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ORTHOPAEDIC SURGERY IN ONTARIO IN THE ERA OF THE WAIT TIME STRATEGY

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Table of Contents

| | | |
|-----|--|----|
| 1.0 | INTRODUCTION..... | 1 |
| | Objectives | 3 |
| | Interpretative Cautions..... | 3 |
| 2.0 | METHODOLOGY | 3 |
| | 2.1 Data Sources..... | 3 |
| | 2.2 Statistical analysis | 4 |
| 3.0 | FINDINGS | 6 |
| | 3.1 Part I: Patterns of use of orthopaedic surgeon services in Ontario, 2005/06 including surgical trends from 1992/93 to 2005/06..... | 6 |
| | Overall utilisation of orthopaedic services in Ontario | 6 |
| | Care provided by orthopaedic surgeons in Ontario | 7 |
| | Volume of care provided in ambulatory settings in Ontario | 14 |
| | Time trends in orthopaedic surgeries in Ontario from 1992/93 to 2005/06..... | 16 |
| | 3.2 Part II: Geographic variation in use of orthopaedic services Ontario, 2005/06..... | 20 |
| | Orthopaedic ambulatory services provided to LHIN residents..... | 20 |
| | Orthopaedic in-hospital services provided to LHIN residents | 20 |
| | Relationship between volume of care provided to LHIN residents and the availability of orthopaedic services | 24 |
| | Volume of in-hospital service provided by orthopaedic surgeons within LHINs | 28 |
| | Cross-boundary flow of patients receiving orthopaedic surgery | 35 |
| 4.0 | LIMITATIONS..... | 47 |
| 5.0 | DISCUSSION | 47 |
| 5.0 | REFERENCES..... | 53 |
| | GLOSSARY OF TERMS..... | 57 |
| | TECHNICAL APPENDIX..... | 58 |

| | |
|---|----|
| A1. Methods..... | 58 |
| Data Sources..... | 58 |
| Identification of encounters with orthopaedic services..... | 59 |
| Definition of ambulatory and hospital encounters | 59 |
| Developing groupings of diagnosis codes..... | 59 |
| General strategy for identifying relevant diagnosis codes | 59 |
| Assigning a diagnosis group | 60 |
| Groups of surgical procedures | 62 |
| Developing groupings of orthopaedic procedures | 62 |
| A2. Supplemental Tables..... | 64 |

List of Tables

| | | |
|----------|--|----|
| Table 1. | Distribution of encounters with orthopaedic surgeons by diagnosis groups and service setting, Ontario, 2005/06 | 7 |
| Table 2. | Number of specific types of orthopaedic surgery by age and gender according to diagnosis groupings, Ontario, 2005/06 | 13 |
| Table 3. | Ambulatory encounters with orthopaedic surgeons, Ontario, 2005/06 | 15 |
| Table 4. | Number of TJR, arthroscopy, reductions with or without fixations, repairs and other surgeries performed by orthopaedic surgeons in Ontario from 1992/93 to 2005/06 | 18 |
| Table 5. | Number of orthopaedic surgeries provided by orthopaedic surgeons according to anatomic location by Local Health Integration Networks, Ontario, 2005/06 | 34 |
| Table 6. | Retention rate achieved by each LHIN and percentage of outflow to adjacent and non-adjacent LHINs for all orthopaedic surgery by Local Health Integration Networks, Ontario, 2005/06 | 44 |

List of Figures

| | | |
|------------|--|----|
| Figure 1. | Distribution of all encounters with orthopaedic surgeons by service setting, Ontario, 2005/06 | 6 |
| Figure 2. | Distribution of hospital encounters by diagnosis group according to surgical grouping, Ontario, 2005/06 | 7 |
| Figure 3. | Number of specific orthopaedic surgeries, Ontario, 2005/06 | 8 |
| Figure 4. | Number of orthopaedic surgeries for arthritis and related conditions, for trauma, for MSK and for other conditions, Ontario, 2005/06..... | 8 |
| Figure 5. | Number of specific types of orthopaedic surgery by diagnosis grouping, Ontario, 2005/06. | 9 |
| Figure 6. | Number of specific types of orthopaedic surgery by service setting, Ontario, 2005/06 | 10 |
| Figure 7. | Number of specific types of orthopaedic surgery by anatomic location, Ontario, 2005/06 | 11 |
| Figure 8. | Total number of surgeries (in thousands) by age and sex, Ontario, 2005/06 | 12 |
| Figure 9. | Total number of surgeries (in thousands) according to diagnosis grouping by age and sex, Ontario, 2005/06..... | 12 |
| Figure 10. | Distribution of ambulatory encounters by diagnosis group, Ontario, 2005/06 | 14 |
| Figure 11. | Number of encounters with orthopaedic surgeons for fractures and dislocations and sprains and strains according to anatomic location, Ontario, 2005/06 | 16 |
| Figure 12. | Total number of orthopaedic surgeries, in Ontario from 1992/93 to 2005/06 | 17 |
| Figure 13. | Number of total hip replacements, total knee replacements and other joint replacements for arthritis and related conditions in Ontario from 1992/93 to 2005/06 | 19 |

| | |
|--|----|
| Figure 14. Age and sex standardised ambulatory person-visit rates per 1,000 population according to diagnostic categories, by Local Health Integration Networks, in Ontario 2005/06 | 22 |
| Figure 15. Age and sex standardised rates of specific types of orthopaedic surgery, by Local Health Integration Networks, Ontario, 2005/06..... | 24 |
| Figure 16. Relationship between the standardised ambulatory person-visit rate per 1,000 population and the availability of orthopaedic services by Local Health Integration Networks, Ontario, 2005/06 | 25 |
| Figure 17. Relationship between the standardised rate for all orthopaedic surgeries per 100,000 population and the availability of orthopaedic services by Local Health Integration Networks, Ontario, 2005/06 | 27 |
| Figure 18. Distribution of hospital encounters with orthopaedic surgeons according to service setting, by Local Health Integration Networks, Ontario, 2005/06..... | 29 |
| Figure 19. Distribution of surgical and medical inpatient encounters with orthopaedic surgeons, by Local Health Integration Networks, Ontario, 2005/06 | 30 |
| Figure 20. Number of orthopaedic surgeries provided within LHINs according to diagnosis groups, by Local Health Integration Networks, Ontario, 2005/06 | 31 |
| Figure 21. Number of orthopaedic surgeries provided within LHIN according to service setting, by Local Health Integration Networks, Ontario, 2005/06 | 32 |
| Figure 22. Number of specific types of orthopaedic surgery provided within LHIN, by Local Health Integration Networks, Ontario, 2005/06..... | 33 |
| Figure 23. Relationship between the number of all orthopaedic surgeries provided per 1,000 population and the availability of orthopaedic services by Local Health integration Networks, Ontario, 2005/06 | 36 |
| Figure 24. Number of all orthopaedic surgeries performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Networks, Ontario, 2005/06..... | 37 |
| Figure 25. Number of arthritis and related surgeries performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06..... | 38 |
| Figure 26. Number of trauma and related surgeries performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06..... | 39 |
| Figure 27. Number of day surgeries performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06. | 40 |
| Figure 28. Number of inpatient elective surgeries performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06..... | 41 |
| Figure 29. Number of TKR performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06. | 42 |
| Figure 30. Number of knee arthroscopies performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06. | 43 |

