason for visits to primary care in Ontario. It extends our previous work by reporting on the use of specialist ambulatory care for arthritis and related conditions, overall and in relation to availability of specialist services.
- The objectives of this study were:
 1. to describe patterns of primary and specialist care for arthritis and related conditions in Ontario; and to
 2. determine the extent to which any area variations in the rates of visiting rheumatologists and orthopaedic surgeons for arthritis and related conditions are related to the availability of specialist rheumatology and orthopaedic services in Ontario.
- Ontario Health Insurance Plan (OHIP) billing data from the fiscal year 1996/97, together with data on the location and amount of service provision by rheumatologists and orthopaedic surgeons, were analyzed. The study focused on individuals aged 15 years and older, resident in District Health Council (DHC) areas throughout Ontario, with arthritis and related conditions, visiting doctors, irrespective of where these visits took place. All individuals with at least one ambulatory encounter for arthritis and related conditions, as defined by an appropriate fee code with a prefix of "A" or "K", were

entered into the study. Some analyses also focused on the specific conditions of osteoarthritis (OA) and rheumatoid arthritis (RA). Doctors were categorized as being either primary care physicians, medical (rheumatology, internal medicine, other) or surgical (orthopaedic, other) specialists.

- Patient visit rates were calculated for each of the diagnostic groups based on individuals making at least one visit for that diagnosis. The person visit rate is the percentage of the population who made at least one visit to a doctor for a given diagnosis. Data from the 1996 census were used to determine the number of individuals living in each of the DHCs by age and sex. The total number of visits, the mean visits per individual and the ratio of the number of females to males were also determined.
- Area variations in the rates of patients with arthritis and related conditions visiting specialists by District Health Council areas in Ontario were related to data on the per capita provision of rheumatology and orthopaedic clinics throughout Ontario, obtained from the 1996 ACREU surveys of all practising Ontario rheumatologists and orthopaedic surgeons.
- Overall, in 1996/97 over one million individuals in Ontario (120 per 1000 population aged 15+) made at least one visit to a doctor where the recorded diagnosis was in the overall category “arthritis and related conditions”, with a mean of 2.2 visits per person visiting. The proportion of women with visits (135 per 1000) was higher than that for men (105 per 1000). The rate increased with age, so that over one third of people aged 65 years and older made at least one such visit. Osteoarthritis was the most common diagnosis with a crude person visit rate of 53.3 per 1000. The rate for person visits for rheumatoid arthritis (RA) was 9.8 per 1000, with a female to male ratio of 2:1.
- The majority (81%) of individuals made at least one visit to a primary care physician. Overall, 31% made visits to specialists. Just under half of specialist visits were to medical specialists, and just under half of these visits were to rheumatologists (accounting for 6% of all visits). Internal medicine had a similar proportion of all visits as rheumatology. One fifth of all visits were to surgical specialists, with the vast majority of these visits being to orthopaedic surgeons. For RA, 43% of individuals visited specialists, including 22% visiting rheumatologists. Visits for OA were mainly to orthopaedic surgeons.
- The person visit rates per 1000 population for arthritis and related conditions varied somewhat across the DHCs, from 89.9 per 1000 for Waterloo Region to 141.2 per 1000 for Essex County. Some of this variation may be partially explained by the skewing effect of areas in which there is a high proportion of doctors who participate in alternative

payment plans; visits to such doctors are not included in the OHIP database.

- An important factor in determining visits to specialists is the local availability of specialist services. In general, DHCs with low provision of rheumatology services had lower rates of people with arthritis or related conditions visiting rheumatologists. There was a statistically significant lower mean person visit rate to rheumatologists in areas with no or low per capita provision of rheumatology services; this was true for the overall diagnostic group of arthritis and related conditions and for the group with rheumatoid arthritis.
- This is the first report of analyses of Canadian data which documents the use of specialist care by people with arthritis and related conditions. Although almost a third of patients had visits to specialists, the proportions of patients with arthritis and related conditions, RA, and other serious conditions who visited rheumatologists was relatively low, which is in line with previous work. This suggests a potential under-referral particularly of patients with early RA to specialists. Our findings underline the fact that primary care physicians provide the vast majority of care for people with arthritis.
- There was no discernable pattern in the variation of person visit rates by DHC within the province, except in relation to the provision of rheumatology services. This is in contrast to the findings of the National Population Health Survey (NPHS) which held that the areas of highest prevalence of reported arthritis or rheumatism tended to be in the Northern and rural areas. The discordance between the areas of the province with high self-reported prevalence of arthritis, and those with higher rates of doctor visits, raises the issue of whether there are barriers to accessing services.
- The relationship between person visit rates to rheumatologists for reasons of arthritis and rheumatism and the per capita provision of clinics suggests that the degree of local availability of services may affect the chances of a patient receiving rheumatological care, even though, in principle, patients could be referred elsewhere.
- These findings strongly suggest that, in Ontario, there are problems with the availability of care and access to that care, particularly with respect to rheumatologists. This is an especially concerning finding in light of emerging evidence of the role of early and effective treatment of inflammatory arthritis in preventing disability and improving outcomes. New models of care need to be explored, particularly with respect to the provision of rheumatological specialist care to remote areas.

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1.0 INTRODUCTION

1.1 Background

This report is one of two reports on research carried out as part of a partnership of the Arthritis Community Research and Evaluation Unit (ACREU) with the Ministry of Health and Long Term Care (MOHLTC) Population Health Unit with the goal of identifying variations in the use of care for arthritis and related conditions, what services are being accessed by whom, and factors that contribute to access and non-access.

Work on this theme builds on the ICES Practice Atlas, *Patterns of Health Care in Ontario: Arthritis and Related Conditions*¹ which was published in September of 1998. That publication highlighted substantial variations in both the availability and use of services for people with arthritis in Ontario. As a result of the publication of the Atlas, the MOHLTC formed an Arthritis Strategy Working Group (ASAG). This group reported to the Minister in early 2000. The first recommendation of the report to the Minister related to the importance of identifying geographic, gender, age and socioeconomic barriers to accessing arthritis services and professionals across Ontario. This and its companion report² provide further background information relevant to this recommendation.

Arthritis and related conditions are leading causes of morbidity, disability, and health care utilization in Ontario. Almost twice as many women as men report having arthritis, and the prevalence increases with age³. Given the aging of the population, current estimates suggest that the number of people with arthritis will more than double by the year 2020⁴. Health care has an important part to play in the management of arthritis and in the prevention of arthritis related disability. There are over 100 different types of arthritis and related conditions. Most are chronic disorders which generally progress until the end of life, so it is important that individuals with arthritis are able to access appropriate services throughout their lives. The type of care they require changes as their conditions evolve. It is therefore important that there be a continuum of care to reduce the impact of arthritis on individuals and in the population as a whole. Primary care and specialist services for people with arthritis are the backbone of this continuum^{5,6}.

1.2 Overview

The first line of health professional care for people with arthritis is often a primary care doctor. These practitioners are the gatekeepers to care for people with arthritis, and the key health care professional in providing continuity of care over the course of the disease process.

Specialists, particularly rheumatologists and orthopaedic surgeons, are a vital component to the continuum of care. There is a growing body of literature about the importance of rheumatological care in the management of rheumatoid arthritis (RA)^{7,8}, and joint replacement surgery is well established as a highly cost-effective treatment for the management of advanced arthritis, particularly osteoarthritis (OA)^{9,10}. Current practice guidelines suggest that people with a primary care diagnosis of RA should be referred to a rheumatologist, and that people with long standing and severe OA should be referred for an orthopaedic opinion^{5,11}.

Despite the important role of specialist care for arthritis, very little is known about the patterns of specialist care for arthritis in Canada (or any other country) due to a lack of routine data on ambulatory specialist care. This is particularly crucial for rheumatology, as it is primarily an outpatient specialty. It is unknown what proportion of patients with arthritis are seen by what type of specialist and with which diagnoses.

From a health planning standpoint, it is important to assess both the impact of arthritis in the population and the needs of those affected, with special attention to the role of formal health services. This report focuses on one aspect of health care utilization, rates of visiting various doctor specialties for different types of arthritis using administrative billing data from the Ontario Health Insurance Plan (OHIP). The most relevant types of specialists are rheumatologists and orthopaedic surgeons.

The objectives of this report are: a) to describe patterns of primary and specialist care for arthritis and related conditions in Ontario; and b) to determine the extent to which any area variations in the rates of visiting rheumatologists and orthopaedic surgeons for arthritis and related conditions are related to the availability of specialist rheumatology and orthopaedic services in Ontario.

2.0 METHODS

2.1 Overview

The Analyses presented in this report used data from the OHIP to identify individuals visiting doctors with arthritis and related conditions. Individuals were also characterised by their area of residence in the province, in terms of District Health Council areas, irrespective of where in the province the doctors were seen. Doctors visited were categorized as being primary care doctors, medical and surgical specialists, with particular focus on rheumatology, internal medicine, and orthopaedic surgery. Area variations in the rates of patients with arthritis and related conditions visiting specialists by Ontario District Health Council areas were related to data on the per capita provision of rheumatology and orthopaedic clinics throughout Ontario.

2.2 Data Sources

2.2.1. Provision of Specialist Care: Rheumatology and Orthopaedic Ontario Surveys

In 1997, the Arthritis Community Research Evaluation Unit (ACREU) carried out surveys of all practising Ontario rheumatologists and orthopaedic surgeons. The surveys included questions about practice location and the number of clinics offered by each practitioner. The survey consisted of a self-administered mailed questionnaire with a telephone follow-up for non-respondents¹², eliciting a response rate of 99.4% (167 out of 168) for rheumatologists. The service volume was calculated based on the number of clinic half days held each week for each clinic location throughout Ontario. For each DHC (District Health Council), the total number of clinic half days was summed together in order to calculate the total degree of service provision.

The response rate of the survey of Ontario orthopaedic surgeons was 99.5% (372 out of 374). The orthopaedic surgeons were asked the number and location of clinic half days for both their clinical and surgical practices. Total service provision was calculated based on the summation of their clinic and surgery hours, which was then aggregated and stratified for each of the DHCs.

2.2.2. *Doctor Specialty*

Doctor specialty was defined according to the method described by Chan¹³ which uses information from the Southam Medical Database (SMDB), National Physician Database (NPDB) and the Corporate Provider Database (CPDB). This methods used quasi-probabilistic matching, based on the doctor's date of birth, gender, postal code, graduation year and graduation school, to link the SMDB database with the NPDB database. The same quasi-probabilistic matching was used to link the NPDB with the CPDB. Codes for the identified specialists were then linked to the OHIP billing data file. The OHIP billing codes are divided into different specialties, such that there are unique billing numbers for each kind of provider. For example, an ambulatory consultation done by a family practice doctor or a general practitioner is billed as A005, whereas a similar ambulatory consultation done by a rheumatologist is billed as A485. It is therefore possible to define a specialty (functional specialty) based on how the doctor bills.

According to Chan's method, a doctor was defined as a rheumatologist if his or her functional specialty was that of a rheumatologist, or if he or she listed rheumatology as a sub-specialist in the NPDB database. If the doctor had no sub-specialty listed in any of the databases and billed as a general internist then the doctor was considered to be a general internist. If the doctor had a medical related sub-specialty listed in any of the databases and did not bill as a rheumatologist, he or she was considered to be another medical speciality. Orthopaedic surgeons were defined as such if their functional specialty was that of an orthopaedic surgeon or if he or she was listed as an orthopaedic surgeon as a sub-specialist in the NPDB database. The other surgeon group was made up of doctors who billed mostly using the surgery-based fee codes and who did not list rheumatology or orthopaedic surgery as a sub-specialty.

2.2.3 *Patient residence*

Data on patients' residence was obtained from the Registered Persons Database (RPDB), which is maintained by the Ministry of Health. The database lists all of the individuals in Ontario who have a health card number. Each individual's date of birth, gender, address and postal code are listed in the database. The postal code and address are updated automatically

each time a health card holder is admitted to an Ontario hospital. However, when individuals move, it is not necessary for them to register their change of address with the Ministry of Health. Residential postal codes in the RPDB were grouped according to District Health Council areas.

2.2.4 Ontario Health Insurance Encounter Data

Administrative data from the Ontario Health Insurance Plan database for the 1996 fiscal year (April 1996 to March 1997) were used in the analysis. Only 6% of Ontario doctors who practice under alternative payment plans typically do not submit claims to this database¹⁴. For every claim, the following information is recorded: type of services/procedures received, diagnostic code, age and gender of the patient, patient identification number, doctor identification number and doctor speciality type. All identification numbers were scrambled to assure confidentiality. In order to be paid, doctors must submit for every encounter a three digit diagnostic code based on the international classification of disease system.

2.3 Identification of medical encounters for arthritis and related conditions

All individuals with at least one musculoskeletal related ambulatory encounter, as defined by a fee code with a prefix of “A” or “K”, were entered into this study (see Table 1). We decided to focus on the overall group of people who ostensibly have arthritis or related conditions together with the specific conditions of osteoarthritis (OA) and rheumatoid arthritis (RA).

In order to avoid problems with accuracy of the data due to small cell sizes (which were most problematic for our area variation analyses), arthritis and related diagnostic codes were grouped in such a way that diseases with similar clinical and epidemiological profiles were aggregated. Disseminated lupus erythematosus, scleroderma, dermatomyositis and polyarteritis were joined to form a single group of connective tissue diseases. Ankylosing spondylitis and gout were also combined because both of these types of inflammatory arthritis are more prevalent in males. The other arthritis and related conditions group comprised a number of relatively infrequent conditions, the majority of which relate to deformity or malfunction of joints: joint

derangement, recurrent dislocation, ankylosis, pyogenic arthritis, traumatic arthritis, hallux vagus, hallux varus, hammer toe, flat foot and pes planus.

2.4 Geographical Variation

The 33 District Health Councils (DHC) were used as the unit of analysis for the intra-provincial variation in health care utilization. Ambulatory visits were assigned to a DHC based on each individual's postal code from the RPDB, and not on where the visited doctor had his or her practice.

2.5 Analyses

For each diagnosis, the total number of individuals with at least one visit to any doctor was calculated. The total number of individuals for the arthritis and related conditions group was a summation of all the individuals with at least one arthritis or related diagnosis. The total number of visits to all doctors for each diagnosis and for the arthritis and related conditions group was calculated. The mean visits per individual, and the ratio of the number of females to males, were determined. Population visit rates, referred to as person visits rates, were calculated for each of the diagnostic groups based on individuals making at least one visit for that diagnosis. Person visit rate was computed according to the following formula:

$$\text{Person Visit Rate} = \frac{\text{Number of Individuals Visiting}}{\text{Total Adult Population of Area}}$$

Data from the 1996 census were used to determine the number of individuals living in each of the DHCs by age and gender.

The percentage and person visit rates of individuals visiting the different specialties were calculated. The "all medical specialist" group was comprised of all individuals who visited a rheumatologist, internal medicine and/or any other medical specialists at least once during the 1996 fiscal year. Likewise, the "all surgical specialist" group consisted of all individuals who visited an orthopaedic surgeon and/or any other surgical specialist at least once during that year. The "all specialist" group consisted of all individuals who visited any specialist (i.e., non family

practitioner) at least once. Since it is possible for an individual to visit more than one type of specialist and a family practitioner at least once for the same diagnosis during the year, the percentages do not add up to 100%.

Person visit rates for arthritis and related conditions, OA and RA were calculated for each of the DHCs. Fewer than 1% of the individuals in the study did not have a postal code and were therefore dropped from the analysis. Similar rates per 1000 population were calculated for OA and RA for the different DHCs. The percentages of individuals visiting a primary care doctor, a specialist, a medical specialist and a surgical specialist were also calculated for each of the district health councils, as were the corresponding visit rates per 1000 of population

In order to determine if there was any relationship between the proportion of patients visiting a specialist and the extent of provision of rheumatological or orthopaedic services by DHC area, person visit rates per 1000 population to rheumatology, internal medicine, and orthopaedic practitioners were calculated and compared to data on specialist provision. To simplify the presentation of data, the provision of specialist services was put into three groups based on the number of clinical half/days provided per week per 100,000 population¹². For rheumatology provision, these divisions were: the lowest quintile (no rheumatological service or 0.04 to 0.72 clinical half/days per week per 100,000), the middle three quintiles (1.31 to 9.49 clinical half/days per week per 100,000) and the high quintile (12.67 to 18.91 clinical half/days per week per 100,000). The corresponding groups for orthopaedic services were: the lowest quintile (no orthopaedic service or 2.31 to 5.46 office half/days per week per 100,000), the middle three quintiles (6.44 to 17.76 office half/days per week per 100,000) and the high quintile (20.45 to 26.35 office half/days per week per 100,000).

3.0 RESULTS

Analyses of data from the OHIP database showed that, in 1996/97, over one million individuals, 120 per 1000 (12%) of the Ontario population aged 15+, made at least one visit to a doctor for which the recorded diagnosis was arthritis or a related condition (Table 2). The overall number of visits was over 2 million, with a mean of 2.2 visits per person visiting. The rate for women with visits (135 per 1000) was higher than that for men (105 per 1000), and the rate increased with age, so that over one third of people aged 65 years and older made at least one such visit.

Osteoarthritis was the most common diagnosis with a crude person visit rate of 53.3 per 1000 (see Table 2). The person visit rate for rheumatoid arthritis (RA) was 8.5 per 1000, with a female to male ratio of 2:1. This is very similar to the literature prevalence estimates for RA of 10 per 1000, with a 2-3 fold excess in women¹⁵. Rates of visiting for all arthritis and related conditions were higher in women except for ankylosing spondylitis and gout, which reflects the gender profile for these conditions¹⁵. The person visit rate for connective tissue diseases was 1.6 per 1000, once again similar to published prevalence estimates¹⁵.

The majority, 81%, of individuals made at least one visit to a primary care doctor, which was billed as being for arthritis or a related condition, during the 1996 fiscal year (Table 3). Overall, 31% made visits to specialists (with some visiting both primary care doctors and specialists). Just under half of specialist visits (13% of all visits) were to medical specialists, and, again, just under half of these visits were to rheumatologists (6% of all visits). Internal medicine had a similar proportion of all visits. One fifth of all visits were to surgical specialists, with the vast majority of these visits being to orthopaedic surgeons. The proportion of individuals with RA making visits to specialists and specifically rheumatologists was 43% and 22% respectively. The highest proportion for all specialist visits was by those billed for connective tissue disease, with 70% and 38% of such people visiting specialists and rheumatologists respectively.

As might be expected, visits for OA and for the other arthritis and related group were

mainly to orthopaedic surgeons. Table 4 also reports on visits to different types of doctors, but here the data are expressed as person visit rates per 1000 population. Overall, almost 10% of the population visited a primary care doctor for arthritis and related conditions, 3.7% visited a specialist, 0.7% visited a rheumatologist, and 2% an orthopaedic surgeon.

The person visit rates for arthritis and related conditions varied somewhat across the DHCs (Figure 1). The rates ranged from 89.9 per 1000 for Waterloo Region to 141.2 per 1000 for Essex County. Person visit rates by DHC are also shown in Table 5, which further looks at the proportion of visits to primary care practitioners and to specialists. The proportion seeing primary care doctors varied from 90.8% (with 18.6% seeing specialists in Nipissing/Tamiskaming) to 70.4% (with 41.7% seeing specialists in Hamilton Wentworth).

Over and above any 'true' variation in the rate of visits for arthritis and related conditions, there are a number of potential issues which might contribute to this variation. Lack of specialist billings might contribute to inflating the overall proportion of primary care visits. For the Kingston/Frontenac/Lennox/Addington region, only 16% of billings were for visits to specialists, with 91% to primary care. In this same area, a large proportion of specialists practice under the Southeast Ontario Academic Medical Organization (SEAMO), an alternative payment plan, and therefore are severely under-represented in the OHIP database. For this reason, we did not include Kingston in further analyses on OHIP data relating to service provision. The high proportion of primary care billings in other areas, such as Nipissing/Tamiskaming, could be due to a lack of local specialist services. Conversely, the presence of a high concentration in any DHC of primary care doctors who are part of alternative payment plan arrangements, such as Health Service Organizations and Community Health Centres, would likely to produce a lower proportion of visits to primary care, and to inflate the overall proportion of specialist visits. For example, this may well be the situation in Hamilton Wentworth, where there is large Health Service Organization, i.e. Stoneychurch.