Figure 31. Relationship between the local service rate , the retention rate for any surgery and availability of orthopaedic services by Local Health Integration Networks, in Ontario, in 2005/06..... 45

Figure 32. Relationship between the retention rate, the local service rate and median wait time for THR by Local Health Integration Network, in Ontario, in 2005/06..... 46

Figure 33. Relationship between the retention rate, the local service rate and median wait time for TKR by Local Health Integration Network, in Ontario, in 2005/06 46

List of Maps

| | | |
|--------|--|----|
| Map 1. | Age and sex standardised rate of all ambulatory person visits rate per 1,000 population, by Local Health Integration Network, Ontario, 2005/06 | 21 |
| Map 2. | Age and sex standardised rate of all orthopaedic surgeries by Local Health Integration Network, Ontario, 2005/06 | 23 |

List of Tables in Appendix

| | | |
|------------|---|----|
| Table A1. | Description of databases used in this report | 58 |
| Table A2. | Description of surgical groupings used in this report | 63 |
| Table A3. | Number of LHIN resident encounters with orthopaedic surgeons according to service setting by Local Health Integration Networks, Ontario, 2005/06 | 64 |
| Table A4. | Number of LHIN resident hospital encounters with orthopaedic surgeons according to hospital service setting by Local Health Integration Networks, Ontario, 2005/06..... | 65 |
| Table A5. | Percentage of LHIN resident encounters with orthopaedic surgeons by diagnosis group in ambulatory and hospital setting by Local Health Integration Networks, Ontario, 2005/06 | 66 |
| Table A6. | Ambulatory person-visit rates to orthopaedic surgeons per 1,000 population by diagnosis groups by Local Health Integration Networks, Ontario, 2005/06..... | 67 |
| Table A7. | Rates of all orthopaedic surgeries performed by orthopaedic surgeons per 100,000 population by diagnosis groups by Local Health Integration Networks in Ontario, in 2005/06 | 68 |
| Table A8. | Age and sex adjusted rates of specific types of orthopaedic surgery per 100,000 population by Local Health Integration Networks, Ontario, 2005/06 | 69 |
| Table A9. | Distribution of hospital encounters with orthopaedic surgeons according to hospital service setting, within Local Health Integration Networks, Ontario, 2005/06..... | 70 |
| Table A10. | Distribution of hospital encounters with orthopaedic surgeons according to diagnosis groups by Local Health Integration Networks, Ontario, 2005/06..... | 71 |
| Table A11. | Proportion of all hospital encounters which were surgical according to diagnosis groups by Local Health Integration Networks, Ontario, 2005/06 | 72 |
| Table A12. | Number of surgeries provided by orthopaedic surgeons within LHIN* according to diagnosis groups by Local Health Integration Networks, Ontario, 2005/06..... | 73 |
| Table A13. | Number of surgeries provided by orthopaedic surgeons according to service setting by Local Health Integration Networks, Ontario, 2005/06 | 74 |
| Table A14. | Number of specific types of orthopaedic surgery provided within LHIN* by Local Health Integration Networks, Ontario, 2005/06..... | 75 |
| Table A15. | Number of all orthopaedic surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 76 |
| Table A16. | Number of orthopaedic surgeries for arthritis and related conditions performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 77 |

| | |
|--|----|
| Table A17. Number of orthopaedic surgeries for trauma and related conditions performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 78 |
| Table A18. Number of orthopaedic surgeries for musculoskeletal conditions performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 79 |
| Table A19. Number of total hip replacement surgery performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 80 |
| Table A20. Number of total knee replacement surgery performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 81 |
| Table A21. Number of knee arthroscopies performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 82 |
| Table A22. Number of reductions with or without fixations performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 83 |
| Table A23. Number of other repairs performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06..... | 84 |
| Table A24. Number of spinal surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06..... | 85 |
| Table A25. Number of inpatient-elective surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 86 |
| Table A26. Number of day surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06..... | 87 |
| Table A27. Number of inpatient non-elective surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06 | 88 |

Executive Summary

This report on Orthopaedic Surgery in Ontario in the era of the Wait Time Strategy addresses the workload of orthopaedic surgeons to provide information for an informed debate on enhancing orthopaedic care and access to surgery, and to support policy development in the context of the transformation of the Ontario health system with the creation of Local Health Integration Networks (LHINs) and new stewardship roles for the Ministry of Health and Long Term Care.

Key Findings

- In 2005/06, over 600,000 Ontarians had over 1.3 million encounters* with orthopaedic surgeons. Of those 86% were ambulatory encounters and the remaining 14% were in hospital encounters (Inpatient, Emergency department, Same day surgery). Overall, orthopaedic surgeons carried out over 140,000 surgeries in Ontario, 58% of these as inpatient surgeries.
- Total joint replacement (TJR) accounted for 25% of all surgeries carried out by orthopaedic surgeons in Ontario, while knee arthroscopic repairs accounted for 14% and reductions with or without fixation accounted for 21% of all surgeries. Moreover, arthritis-related surgeries accounted for more than half of all surgeries performed by orthopaedic surgeons.
- Almost 40% of all arthritis-related surgeries were TJR and almost and over one quarter were arthroscopy. 15% of trauma-related surgeries were TJR (mostly partial hip replacements) and 46% were reductions with fixations.
- The knee was the most common site, followed by the hip and shoulder and elbow, for orthopaedic surgical procedures.
- Arthroscopic surgery was more frequent for younger men whereas TJR was more frequent for older women.
- Of the 1.1 million ambulatory encounters with orthopaedic surgeons, representing 500,000 people, the majority were for a traumatic condition (48%) (i.e. sprains, strains, fractures, dislocations) followed by arthritis and related conditions (35%). Visits for osteoarthritis, the most frequent reason for TJR, accounted for 18% of all encounters. On average, Ontarians who visited an orthopaedic surgeon had two ambulatory encounters.
- The data suggest that less than one in three people seeing an orthopaedic surgeon get orthopaedic surgery.
- The number of surgeries carried out increased steadily over the period 1992/93 to 2005/06 with much of this increase associated with increased numbers of TJR. There was a notable increase of over ten thousand TJRs carried out by orthopaedic surgeons between 2002/03 and 2005/06, with much of this increase taking place between 2004/05 and 2005/06 when the number of TJRs increased by over five thousand, coinciding with the initiation of the Ontario Wait Strategy. At the same time, the number of other types of surgeries remained relatively stable.
- There was almost a two-fold difference in the age-sex adjusted rates of ambulatory care encounters and orthopaedic surgeries between the Local Health Integration Networks (LHINs) in Ontario, and an over five-fold variation in the total number of surgeries carried out within each LHIN.
- There was considerable cross-boundary flow for surgical services, which was most marked in the LHINs including the Greater Toronto Area. The pattern of cross boundary flow was

* An *Encounter* is a visit to an orthopaedic surgeon where medical care was provided.

similar for all types of surgery, both elective and non-elective, suggesting structural determinants.