Figure 2 and Table 6 show the rate of patients visiting for osteoarthritis by DHC. There was considerable variation ranging from 33.7 per 1000 in Waterloo region to 71.4 per 1000 in Renfrew county. Similar variation in rates were seen for persons visiting with rheumatoid

arthritis, though there were some differences in the relative order of the DHCs. (Figure 3 and Table 7). Omitting the Kingston area, the lowest rate of person visits for RA was in York Region (6.1 per 1000) and the highest in Lambton (17.1 per 1000). It is noteworthy that a high person visiting rate for RA was found for Manitoulin-Sudbury. This area of the province has a high aboriginal population. Rheumatoid arthritis is known to have a high prevalence in many North American Indian populations¹⁵.

A further possible explanation for variation in person visit rates between DHCs might be differences in the proportion older people (who are more likely to have arthritis) in the population. However, age and sex standardized rates show similar variation in the patient visit rates (Data not shown).

A potential important factor in determining visits to specialists is the local availability of specialist services. Figure 4 shows the rates of person visits to rheumatologist for arthritis and related conditions, together with the rate of availability of rheumatology half day clinics per 100,000 population for each DHC. In general, those DHCs with low provision of rheumatology services had lower rates of persons visiting rheumatologists for arthritis and related conditions. Higher rates of person visits were seen for DHCs with a higher per capita provision. This is further shown in Figures 5 and 6 which groups the DHCs into those with the lowest quintile, middle quintiles of provision, and the highest quintile of rheumatology provision and relates them to person visit rates to rheumatologists respectively for reasons of arthritis or related conditions and rheumatoid arthritis. A Krushal Wallis test showed statistically significant differences in the mean person rate of visits to rheumatologists between the three levels of rheumatological provision (Table 8). Similar analyses for visits to internal medicine showed no difference in mean person visit rates (Figures 7 and 8, Table 8) suggesting that access to specialist medical services overall is not a factor.

Figure 9 shows the person rate of visiting orthopaedic surgeons for OA for DHCs grouped into the lowest quintile, the middle quintiles and highest quintile of orthopaedic service provision. There is no obvious relationship.

Given that patients with rheumatoid arthritis ideally need to be seen by specialists with

access to facilities equipped to monitor the potentially toxic drugs used to treat this condition, it could be argued that if individuals did not have access to a local rheumatology service, general internal medicine specialists might be consulted as an alternative. One might expect that this tendency would result in higher rates of internal medicine visits where there is low rheumatology provision, and vice versa. Figure 10 is a plot of person visit rates to rheumatology versus person visit rates to internal medicine for each DHC, where the DHCs are classified as having low, middle and high provision of rheumatology services. Contrary to expectation, there is no discernable relationship.

4.0 DISCUSSION

4.1 Overall

This report builds on the preliminary findings reported in *Patterns of Health Care in Ontario: Arthritis and Related Conditions*, which used data from the OHIP database to show that arthritis and related conditions are a major reason for visits to primary care in Ontario⁶. This report extends our previous work by reporting on the use of specialist ambulatory care for arthritis and related conditions, overall and in relation to the availability of specialist services.

Studies of arthritis and other conditions which are seen primarily in ambulatory care settings are limited by a lack of available data sources. Some information is available from national and provincial population health surveys, however the data from these sources are limited. For example, the National Population Health Survey asks respondents about visits to various types of health care providers in the previous 12 months, but no information is collected about the reasons for these visits. Data from the Ontario Health Insurance Plan (OHIP), although not without limitations, could potentially remedy some of these deficiencies.

The overall findings from our analyses of the OHIP data seem to have reasonable face validity. More serious types of arthritis, such as rheumatoid arthritis, are likely to result in visits to doctors. Prevalence estimates based on individuals making at least one visit to a health care

provider with RA and other specific types of arthritis are in line with published estimates, as are female to male sex ratios for these conditions¹⁵. As might be expected, a greater proportion of individuals with more serious conditions, such as RA or connective tissue disorders, also made visits to specialists.

4.2 Potential limitations of OHIP Data

Nevertheless, we have to acknowledge a number of potential limitations in using OHIP data. These data are collected as part of a system of doctor remuneration where doctors have to enter a diagnostic code for each encounter in order to be paid. A major limitation is that these OHIP diagnoses are not validated. A further disadvantage of the OHIP data set is that it only one diagnosis per visit is usually recorded. If a patient had more than one reason for visiting, some rheumatological diagnoses might be missed. Also, primary care doctors have a large range of possible diagnoses from which to choose. It may be that individual doctors routinely use a small subset for convenience. Codes for infrequently encountered types of arthritis may therefore not be recorded in favour of more non-specific codes. However, the converse of this is that infrequently used codes, such as that for RA, may be more likely to have been used appropriately to designate an inflammatory arthritis affecting several joints. In such cases, a referral to a specialist might well have been warranted.

There are also some concerns about the coverage of the OHIP database. Data from doctors and patients enrolled in alternative payment plans are typically not included. As noted above, these only cover about 6% of all doctors. However, patients covered by these plans are likely to be clustered in certain areas in the province, and it may be that data relating to some DHCs are markedly affected. This is noted above in regard to areas such as Hamilton Wentworth which appear to have an unusually low proportion of primary care visits. To perform more detailed analyses would require information about the population coverage of all alternative payment programs, and/or cross-validation of the arthritis data with data about other conditions. These were not available at the time of preparing this report.

Furthermore, visits by patients who are seen under the auspices the Workers' Safety and

Insurance Board and other insurance schemes may not appear in the OHIP dataset. However, as arthritis is not usually related to work or trauma, only a minority of arthritis related visits are likely to have been missed.

The choice of DHC areas for studying area variation was one of convenience, and may have implications for interpreting the results. Reijneveld¹⁶ found that the clustering of poor health is largest in neighbourhoods and smallest in postal code sectors – the choice of geographical determinant affects the degree of clustering of poor health by area. It does not, however, alter the fact of the existence of area variation. A more serious potential limitation is that the postal codes in the Registered Persons' Database are not always updated if a person moves. This would only be of concern if a substantial proportion of total moves took individuals from one DHC area to another. However, a study in the inner city of Toronto, which has one of the most mobile populations in Canada, showed that a very high proportion of all movers stayed within the city of Toronto, and that 85% of all moves were between areas of similar socioeconomic status¹⁷. Mobility in the rest of Ontario is likely to be less.

4.3 Patterns of primary and specialist care for arthritis and related conditions

Our findings underline the fact the primary care doctors provide the vast majority of care for people with arthritis. Overall, 80% of people making visits for arthritis and related conditions made at least one visit to a primary care doctor. This is line with findings from the National Population Health Survey which showed that 90% of people reporting arthritis or rheumatism as a long term health problem have seen a primary care doctor in the previous year^{2,18}, although the reasons for these visits were not asked for in the survey. Data from the 1990 Ontario Health Survey showed that 70% of people with arthritis or rheumatism had consulted a health professional, most commonly a primary care doctor in the previous year, specifically because of their arthritis, with over 80% of those with arthritis of recent onset (within a year) doing so³.

It is unknown to what extent the data on persons visiting doctors for arthritis and rheumatism capture the full spectrum of people with arthritis and related conditions in Ontario. Our data only cover the fiscal year 1996/97 and any potential patients not visiting in that time

period with a visit recorded as arthritis and related disorders may have been missed. Not all people with long term arthritis visit a doctor in the course of a year. Apart from the stereotype of OA as a condition of aging with which one has to live, clinical practice guidelines for non-severe arthritis include exercise and acetaminophen for pain relief. Neither of these require routine monitoring by a doctor. However, as indicated above, for the more severe and rare types of arthritis, the person visit rates are similar to prevalence estimates. The data from the 1990 OHS suggest that some 30% of people with chronic arthritis may not visit a doctor; this proportion increases with increasing duration of the conditions³. Factors affecting rates of visits to doctors over the course of arthritis and related disorders need further study.

This is the first report based on Canadian data which documents the use of specialist care by people with arthritis and related conditions. Although almost a third of patients had visits to specialists, the proportions of patients with arthritis and related conditions, RA, and other serious conditions who visited a rheumatologist was relatively low. Overall, only 6% of patients with arthritis and related conditions, and 22% of patients with RA, had visits to rheumatologists specifically for those conditions. This may be in line with previous work which suggests a potential trend of under-referral to specialists, particularly of patients with early RA^{19,20}. The proportions of visits to internal medicine specialists were similar to those to rheumatologists, and the proportions visiting orthopaedic surgeons were almost three time higher. The overall person visit rate for the latter was almost 2% of the population aged 15+. This is orders of magnitude higher than rates for hip and knee replacement surgery in 1996/97, which were, respectively, 83 and 92 per 100,000 persons aged 20 years and older²¹. The high proportions of visits to specialists other than rheumatologists raise questions about the extent to which referral of patients with arthritis is relatively non-specific, and whether the choice of the target specialist for the referral is always the most appropriate. This pattern of referral also has potential implications for the continuing education of general internist and orthopaedic surgeons in the ambulatory care management of arthritis and related conditions.

4.4 Differences in person visit rates by region

There is considerable variation in person visit rates by DHC regions. There was no discernable pattern in variation of rates within the province, except in relation to the degree of provision of rheumatology services; this relationship is discussed below. The lack of geographic pattern is in contrast to findings from the National Population Health Survey (NPHS) which suggested that the areas of highest prevalence of reported arthritis or rheumatism tended to be in the Northern and rural areas².

The discordance between the areas of the province with high self-reported prevalence of arthritis, and those with higher rates of visiting doctors raises the issue of whether there are barriers to accessing services.