- For most LHINs the majority of patients had surgery within their LIHN of residence except for LHINs spanning the GTA.
- Across the LHINs the rate of ambulatory encounters was correlated with the availability of orthopaedic surgeon office hours. Surgical volumes as well as the proportion of people receiving surgery in their LHIN of residence was correlated with the availability of orthopaedic services in general, suggesting that location of surgical practice matters.
- Cross-boundary flow in most LHINs was predominantly between adjacent LHINs suggesting that much is related to the location of hospitals and transportation patterns in relation to where people live. This is particularly likely to be the case in the GTA.
- Wait times for THR and TKR were only weakly correlated with measures of cross-boundary flow.

Conclusion

Orthopaedic surgeons provide substantial contributions to the management of chronic musculoskeletal conditions including arthritis and trauma with high volumes of ambulatory as well as surgical care. These findings provide a factual basis for initiatives that help to maximize the use of surgical time and increase capacity in the system particularly for total joint replacement while at the same time ensuring that other vital areas of care recognized and not neglected. They also provide support for strategic directions in the comprehensive chronic disease management of people with arthritis, other musculoskeletal conditions and trauma including the development of alternative models of care using other health providers.

Within Ontario these findings form a baseline to support decision-making concerning system management, resource allocation and service provision in the transformation of Ontario's healthcare system.

Forward

This report entitled *Orthopaedic Surgery in Ontario in the Era of the Wait Time Strategy* addresses the workload of orthopaedic surgeons to provide information for an informed debate on enhancing orthopaedic care and access to surgery. Part I of this report, *Patterns of Use of Orthopaedic Surgeon Services in Ontario 2005/06 including time trends in surgery from 1992/93 to 2005/06* was published in December 2006. This report provided information on the balance of surgical and ambulatory care and gave a preliminary assessment of the impact of the wait time strategy to date. Part II, included in the current report, extends this work to examine the geographic variation in utilisation of orthopaedic services across LHINs in Ontario as well as patterns of cross-boundary flow of patients receiving orthopaedic care. This report is a combined report which incorporates the findings from Part I to set the scene for Part II, with a new integrated introduction and discussion.

1.0 Introduction

Access to total joint replacement (TJR) is of major concern in Ontario. This type of surgery plays a vital role in the successful management of end-stage arthritis. It is a widely accepted, efficacious form of treatment that has also been shown to be cost-effective and even cost saving. ICES Research Atlases have documented increasing rates of TJR which have been accompanied by increasing wait times (1-4). Demand for TJR already outstrips supply as illustrated by these increasing waiting times, and also by an Ontario study which found unmet need for TJR, even in an area with one of the highest per capita rates of this type of surgery (5;6).

The demand for TJR is unlikely to abate in the near future. The aging of the population is bringing with it an increasing prevalence of arthritis (7;8) with a concomitant increase in the need for TJR. Currently not all people with severe arthritis are willing to undergo this procedure (9;10), however, there is speculation that the aging baby boomers may be more willing than their predecessors to have surgery, putting further pressure on waiting times. In addition, increasing obesity rates in the population are also likely to contribute to an increase in the incidence of osteoarthritis, especially of the knee (11). This is also likely to fuel the future need for TJR.

The government and community have responded to public concern about increasing waiting times for TJR. The Ontario Wait Time Strategy has spearheaded a number of initiatives directed at both increasing efficiency and increasing capacity particularly in the short term to catch up on the backlog of required surgery (12). These initiatives include funding for additional hip and knee replacements, investments in home care, public access to wait time information, funding for special innovation and education projects to educate staff about efficient practices and support of hospital innovations. Special projects include the *North West Local Health Integration Network*, the *Toronto Joint Network*, and the *Thunder Bay Regional Health Sciences Centre initiative* (13). As indicated above, the need for TJR will continue to escalate. In the longer term we need to look more broadly at other factors, which affect capacity for these procedures. These have mainly looked at streamlining assessments for TJR and increasing efficiency of the process around surgery. In the long term we need to look more broadly at the whole system to increase capacity for TJR and other surgical procedures.

Orthopaedic surgeons are central to the provision of TJR. An essential component of any long-term strategy therefore has to consider their availability. A 2000 study of orthopaedic manpower showed an overall decline in the numbers of surgeons practising in Ontario, and an increase in their average age (14;15). There is considerable area variation in the amount of service provided. An earlier report by the Arthritis Community Research and Evaluation Unit (ACREU) also hinted at the possible importance of the amount of local orthopaedic provision in determining the rate of surgery to the population (16). Clearly one important component to increasing orthopaedic provision is the recruitment and retention of orthopaedic surgeons. This is an important mission of the Ontario Orthopaedic Association, and is outside the scope of this report. The surgical community has also pointed to the need to improve the efficient and effective use of highly skilled orthopaedic resources (13).

How orthopaedic surgeons spend their time is an important contributor to the amount of surgeon resources available for surgery. The ACREU survey of Ontario orthopaedic surgeons indicated that 35% of orthopaedic surgeon time is dedicated to surgery, with the balance being spent

seeing patients in office settings (17;18). This is the reverse of the US recommendation of 62% of orthopaedic surgeon's time to be dedicated to the operating room (19).

ACREU's previous reports have considered the role of orthopaedic surgery for people with arthritis (20;21). These reports drew attention to the fact that arthroscopy comprises almost half of orthopaedic surgery for arthritis although its efficacy in the management of arthritis remains unclear. However, this previous work did not take into account the considerable workload of orthopaedic surgeons related to acute trauma (such as fractures, dislocations and tendon repair), repair of damage from injury and musculoskeletal deformities (such as corrective foot and ankle surgery), spinal conditions, and other orthopaedic surgery related to other conditions such as musculoskeletal cancers. Clearly it is important to set orthopaedic surgery for arthritis and related conditions into the wider context of all orthopaedic surgery. This report begins to address this wider context.

The examination of office time of surgeons should also not be neglected. As indicated above surgery is only one component of the work of orthopaedic surgeons. ACREU's previous work showed that in 2000/01 Ontario orthopaedic surgeons saw 15.2% of the 1.3 million patients visiting physicians for arthritis and related conditions (21). In addition to osteoarthritis (the most common reason for TJR) orthopaedic surgeons also saw patients with a variety of other arthritis related diagnoses including joint derangement, synovitis, and spinal disorders. Only one quarter of arthritis-related visits to orthopaedic surgeons was for osteoarthritis or rheumatoid arthritis, conditions for which TJR might be indicated, and only for patients aged 65 years and older (approximately one third of all visits) were the majority of visits for these conditions. In summary, our previous report showed that orthopaedic surgeons play a major role in the clinical management of musculoskeletal conditions, and the visits from patients likely to be candidates for TJR represented a relatively small proportion of this workload. However, this work did not include visits to orthopaedic surgeons for trauma.