A study of Ontario family doctors found that the majority reported barriers to referral of patients with musculoskeletal problems²⁰. Many of these problems related to unacceptably long waiting times and were particularly severe for physiotherapy, orthopaedic surgery and rheumatology. Potentially more serious, although less common than waiting time barriers, were access barriers to specialist services relating to the availability of those services. Both types of barriers may indicate a lack of sufficiently trained personnel. As expected, access problems were much more common in rural parts of the province and in the north²⁰. There may also be other barriers to visiting rheumatologists who are far away, as would be the case for patients living in rural areas who need to be referred elsewhere. In addition to the expense and potential loss of income to patients, there may be a direct impact of painful and disabling conditions on the ability of patients to undertake long journeys.

Studies of hip and knee replacement surgery show large area variations in rates throughout the province²¹ which are not explained by the demographic characteristics of the population nor by variations in prevalence of self-reported arthritis^{22,23}. An in-depth study of two areas with high and low joint replacement rates highlighted a range of potential contributory factors to the variation, including both patients' willingness and doctor practices²⁴.

4.5 Visits to rheumatologists

Despite limitations in the data, the relationship between person visit rates to rheumatologists for arthritis and rheumatism and the per capita provision of clinics suggests that local availability of services may affect the chances of a patient receiving rheumatological care, even though, in principle, patients could be referred elsewhere. Also, much of the rheumatology provision to rural areas is by doctors making visits for clinics several times a year¹². This means that, in addition to the overall low level of provision, there may be barriers to access for urgent care and for monitoring of patients with arthritis .

Taken together, these findings strongly suggest that, in Ontario, there are problems with the availability of care and access to that care, particularly with respect to rheumatologists. These issues require further attention and creative problem solving to improve access to care. This is particularly crucial in the light of emerging evidence of the role of early and effective treatment of inflammatory arthritis in preventing disability and improving outcomes^{7,8}.

4.6 A crisis in specialist care

It is likely that the variations in visiting patterns between specialists are due in part to under-servicing; a patient cannot visit a specialist if one is not available in the area.

The probability of seeing a specialist appears to be influenced by the presence or absence of local specialists²⁵, even though in a system of universal insurance and access like that of Canada, patients can presumably go anywhere in the province for treatment. To some extent, the general internists could provide service for arthritis patients when rheumatology services are unavailable. However, it seems that the rate of visits to these specialists is equally variable across the province and not correlated with level of rheumatology services. The study of primary care doctors, which indicated almost universal barriers to referral²⁰, also supports the suggestion that provision of specialist care may be generally inadequate, as does the work of Hawker which pointed to unmet need for joint replacement surgery, even in an area in the province with one of the highest rates²⁴.

This crisis in specialist provision appears to be part of a larger trend in Western health

services. Helms²⁵ *et al* identified the following relevant trends: conflict between cost-containment and access goals, increased financial risk for hospitals (particularly smaller rural ones), continued consolidation in the health care delivery system, a shift from in-patient to out-patient focus, changes in doctor practice patterns due to competition, hospitals' increased need for capital, inadequate supply of health personnel, and the fragmentation of emergency services in rural areas.

An insufficiency of specialists is a provision crisis best approached from a systems perspective. Identified variations in health service delivery do not necessarily signal an inappropriateness of care, and there is a need to support research aimed at testing appropriateness from a clinical, not an economic or infrastructure perspective^{26,27}. It is a truism that rural regions appear to be under-serviced, relative to urban regions^{26,27}. New models of rural care need to be explored, particularly for the provision of rheumatological specialist care to remote areas. Coward²⁶ *et al* suggest that we must: realign existing hospital and related secondary care services to meet ambulatory care needs, enhance transportation of rural elder patients to receive ambulatory care, deliver ambulatory care using temporary services which periodically visit the area, increase the use of telecommunications for diagnosis, treatment and related consultation, improve the delivery of continuing education to rural health professionals, and offer fiscal enticements to encourage professionals to relocate. In view of the relatively high proportion of specialist visits that are to general internists or orthopaedic surgeons, one might add enhanced training of these specialists in the ambulatory care of arthritis patients to this list.

Some of the above are already part of the delivery of rheumatology care in Ontario. In a number of areas, care is delivery by periodic visits¹², and there is a program in place which uses telecommunications to allow a university-based specialist to “see patients” in remote northern communities, with the help of a therapist from the Arthritis Society Consultation and Therapy Service to examine the patients and relay physical findings to the specialist²⁸.

Furthermore, even when services are optimally distributed, utilization may or may not occur. ACREU's work has documented potential deficiencies in primary care which are likely due to lack of exposure of primary care doctors to specific training about arthritis; this may deter

appropriate referral and treatment^{29,30}.

5.0 CONCLUSION

Exploratory analysis of the Ontario Health Insurance Plan database shows that, overall, 12% of the population aged 15 and older made at least one visit to doctors for arthritis and related disorders in the 1996/97 fiscal year. Primary care doctors were the mainstay of treatment for people with arthritis and rheumatism, with 81% of these individuals making at least one visit to a primary care doctor. Almost a third of individuals making visits saw a specialist. Although rheumatologists are the recognized specialists in this area, only 6% of patients visited general internists, and almost three times as many visited orthopaedic surgeons.

The probability of seeing a rheumatologist is strongly influenced by the presence of a local rheumatology service, even though Ontarians can theoretically seek specialist care anywhere in the province. This suggests that people living in areas with low or no local provision are not receiving the care that they need. Although to some extent the provision gap may be being filled by other medical specialties, there is concern for the long-term appropriateness or sufficiency of such care.

These findings point to a crisis for the growing number of people with arthritis and related conditions in Ontario, which is in part related to a lack of rheumatology care. Further research is needed to confirm these preliminary results. The survey of the location and practice volume of rheumatologists and orthopaedic surgeons has been repeated in 2000-2001, which offers the possibility of replicating these results for another time period. Also, more analyses are needed to determine whether the barriers to care are universal to the whole patient population or whether certain groups, such as women or older individuals, are disproportionately affected.

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Table 1: Summary of OHIP (Ontario Health Insurance Plan) diagnostic codes used to define specific conditions examined in this report.

Disease Category	Condition	Diagnostic Categories	OHIP Diagnostic Code(s)
Arthritis and related conditions	OA	osteoarthritis	715
	synovitis	synovitis, tenosynovitis, bursitis, bunion, ganglion	727
	fibrositis	fibrositis, myositis, muscular rheumatism	729
	RA	rheumatoid arthritis, Still's disease	714
	connective tissue	disseminated lupus erythematosus, scleroderma; dermatomyositis, polyarteritis	710; 446
	ankylosing spondylitis & gout	ankylosing spondylitis; gout	720; 274
	other arthritis and related	joint derangement, recurrent dislocation, ankylosis; pyogenic arthritis; dupuytren's contracture; hallux vagus, hallux varus, hammer toe; flat foot, pes planus; traumatic arthritis	718; 711; 728; 735; 734; 716

Table 2: Visits to doctors for arthritis and related conditions in Ontario. Analysis of data from the 1996-97 Ontario Health Insurance Plan

Condition	OHIP Diagnostic Code	Persons Visiting Per 1,000 Population						Number of Persons (1000s)	Number of Visits (1000s)	Mean Visits Per Person	Ratio Female: Male
		All Ages 15+	15-44	45-64	65+	Female	Male				
Arthritis & related		120.3	71.1	136.0	346.4	134.9	105.1	1,064	2,342	2.2	1.3
Osteoarthritis	715	53.3	14.2	62.3	242.7	64.6	41.4	471	962	2.0	1.6
Synovitis	727	43.2	34.8	49.3	70.9	46.6	39.7	382	607	1.6	1.2
Fibrositis	729	9.8	7.5	12.3	15.6	12.9	6.7	87	152	1.7	2.0
Rheumatoid Arthritis	714	8.5	3.5	10.5	30.7	11.3	5.6	75	224	3.0	2.1
Connective Tissue	710, 446	1.6	1.0	1.8	4.7	2.5	0.8	15	34	2.4	3.4
Ankylosing Spondylitis, Gout	720, 274	6.5	3.0	8.4	20.3	3.4	9.8	57	92	1.6	0.4
Other Arthritis & related	728, 718, 734, 735, 711	18.6	15.9	19.4	31.6	19.2	18.1	165	270	1.6	1.1

Table 3: Distribution of patients who visited doctors in Ontario and who were recorded as having been billed for arthritis and related conditions: 1996/97 OHIP dataset.

Condition	OHIP Diagnostic Code	Type of Doctor							
		All Physicians	All Primary Care	All Specialist	Medical Specialists			Surgical Specialists	
		n	%	%	All	Rheumatology	Internal Medicine	All	Orthopaedic
Arthritis & related		1,064,407	81.1%	31.3%	13.4%	6.0%	5.1%	19.8%	16.3%
Osteoarthritis	715	471,232	84.0%	25.3%	11.3%	4.5%	4.9%	15.6%	14.4%
Synovitis	727	381,996	80.5%	24.4%	7.6%	3.1%	2.2%	17.2%	11.1%
Fibrositis	729	87,096	76.3%	27.4%	23.4%	10.7%	7.7%	4.1%	2.4%
Rheumatoid Arthritis	714	75,463	72.4%	42.3%	39.4%	21.5%	16.4%	5.5%	3.7%
Connective Tissue	710, 446	14,553	37.0%	69.6%	66.3%	37.7%	23.2%	4.4%	0.4%
Ankylosing Spondylitis, Gout	720, 274	57,385	84.0%	19.5%	16.2%	8.9%	6.0%	3.5%	2.1%
Other Arthritis and related	728, 718, 734, 735, 711	164,896	52.8%	50.5%	4.9%	0.8%	1.5%	46.0%	41.4%

Table 4: Person visit rates to doctors, per 1000 Population, by those 15 years of age and older in Ontario, 1996

Condition	OHIP Diagnostic Code	Person visits rates per 1000 by type of doctor						
		All Primary Care	All Specialist	Medical Specialist			Surgical Specialists	
				All	Rheumatology	Internal Medicine	All	Orthopaedic
Arthritis & related		97.6	37.7	16.2	7.2	6.2	23.8	19.6
Osteoarthritis	715	44.7	13.5	6.0	2.4	2.6	8.3	7.7
Synovitis	727	34.8	10.5	3.3	1.3	1.0	7.4	4.8
Fibrositis	729	7.5	2.7	2.3	1.1	0.8	0.4	0.2
Rheumatoid Arthritis	714	6.2	3.6	3.4	1.8	1.4	0.5	0.3
Connective Tissue	710, 446	0.6	1.1	1.1	0.6	0.4	0.1	0.0
Ankylosing Spondylitis, Gout	720, 274	5.4	1.3	1.0	0.6	0.4	0.2	0.1
Other Arthritis and related	728, 718, 734, 735, 711	9.9	9.4	0.9	0.1	0.3	8.6	7.7

Table 5: Arthritis and related conditions: Person visit rates to doctors, per 1000 population, by those 15 years of age and older, with proportion seeing different types of doctor by region and District Health Council in Ontario.