Orthopaedic services utilisation also varies across health regions. Large variation often cannot be attributed to underlying difference in the prevalence or incidence of diseases or age and gender of the population. Practice style differences and supplier-induced demand have been found among factors that might explain some of the geographic variation (22;23). Patient flow has been studied in the context of hospital competition, hospital resource allocation, and for defining hospital service areas. Most of the interest in this topic is driven by the implications on inter-regional funding transfer in publicly funded systems (23-25) or its relationship with type of coverage in the United States (26;27). However, health planners might be interested in patient flow across health regions as an indicator of inadequate health service provision or it could be used to estimate future service utilisation. This is becoming of crucial interest in Ontario as LHINs begin to move towards assuming responsibility for the planning and funding and the purview of Ministry of Health and Long Term Care (MOHLTC) rises to a more strategic level focussing on the stewardship of the health system (28). We hope this report will help set the scene for planning of services to meet the needs of people with arthritis and musculoskeletal conditions, including trauma, in Ontario in the content of the provision of services by orthopaedic surgeons.

Objectives

The overall purpose of this two-year project is to document the workload of orthopaedic surgeons in Ontario to serve as a basis for service planning and enhancement.

The results of this study are presented in two parts. The specific objectives of Part I are:

- a. To provide a breakdown of the surgeries performed by orthopaedic surgeons by diagnosis in order to set arthritis-related surgeries in the context of all procedures performed.
- b. To determine the volume of ambulatory care provided by orthopaedic surgeons and the most common types of diagnoses seen in the clinic.
- c. To examine time trends of common surgeries performed by orthopaedic surgeons.

Part II, has the following objectives:

- a. To examine geographic variation in orthopaedic encounters and orthopaedic surgeries by Local Health Integration Network (LHIN), including area variation in total joint replacement and other types of surgery for arthritis and related conditions.
- b. To examine patterns of cross-boundary flow between LHINs for people who underwent joint replacement surgery and other major types of orthopaedic surgeries.

Interpretative Cautions

This working report is a descriptive analysis of the workload of orthopaedic surgeons in Ontario. Conclusions about the appropriateness of current utilisation patterns in relation to the availability of orthopaedic provision should be made with caution. This is descriptive analysis meant to assist in identifying areas where further exploration is needed.

The examination of patient's cross-boundary flow to obtain orthopaedic services across the province is intended to serve as a baseline for future monitoring of the distribution of services within each LHIN.

2.0 Methodology

2.1 Data Sources

Administrative data from the Ontario Health Insurance Plan (OHIP) database, from the Discharge Abstract Database (DAD), from the National Ambulatory Care Reporting System (NACRS) database, and from the Same Day Surgery (SDS) database provided by the Canadian Institute of Health Information (CIHI) for the 2005 fiscal year (April 2005 to March 2006) were used to identify individuals accessing orthopaedic services in Ontario. Table A1 in the Technical Appendix summarises the databases that have been integrated for this study as well as the variables that were available for the analysis. The same databases were used to examine time trends for years 1992/93 to 2005/06.

Orthopaedic service utilisation was measured by encounters with orthopaedic surgeons. Each encounter was represented as a discharge of a hospital inpatient, an ambulatory visit to an orthopaedic surgeon, a visit to an emergency department or a day surgery. The Technical Appendix offers a detailed description of the definitions used in the analysis presented here.

2.2 Statistical analysis

The volume of care provided by orthopaedic surgeons was analysed in terms of the number of persons receiving specific services and the quantity of services provided (since a patient may have several ambulatory encounters or receive several orthopaedic interventions). Four measures were used to quantify the volume of care provided by orthopaedic surgeons:

- (1) The number of in hospital encounters with orthopaedic surgeons,
- (2) The number of surgeries,
- (3) The number of patients having ambulatory encounters with orthopaedic surgeons, and
- (4) The total number of ambulatory encounters.

Time trends were conducted for the number of total surgeries and specific surgeries from 1992/93 to 2005/06. The number of surgeries was also estimated by diagnosis groupings for each study year.

The analysis for Ontario is presented in absolute numbers since one of the interests of this report is to estimate the overall workload of orthopaedic surgeons. However, rates and absolute numbers are presented for the analysis by LHIN. The volume of care provided to LHIN residents is presented as age and sex standardised rates. These estimates serve to remove the effect of any difference in the age-sex distributions of the respective LHINs and allow to direct comparison with the overall provincial rate. Crude rates along with standardised rates are presented in the Technical Appendix.

The volume of care provided within LHINs is presented in absolute numbers and percentage distribution. In addition, two measures of cross-boundary flow are presented here. The first is the **retention rate**, defined as the proportion accounted for the volume of care provided to residents within their residential LHIN of all services provided to LHIN residents (Formula 1). The second measure is the **local service rate** that is defined as the proportion accounted for the volume of care provided to residents within their residential LHIN of all services provided within the LHIN (Formula 2). Both measures are presented as percentages.

$$\text{Retention rate} = \frac{\text{\# of services provided to residents within LHIN}}{\text{Total \# of services provided to LHIN residents}} \quad (1)$$

$$\text{Local service rate} = \frac{\text{\# of services provided to residents within LHIN}}{\text{Total \# of services provided within LHIN}} \quad (2)$$

The degree of regional variation in utilisation rates and volumes of services provided is described quantitatively by measures such as the extremal quotient (ratio between the maximum value to the minimum value). LHIN estimates that are two standard deviations above

(or below) the provincial estimate are considered significantly higher (or lower) than the provincial estimate. The relationship between volume of services provided, measures of cross-boundary flow and availability of orthopaedic services was explored using correlation coefficients.

All measures of orthopaedic services utilisation were calculated for the following variables:

- **Diagnostic groups:** arthritis and related conditions, trauma related conditions, musculoskeletal conditions (MSK) and other conditions.
- **Orthopaedic surgery groups:** TJR, knee arthroscopy, other repairs, reductions with or without fixations, spinal surgeries and other surgeries.
- **Service setting:** ambulatory, inpatient (were further classified as elective and non-elective), day surgeries and emergency department encounters.
- **Patient's demographic characteristics:** sex and age.
- **Type of encounter:** hospital encounters with no orthopaedic procedure recorded in the patient record were defined as medical encounters, as opposed to surgical encounters where an orthopaedic surgery was recorded.

The availability of orthopaedic services was estimated using data from the 2006 ACREU Survey of Ontario Orthopaedic Surgeons (29). Three measures of availability of orthopaedic services are used in this report. The number of orthopaedic surgeons practicing per 100,000 population, the number of office half-days per 100,000 population and the number of surgery half-days per 100,000 population. Half-days are defined in this report as four hours.

The next section presents the results for Part I and II. Findings for the LHINs are presented as figures. The numbers for each LHIN on which these figures are based are given in tables in the Technical Appendix.

3.0 Findings

3.1 Part I: Patterns of use of orthopaedic surgeon services in Ontario, 2005/06 including surgical trends from 1992/93 to 2005/06

Overall utilisation of orthopaedic services in Ontario

In 2005, over 600 thousand people had 1.3 million encounters with orthopaedic surgeons in Ontario (Figure 1). Of those, 516 thousand people made over one million ambulatory visits accounting for 86% of all encounters with orthopaedic surgeons. Same day surgeries and encounters in emergency departments accounted for 34% and 18% of all hospital encounters that required orthopaedic services, respectively, with 48% of hospital encounters being inpatient hospitalizations.