DHC region	District Health Council	Person Visit Rate per 1000	Proportion Seeing			
			Primary Care	Specialists		
				All	Medical	Surgical
East	Eastern Ontario	127.4	80.4%	32.5%	10.8%	23.3%
	Hastings and Prince Edward Counties	129.8	87.8%	21.5%	3.8%	18.3%
	Kingston , Frontenac and Lennox and Addington	101.7	90.6%	16.0%	3.3%	12.9%
	Ottawa - Carleton Regional	118.0	76.1%	36.6%	19.6%	19.6%
	Renfrew County	131.8	76.1%	35.5%	12.8%	24.8%
	Rideau Valley	119.8	87.0%	22.6%	7.5%	16.2%
	Central East	Durham Region	106.1	79.1%	34.6%	14.3%
Haliburton , Kawartha and Pine Ridge		129.7	84.4%	29.6%	13.5%	18.0%
Peel		112.3	82.9%	29.0%	12.4%	18.1%
Simcoe County		114.6	88.9%	21.3%	10.6%	12.0%
Metropolitan Toronto		127.5	81.3%	31.6%	16.7%	17.0%
York Region		102.9	80.0%	32.5%	16.7%	17.8%
Central West		Brant	136.8	82.2%	31.4%	11.4%
	Haldimand-Norfolk	124.1	83.5%	29.7%	10.8%	21.0%
	Halton	120.8	82.6%	30.7%	12.9%	19.3%
	Hamilton-Wentworth	106.9	70.4%	41.7%	18.4%	26.6%
	Niagara	137.3	79.9%	34.0%	12.3%	23.6%
	Waterloo Region	89.9	75.5%	34.9%	15.4%	21.7%
	Wellington-Dufferin	106.8	82.7%	30.0%	11.0%	20.7%
South West	Essex County	141.2	81.2%	31.1%	8.4%	24.3%
	Grey-Bruce	133.7	87.0%	24.8%	6.5%	19.8%
	Huron/Perth	110.2	86.2%	25.7%	6.7%	20.2%
	Kent County	123.1	85.6%	27.8%	8.8%	20.4%
	Lambton	137.2	77.6%	37.1%	13.1%	26.7%
	Thames Valley	109.8	80.0%	31.8%	9.4%	24.0%
North East	Algoma	112.1	75.6%	36.5%	11.9%	26.2%
	Cochrane	115.2	78.6%	36.1%	7.9%	29.6%
	East Muskoka-Parry Sound	122.2	89.8%	21.4%	9.1%	13.8%
	Manitoulin-Sudbury	126.5	82.6%	31.0%	12.2%	21.0%
	Nipissing/Timiskaming	125.9	90.8%	18.6%	7.7%	11.8%
	West Muskoka-Parry Sound	131.8	89.2%	23.6%	9.6%	15.5%
North West	Kenora-Rainy River	108.0	88.1%	23.4%	6.4%	17.8%
	Thunder Bay	121.0	75.0%	40.0%	11.3%	31.2%

Table 6: Osteoarthritis: Person visit rates to doctors, per 1000 population, by those 15 years of age and older, with proportion seeing different types of doctor.

DHC region	District Health Council	Person Visit Rate per 1000	Proportion Seeing			
			Primary Care	Specialists		
				All	Medical	Surgical
East	Eastern Ontario	56.6	80.1%	29.5%	7.9%	23.0%
	Hastings and Prince Edward Counties	62.1	91.8%	13.7%	2.1%	11.9%
	Kingston, Frontenac and Lennox and Addington	57.9	94.3%	10.4%	1.1%	9.5%
	Ottawa - Carleton Regional	47.8	76.7%	33.7%	18.9%	17.3%
	Renfrew County	71.4	75.2%	33.6%	9.3%	26.1%
	Rideau Valley	64.9	88.5%	18.1%	3.6%	15.3%
Central East	Durham Region	44.9	86.6%	23.1%	7.6%	16.8%
	Haliburton, Kawartha and Pine Ridge	62.4	86.4%	23.8%	9.2%	16.4%
	Peel	40.7	84.4%	23.8%	12.8%	12.4%
	Simcoe County	49.8	89.8%	17.7%	8.6%	10.5%
	Metropolitan Toronto	58.1	84.7%	25.0%	14.7%	12.1%
	York Region	40.2	82.9%	26.2%	15.8%	12.4%
Central West	Brant	64.8	86.0%	24.5%	9.8%	16.3%
	Haldimand-Norfolk	59.5	87.0%	23.5%	8.7%	16.4%
	Halton	45.2	81.4%	29.0%	12.5%	17.9%
	Hamilton-Wentworth	49.5	73.5%	36.0%	20.4%	18.8%
	Niagara	66.7	84.3%	25.4%	10.6%	16.5%
	Waterloo Region	33.7	73.7%	34.5%	15.7%	21.2%
	Wellington-Dufferin	40.6	83.3%	26.7%	10.9%	17.7%
South West	Essex County	71.1	82.7%	26.4%	6.3%	21.5%
	Grey-Bruce	66.7	88.9%	20.2%	4.1%	17.6%
	Huron/Perth	55.1	86.4%	23.5%	3.8%	20.8%
	Kent County	63.5	89.4%	20.2%	3.4%	17.5%
	Lambton	61.2	79.5%	31.0%	9.2%	23.3%
	Thames Valley	44.5	84.0%	25.5%	5.3%	21.3%
North East	Algoma	47.1	82.9%	25.4%	7.3%	18.9%
	Cochrane	48.2	88.1%	21.2%	3.5%	18.5%
	East Muskoka-Parry Sound	50.4	91.0%	17.1%	5.5%	13.1%
	Manitoulin-Sudbury	59.3	86.9%	22.7%	8.6%	15.3%
	Nipissing/Timiskaming	64.0	93.8%	11.9%	4.3%	8.1%
North West	West Muskoka-Parry Sound	55.2	91.3%	17.1%	5.4%	12.8%
	Kenora-Rainy River	54.6	92.3%	14.4%	3.3%	11.8%
	Thunder Bay	46.5	80.4%	29.5%	10.5%	20.7%

Table 7: Rheumatoid arthritis: Person visit rates to doctors, per 1000 population, by those 15 years of age and older, with proportion seeing different types of doctor District Health Council in Ontario.

DHC region	District Health Council	Person Visit Rate per 1000	Proportion Seeing			
			Primary Care	Specialists		
				All	Medical	Surgical
East	Eastern Ontario	9.8	71.0%	44.5%	38.7%	8.4%
	Hastings and Prince Edward Counties	9.8	89.1%	19.3%	14.5%	5.8%
	Kingston , Frontenac and Lennox and Addington	4.5	93.9%	11.0%	4.9%	6.6%
	Ottawa - Carleton Regional	7.1	59.4%	53.8%	50.5%	6.8%
	Renfrew County	10.2	66.2%	51.0%	48.1%	5.8%
	Rideau Valley	9.8	78.9%	32.8%	29.1%	5.0%
Central East	Durham Region	7.7	61.3%	56.7%	55.1%	3.9%
	Haliburton , Kawartha and Pine Ridge	10.8	75.4%	46.3%	44.6%	5.2%
	Peel	7.5	75.1%	38.9%	35.2%	5.8%
	Simcoe County	11.8	85.6%	28.6%	27.1%	3.0%
	Metropolitan Toronto	7.6	69.9%	44.7%	41.8%	5.4%
	York Region	6.1	72.8%	43.7%	40.6%	5.5%
Central West	Brant	10.2	77.3%	41.0%	39.7%	4.1%
	Halton	9.7	71.2%	41.7%	39.4%	3.7%
	Haldimand-Norfolk	11.0	84.1%	30.7%	28.5%	4.8%
	Hamilton-Wentworth	7.4	51.9%	59.7%	57.5%	6.5%
	Niagara	7.5	61.4%	52.9%	51.0%	5.3%
	Waterloo Region	6.6	53.2%	60.0%	55.8%	7.4%
	Wellington-Dufferin	7.1	75.6%	40.5%	38.7%	4.6%
South West	Essex County	9.8	81.4%	28.1%	24.7%	6.0%
	Grey-Bruce	8.4	77.8%	40.1%	37.2%	6.1%
	Huron/Perth	10.4	87.6%	25.9%	23.5%	4.0%
	Kent County	8.3	76.1%	41.9%	38.4%	6.3%
	Lambton	17.1	75.7%	35.8%	33.4%	5.0%
	Thames Valley	9.3	74.9%	38.9%	34.4%	7.3%
North East	Algoma	10.6	75.8%	42.2%	38.8%	6.8%
	Cochrane	9.5	83.1%	35.5%	27.3%	10.3%
	East Muskoka-Parry Sound	8.7	84.8%	40.8%	39.4%	3.0%
	Manitoulin-Sudbury	14.7	81.2%	35.3%	33.8%	5.0%
	Nipissing/Timiskaming	9.2	81.5%	40.0%	38.7%	2.9%
	West Muskoka-Parry Sound	10.0	83.3%	42.9%	41.7%	3.3%
North West	Kenora-Rainy River	9.9	91.1%	27.8%	27.3%	1.8%
	Thunder Bay	10.8	78.8%	41.6%	38.6%	6.7%

Table 8: Descriptive statistics, one-way ANOVA and Krushal Wallis test describing relationships between regions with varying levels of rheumatology provision and visit rates by people with any kind of arthritis or rheumatism, rheumatoid arthritis and osteoarthritis.