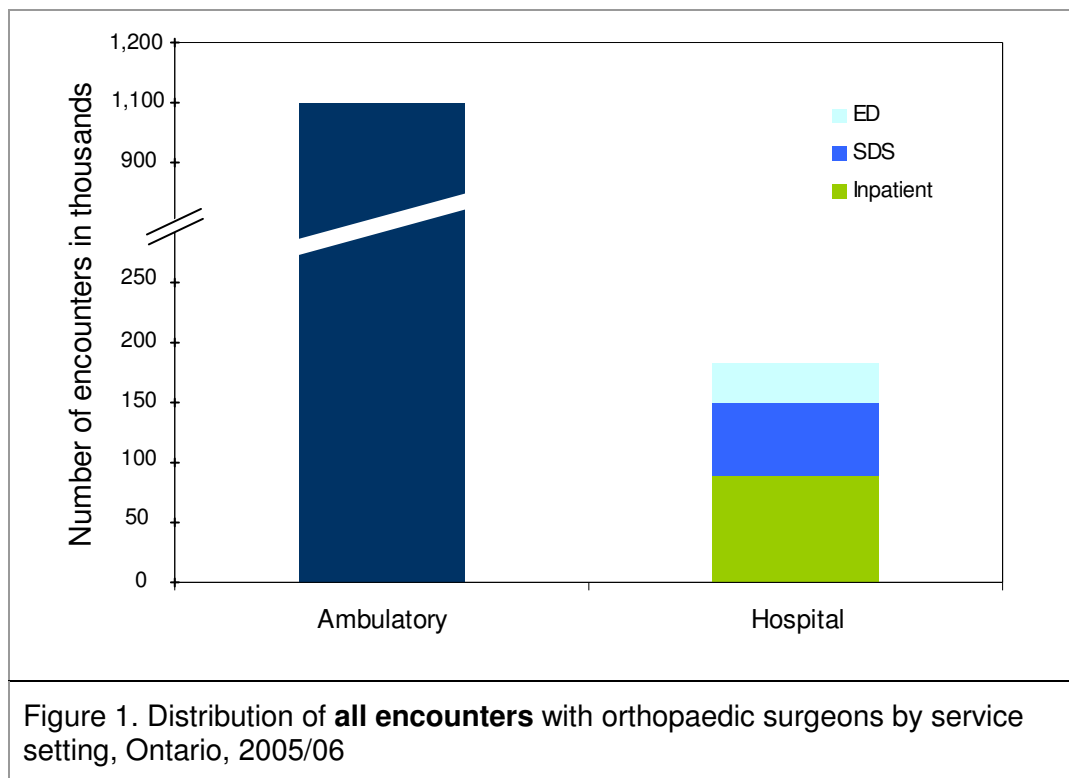


Figure 1. Distribution of **all encounters** with orthopaedic surgeons by service setting, Ontario, 2005/06

Data Sources: OHIP, DAD, NACRS, SDS

In both ambulatory and hospital settings the most common diagnoses seen were traumatic conditions and arthritis and related conditions. These diagnoses accounted for 81% of all ambulatory encounters and all hospital encounters, respectively (Table 1). Traumatic conditions were seen more often in ambulatory settings and arthritis and related conditions were most common in hospital setting. More than half of the day surgeries were for arthritis and related conditions and 82% of the encounters in emergency departments were for traumatic conditions.

Table 1. Distribution of encounters with orthopaedic surgeons by diagnosis groups and service setting, Ontario, 2005/06

| | Total number of encounters | Arthritis and related conditions | | Traumatic conditions | | MSK | | Other | |
|-------------------------|----------------------------|----------------------------------|-------------|----------------------|-------------|----------------|-------------|---------------|------------|
| | | Encounters | % | Encounters | % | Encounters | % | Encounters | % |
| Ambulatory | 1,125,800 | 420,697 | 37.4 | 496,042 | 44.1 | 141,089 | 12.5 | 67,972 | 6.0 |
| Hospitalizations | 182,329 | 74,787 | 41.0 | 73,271 | 40.2 | 18,447 | 10.1 | 15,824 | 8.7 |
| Inpatient | 88,065 | 36,548 | 41.5 | 38,668 | 43.9 | 8,221 | 9.3 | 4,628 | 5.3 |
| SDS | 61,809 | 36,797 | 59.5 | 8,032 | 13.0 | 8,758 | 14.2 | 8,222 | 13.3 |
| ED | 32,455 | 1,442 | 4.4 | 26,571 | 81.9 | 1,468 | 4.5 | 2,974 | 9.2 |
| All encounters | 1,308,129 | 495,484 | 37.9 | 569,313 | 43.5 | 159,536 | 12.2 | 83,796 | 6.4 |

Data Sources: OHIP, DAD, NACRS, SDS

Care provided by orthopaedic surgeons in Ontario

Of the 182,329 patient encounters with orthopaedic surgeons in hospital settings, 75% were surgical encounters (ranging from 55% among patients with other conditions to 95% among patients with arthritis conditions) (Figure 2). Over 44 thousand encounters in hospital settings were medical encounters (encounters that only required a consultation from an orthopaedic surgeon), representing 24% of all encounters in this setting. Encounters for traumatic conditions accounted for 68% of all consultations while encounters with arthritis and related diagnosis or MSK conditions accounted for another 8% each.

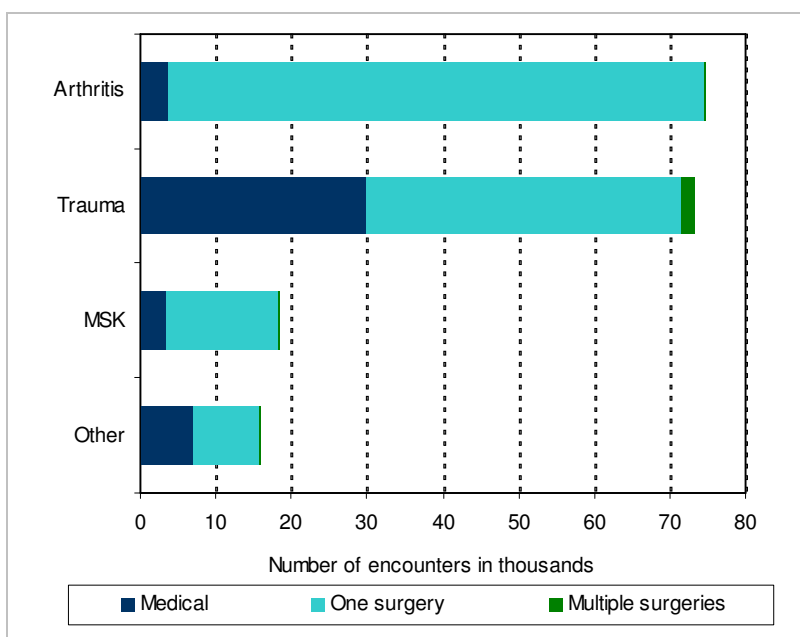


Figure 2. Distribution of **medical and surgical hospital encounters** by diagnosis group, Ontario, 2005/06

Data Source: DAD, NACRS, SDS

Note: surgery refers to orthopaedic surgical procedures

Orthopaedic surgeons performed over 140 thousand surgeries in Ontario in 2005 (Figures 3 and 4). Only a quarter of those surgeries were TJR, another 14% were arthroscopic knee surgery, 16% were reductions with fixations, and repairs and reductions without fixations accounted for 13% and 6% of all surgeries, respectively. Spinal surgery accounted for a small (4%) proportion of all surgeries carried out by orthopaedic surgeons. Over 71 thousand surgeries were for arthritis and related diagnosis, over 46 thousand were for trauma conditions and over 15 thousand were for MSK conditions.