	Utilization of Rheumatology Services			Utilization of Internal Medicine Services		
	Regional Levels of Rheumatology Provision			Regional Levels of Rheumatology Provision		
	no and low	medium	high	no and low	medium	high
<i>those with arthritis and related conditions</i>						
mean person visit rate per 1000	2.8	5.6	10.3	4.2	6.0	6.7
standard deviation	0.7	1.9	2.5	1.2	2.5	2.3
F _{2,29} value from 1-way ANOVA test	23.8 (p<0.0001)			2.4 (p=0.111)		
<i>those with rheumatoid arthritis</i>						
mean person visit rate per 1000	1.2	1.8	2.5	1.6	1.7	1.4
standard deviation	0.4	0.5	0.8	0.6	0.9	0.5
F _{2,29} value from 1-way ANOVA test	7.9 (p=0.002)			0.40 (p=0.672)		
<i>those with osteoarthritis*</i>						
χ^2	21.28			8.67		
degrees of freedom	2			2		
p-value from Kushall Wallis test	p<0.0001			p=0.013		

*Krushal Wallis test was used because these data failed test of homogeneity of variance required for application of ANOVA

Figure 1: Arthritis and related conditions: person visit rate to doctors, per 1000 population aged 15 years and older, by District Health Councils in Ontario.

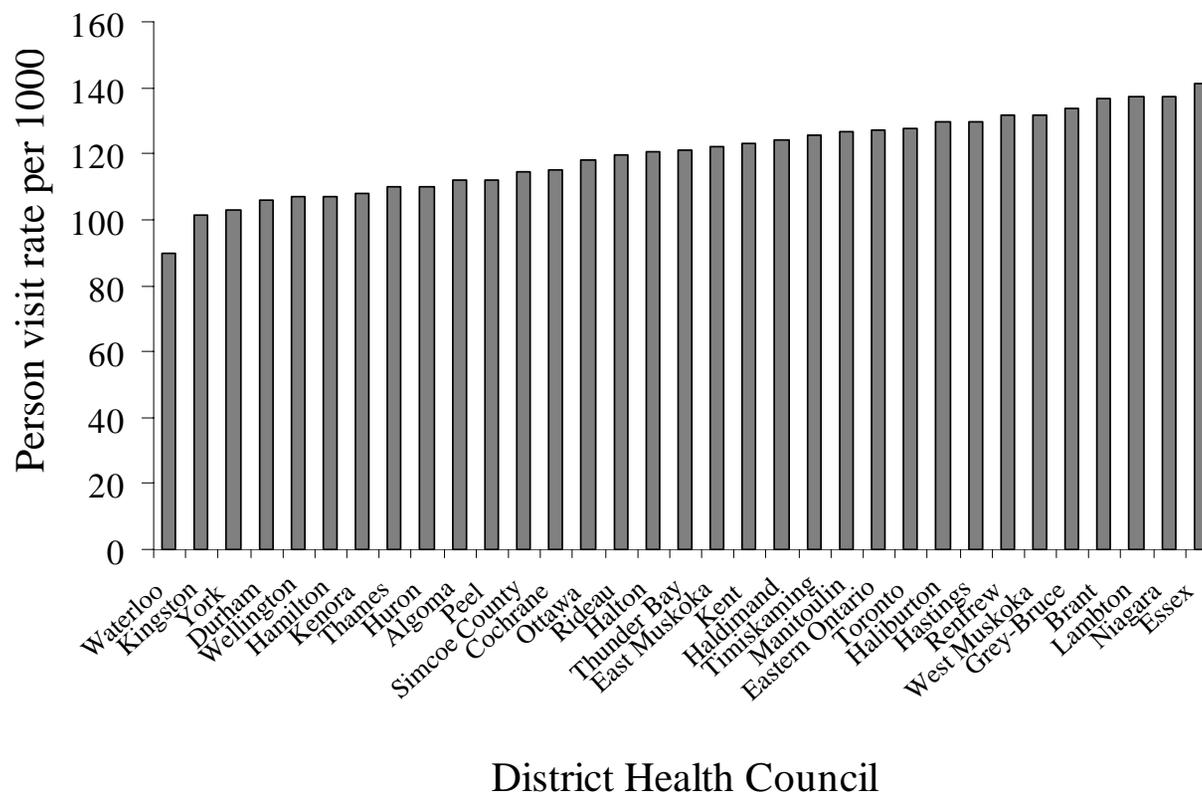


Figure 2: Osteoarthritis: person visit rate to doctors, per 1000 population aged 15 years and older, by District Health Councils in Ontario.

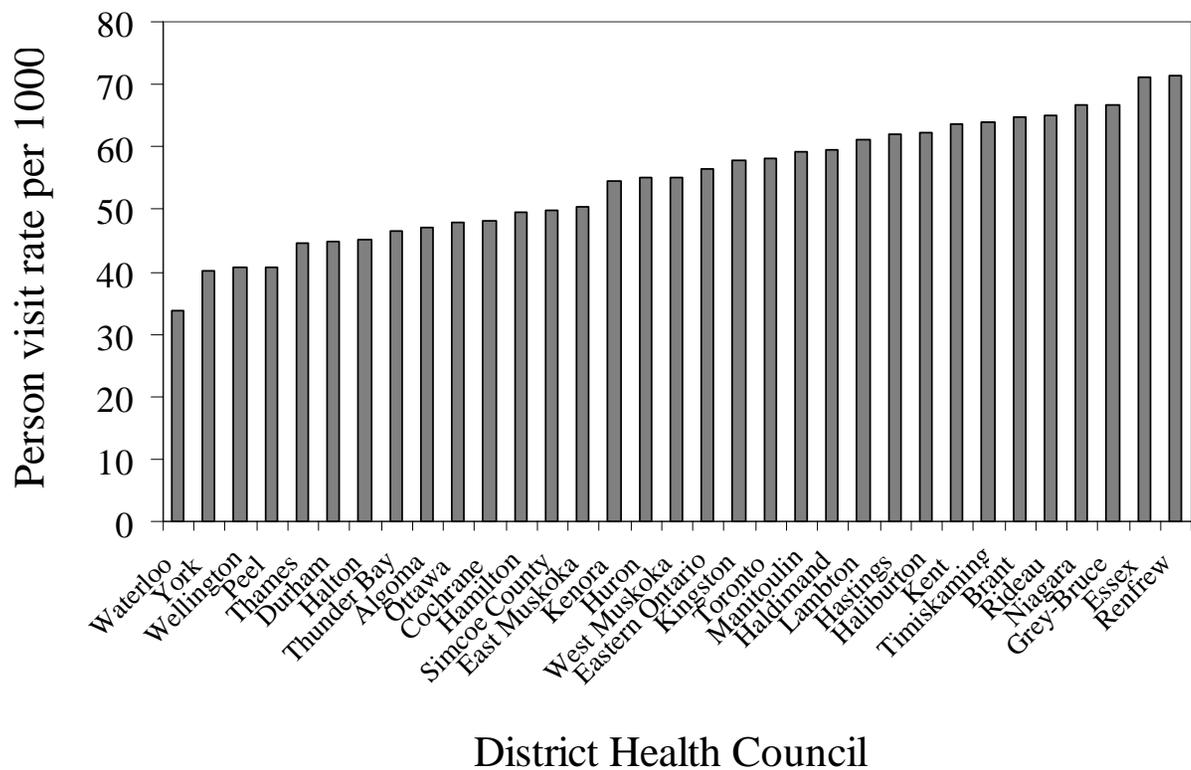


Figure 3: Rheumatoid Arthritis: person visit rate to doctors, per 1000 population aged 15 years and older, by District Health Councils in Ontario.

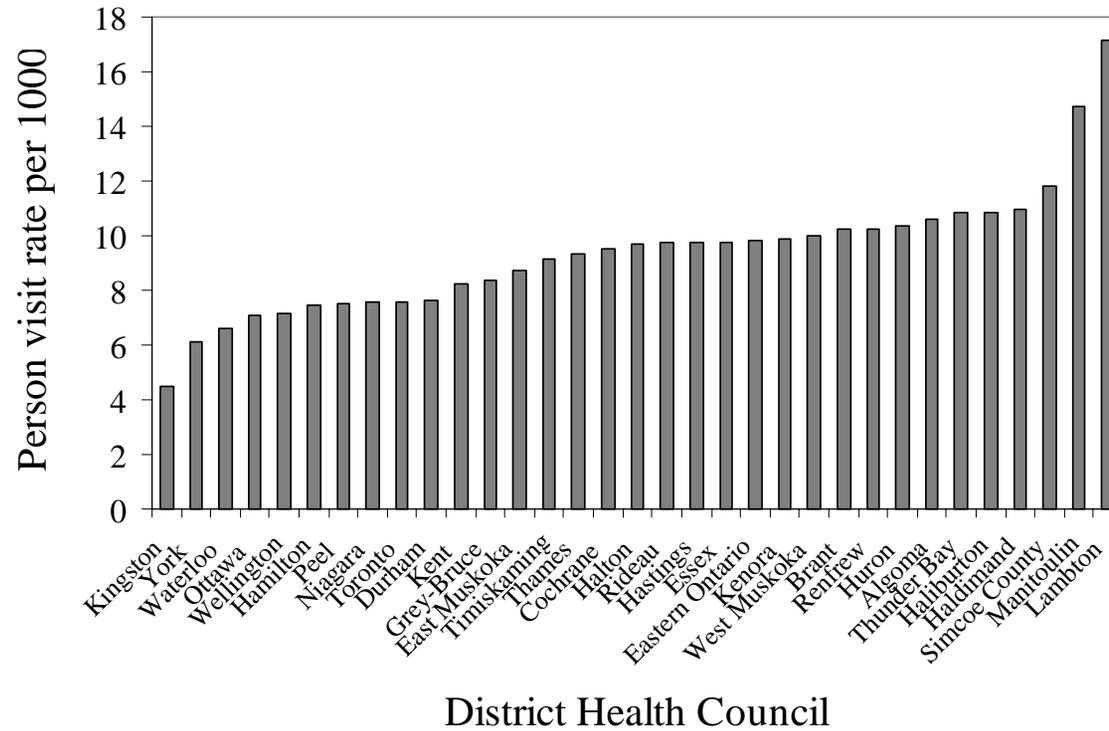


Figure 4: Arthritis and related conditions: person visit rates to rheumatologists, per 1000 population aged 15 years and older, and availability of rheumatologists (in terms of half day clinics per week per 100, 000 population) by District Health Councils in Ontario.