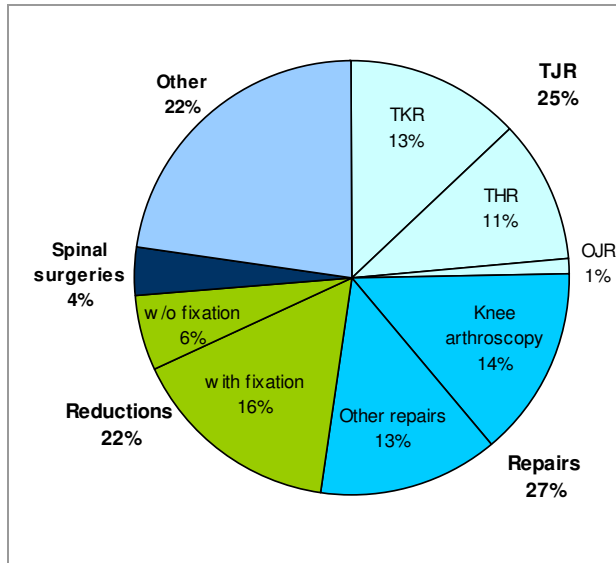


Figure 3. Number of **specific orthopaedic surgeries**, Ontario, 2005/06

Data Source: DAD, NACRS, SDS

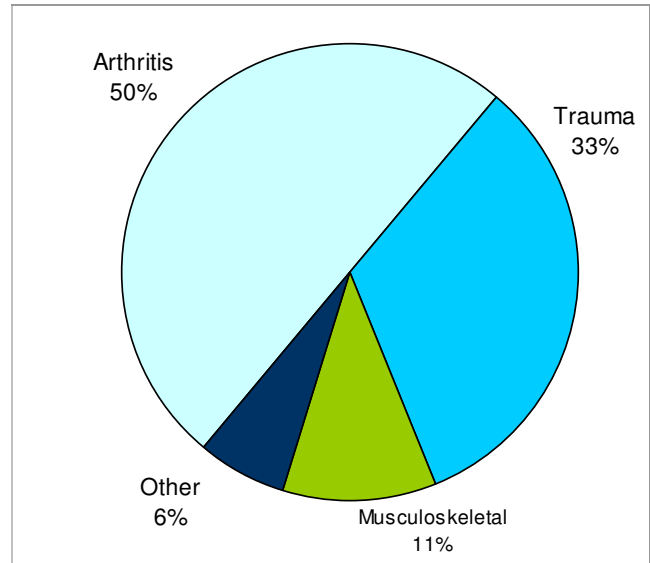


Figure 4. Number of orthopaedic surgeries for **arthritis and related conditions**, for trauma, for MSK and for other conditions, Ontario, 2005/06

Data Source: DAD, NACRS, SDS

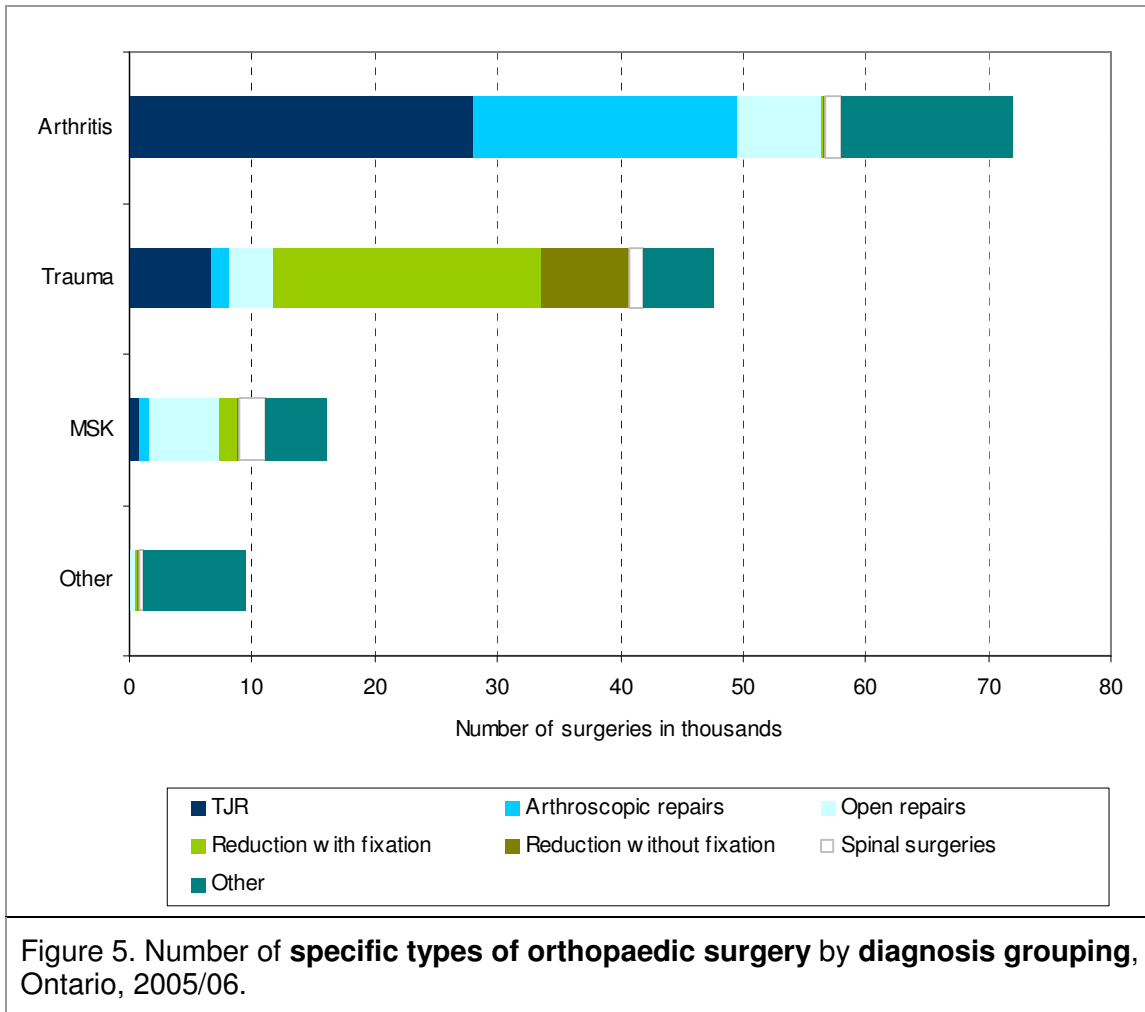


Figure 5. Number of **specific types of orthopaedic surgery** by **diagnosis grouping**, Ontario, 2005/06.