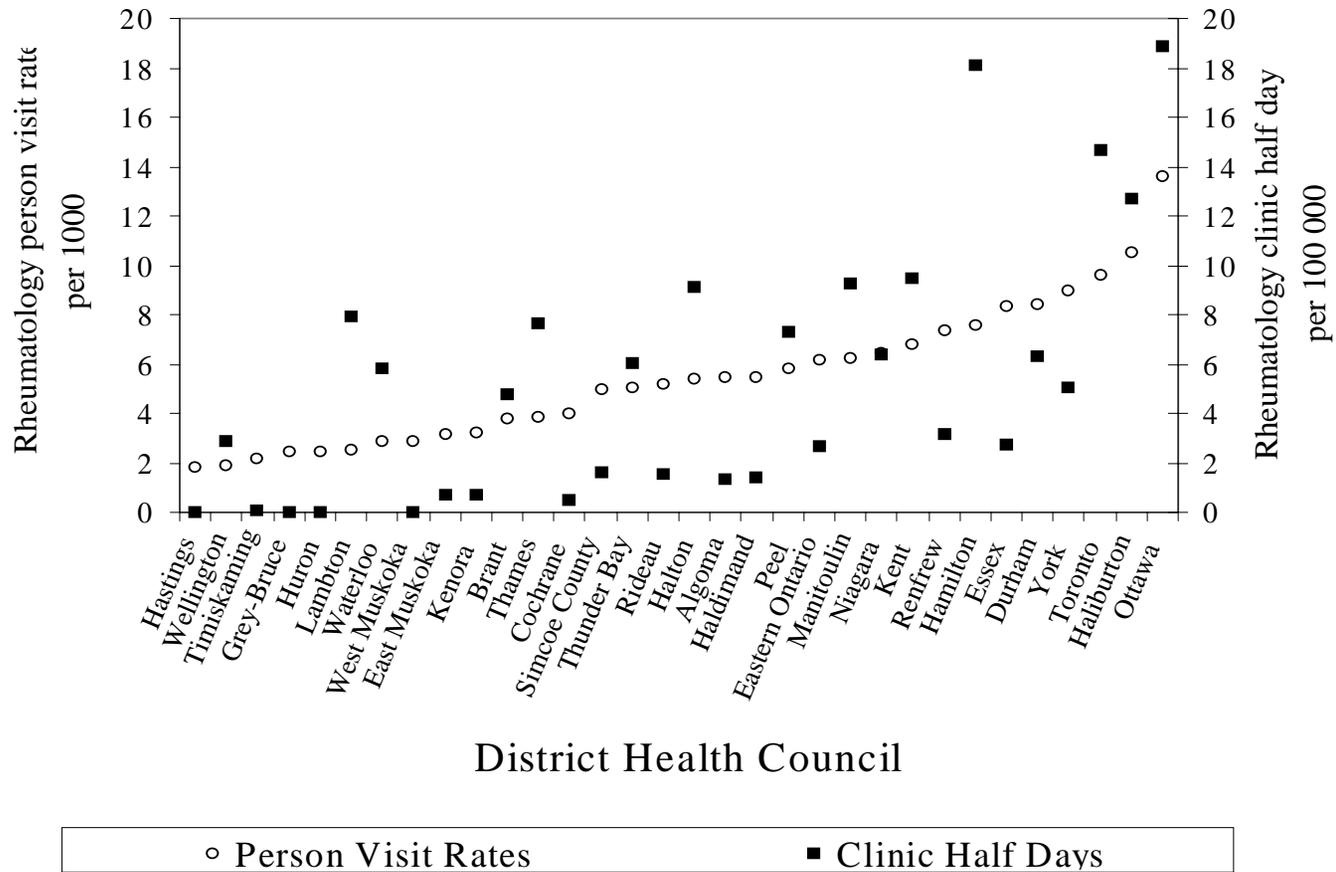


Figure 5: Rheumatology visit rates, per 1000 population aged 15 years and older, for arthritis and related conditions by the availability of rheumatological services in District Health Councils in Ontario; horizontal lines indicate mean values. Availability of services is measured in half-days per week per 100 000 population.

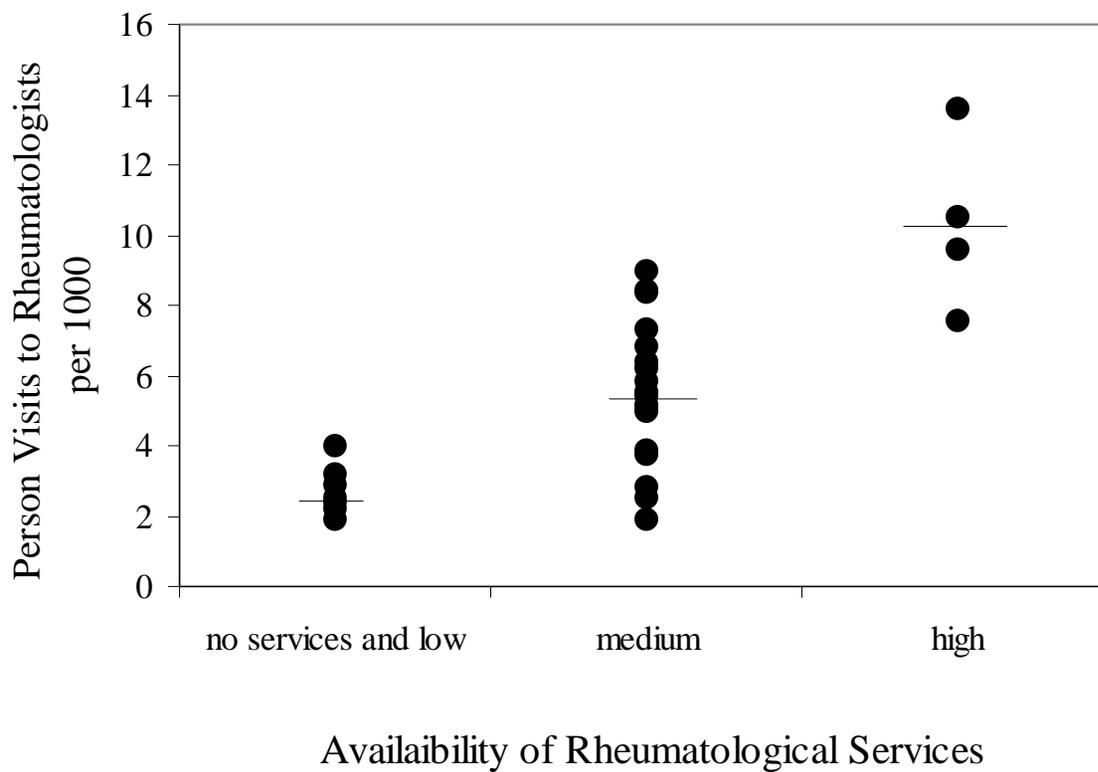


Figure 6: Rheumatology visit rates, per 1000 population aged 15 years and older, for rheumatoid arthritis by the availability of rheumatological services in District Health Councils in Ontario; horizontal lines indicate mean values. Availability of services is measured in half-days per week per 100 000 population.

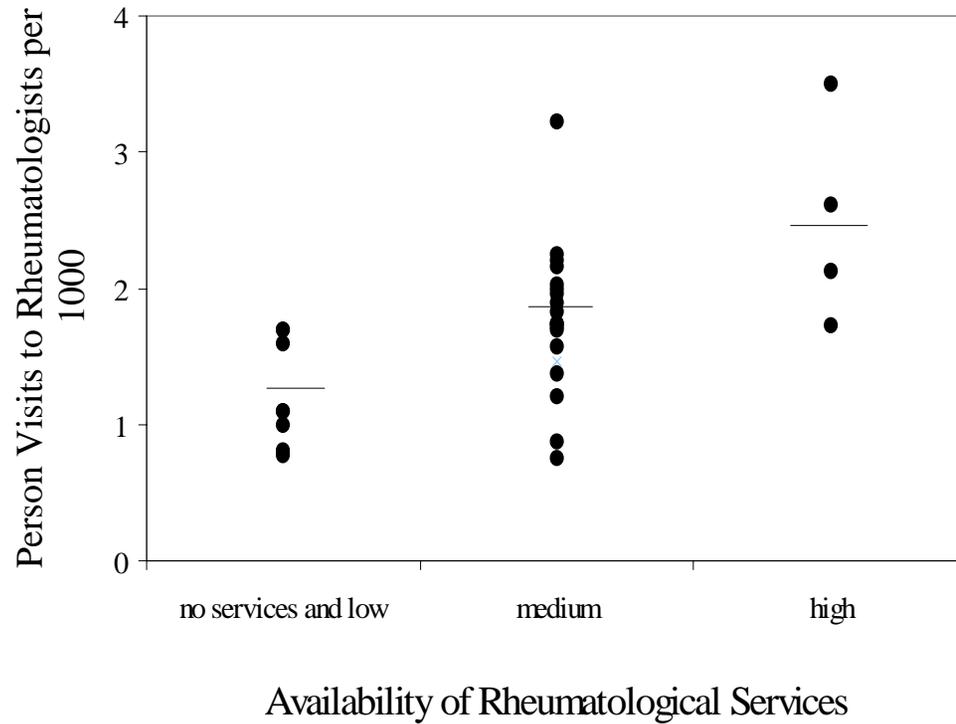


Figure 7: General internist visit rates, per 1000 population aged 15 years and older, for arthritis and related conditions by the availability of rheumatological services in District Health Councils in Ontario; horizontal lines indicate mean values. Availability of services is measured in half-days per week per 100 000 population