Data Source: DAD, NACRS, SDS

The most common surgeries performed in patients with arthritis and related diagnosis were TJR accounting for 40% of all surgeries among patients in this group (Figure 5), arthroscopic surgeries, accounting for another 30%, and open repairs which accounted for 10% of all surgeries. Of the 46 thousand surgeries performed on patients with traumatic conditions almost half were reductions with fixations, 16% were reductions without fixations, 15% were TJR, and open repairs accounted for another 8% of all surgeries in this group. Among patients with MSK conditions open repairs accounted for 37% and spinal surgeries accounted for 14% of all surgeries in this group.

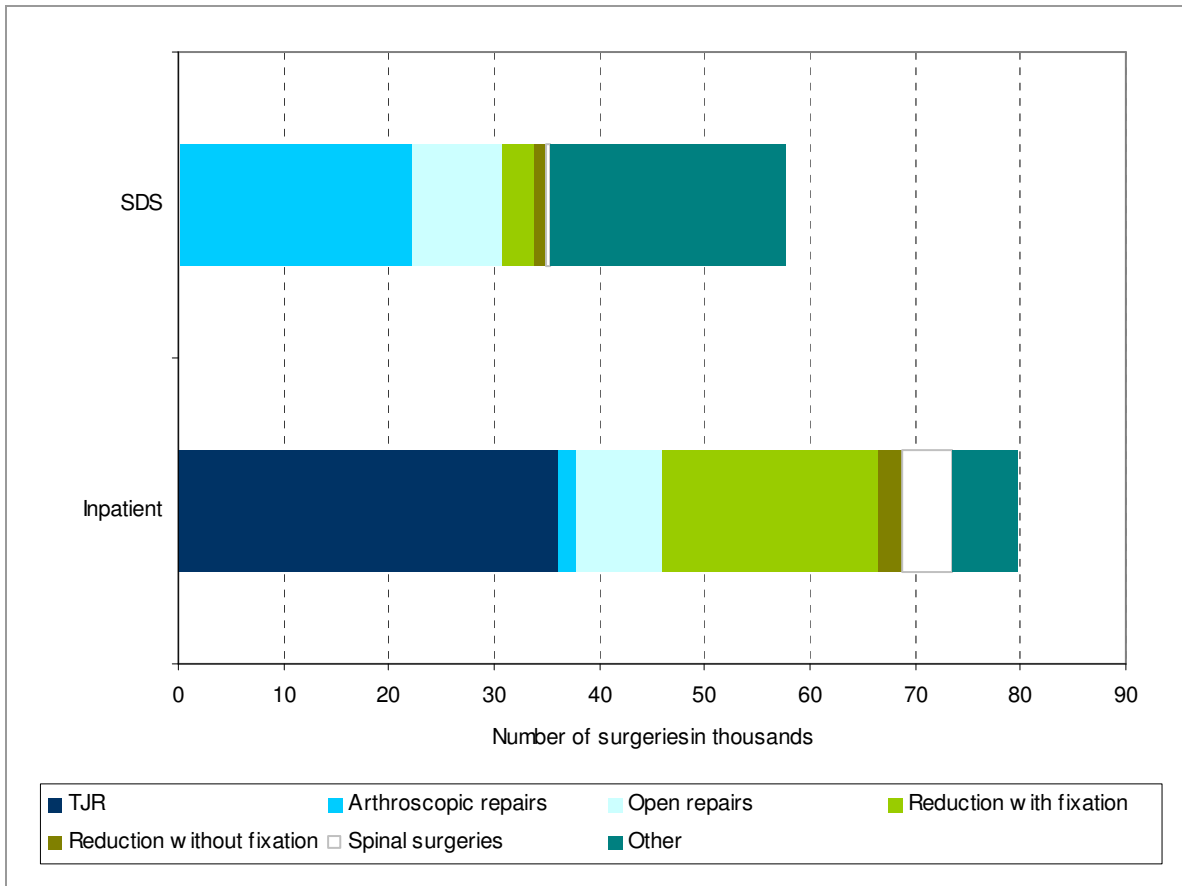
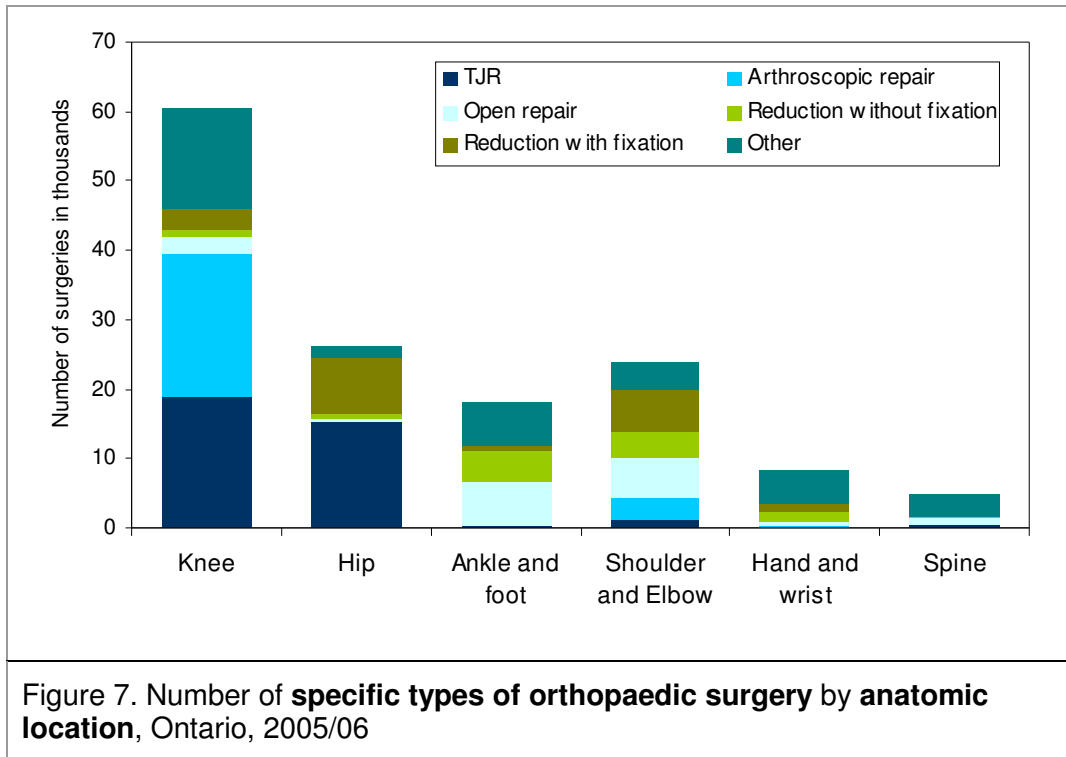


Figure 6. Number of **specific types of orthopaedic surgery** by service setting, Ontario, 2005/06

Data Source: DAD, NACRS, SDS

The number of surgeries performed by orthopaedic surgeons according to service setting is presented in Figure 6. The majority of the surgeries were performed as inpatient encounters or as day surgeries. The most common procedures performed as day surgeries were arthroscopic surgeries, accounting for 38% of all surgeries in this setting. Other surgeries accounted for 39% (almost half were closed excisions) of all day surgeries. Over 79 thousand surgeries were performed by orthopaedic surgeons during inpatient hospitalizations. TJR accounted for 45% and reductions with fixations accounted for 25% of all surgeries in this setting.