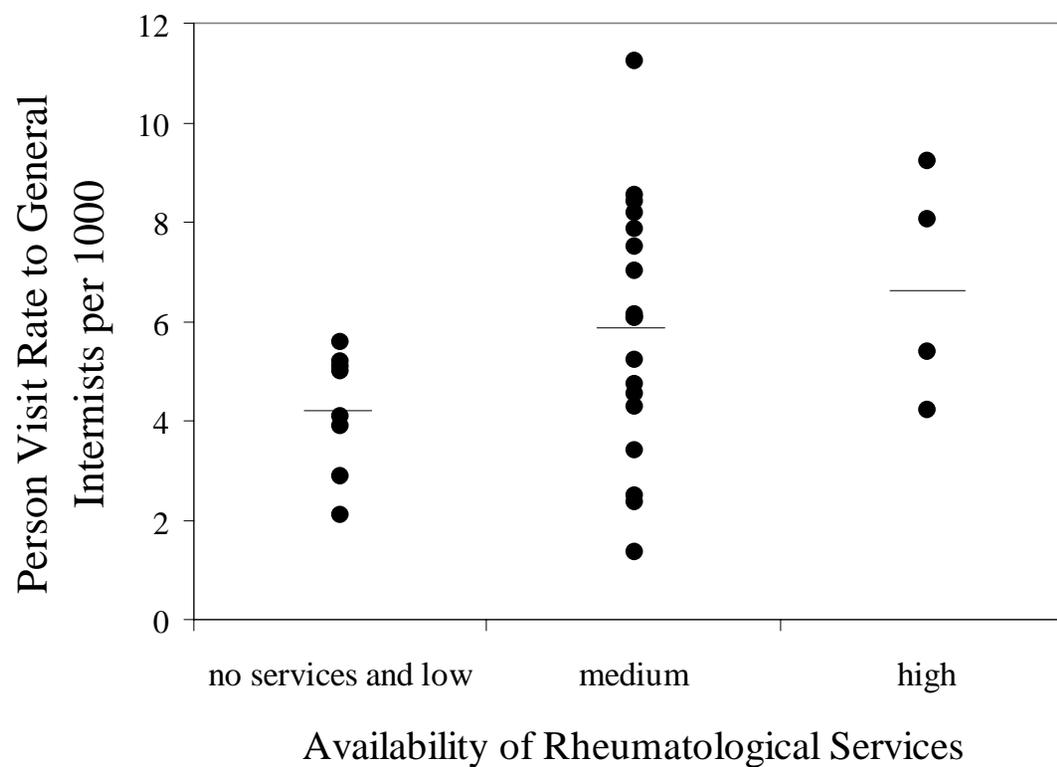


Figure 8: General Internist visit rates, per 1000 population aged 15 years and older, for rheumatoid arthritis by the availability of rheumatological services in District Health Councils in Ontario; horizontal lines indicate mean values. Availability of services is measured in half-days per week per 100 000 population.

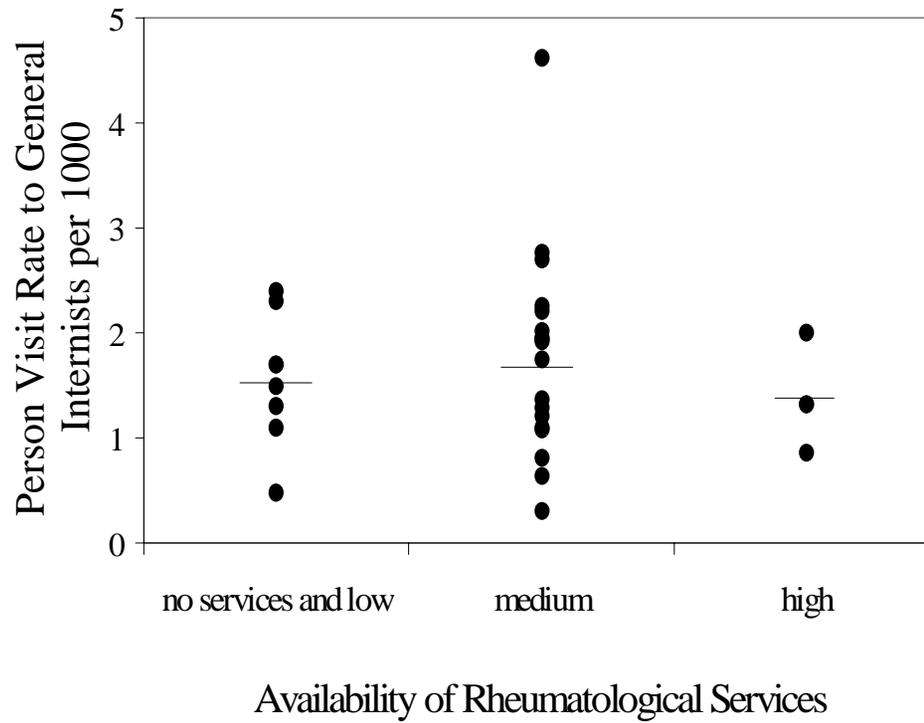


Figure 9: Orthopaedic surgeon visit rates, per 1000 population aged 15 years and older, for osteoarthritis by the availability of orthopaedic services in District Health Councils in Ontario. Availability of services is measured in half-days per week per 100 000 population.

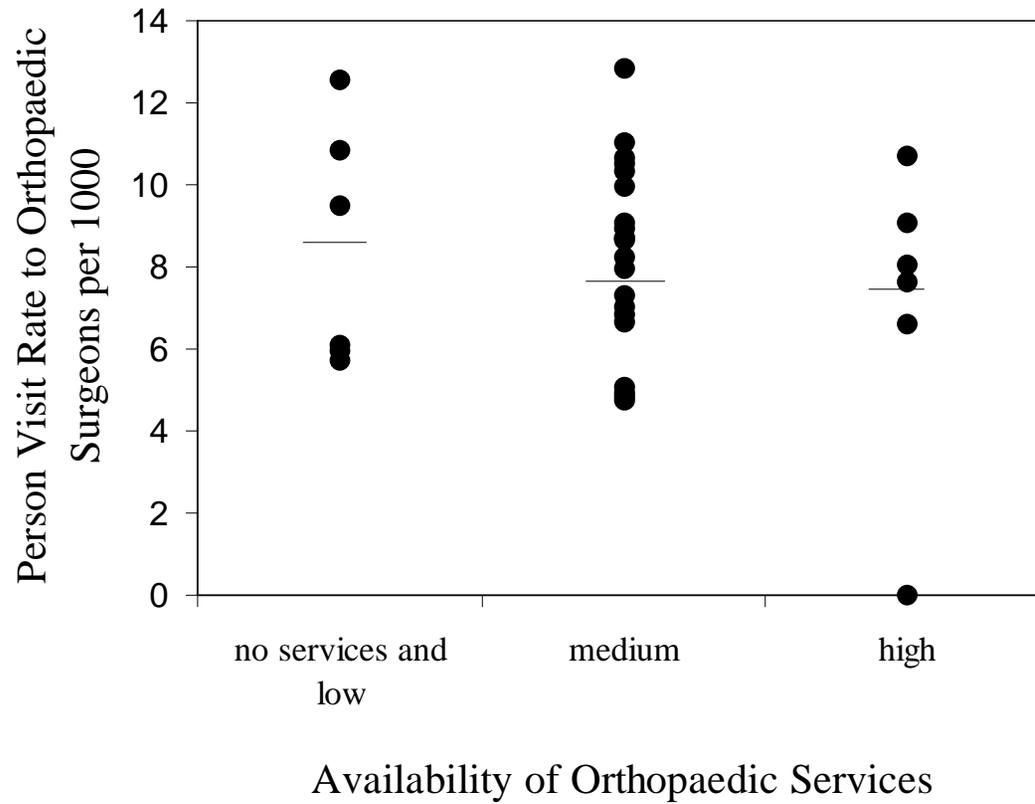
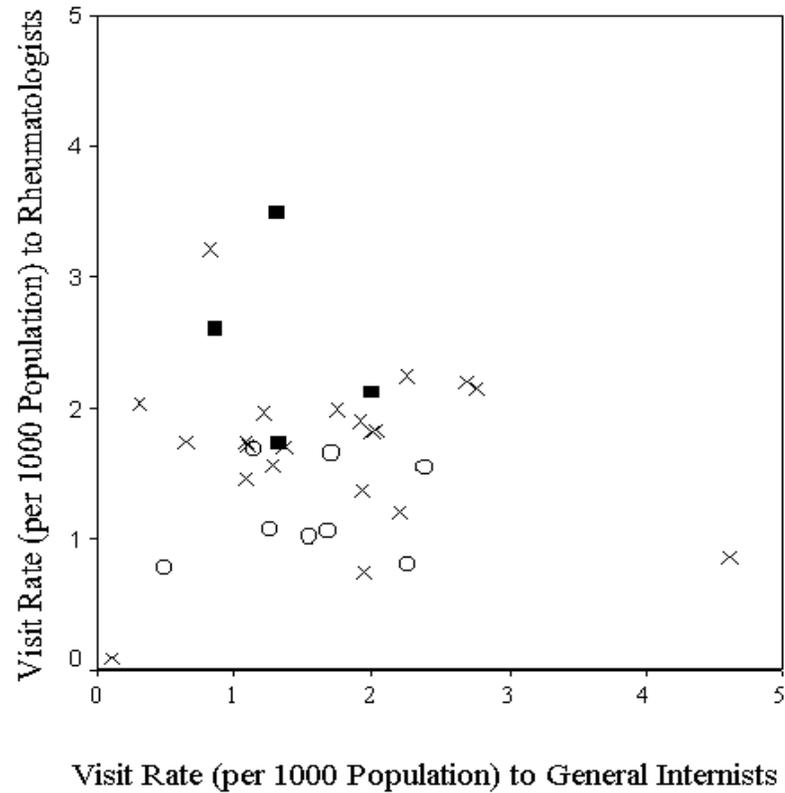


Figure 10: Patient visit rate per 1000 to rheumatology and internal medicine specialists for District Health Councils with varying degrees of availability of rheumatological services.



Availability of Rheumatological Services:
high X medium F low