The distribution of surgeries according to anatomic location is displayed in Figure 7. Surgeries on the knee were most common, accounting for over 40% of all surgeries, followed by the hip (18%), the shoulder and elbow (17%) and foot and ankle (12%). The number of knee replacements was 24% higher than the number of hip replacements. In addition, the number of knee arthroscopic surgeries was 8% higher than the number of total knee replacements. Arthroscopic surgeries were most commonly performed on the knee (87%) and the shoulder and elbow (13%). Reductions with fixations were most commonly carried out on the hip (41%), and shoulder and elbow (31%). Reductions without fixations were performed more often on the ankle and foot (38%), shoulder and elbow (33%) and hand and wrist (11%).

The number of surgeries performed by orthopaedic surgeons varied according to patient's age and sex (Figure 8). The total number of surgeries increased with age among women; however, among men, the number of surgeries increased with age up to the age of 54 and then showed a considerable decline. Among people 44 years or younger the number of surgeries was higher in men than women and among people 55 years or older the opposite was observed.

The pattern of surgery with age varied according to underlying condition. The volume of surgeries for arthritis and related conditions increased with age for men and women until age 64 years and then declined for those 65 years or older (Figure 9). The number of surgeries was higher in men less than age 55 years and in women 55 years or older. The volume of surgeries related to traumatic conditions was higher in younger men (less than age 55) and in older women (64 years or older). The number of surgeries for this diagnosis group was particularly high in older women (75 years or older) where the number of surgeries was almost triple the number in men the same age, and in younger men (24 years or younger) where the number of surgeries was almost double the number of surgeries in women the same age group.

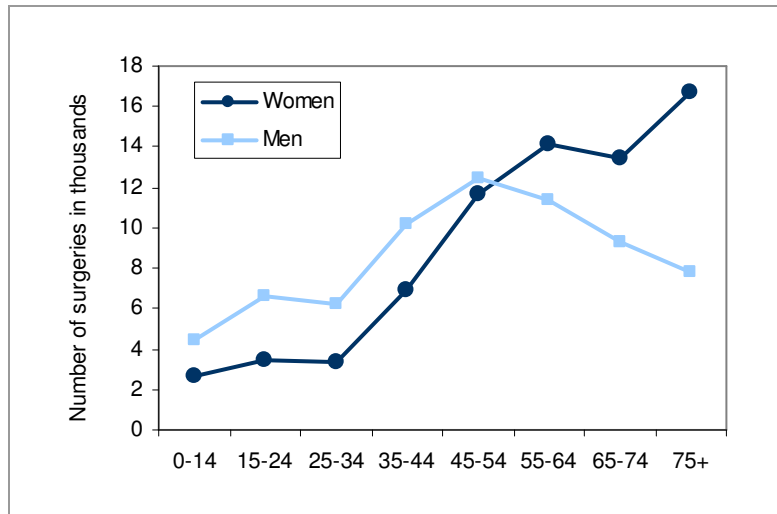


Figure 8. Total number of **orthopaedic surgeries** by age and sex, Ontario, 2005/06

Data Source: DAD, NACRS, SDS

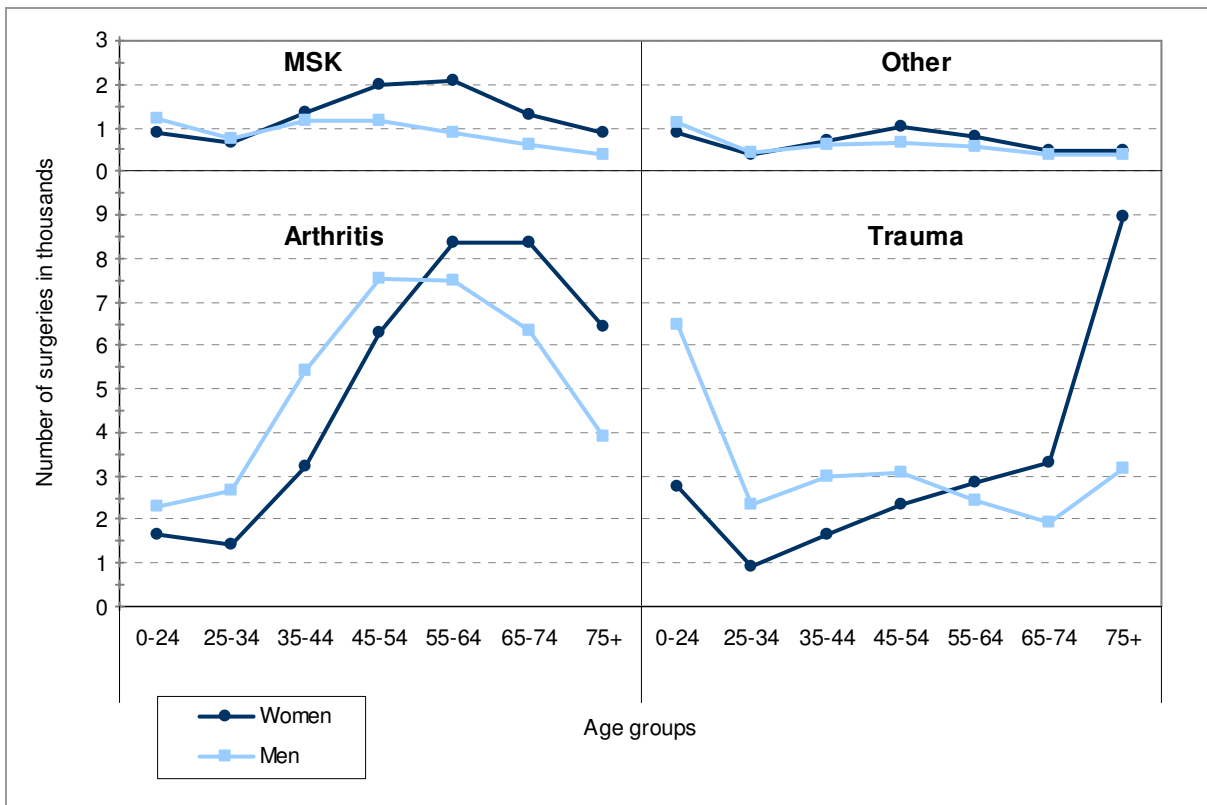


Figure 9. Total number of **orthopaedic surgeries** according to **diagnosis grouping** by age and sex, Ontario, 2005/06

Data Source: DAD, NACRS, SDS

Table 2. Number of **specific types of orthopaedic surgery** by **age** and **gender** according to **diagnosis groupings**, Ontario, 2005/06

| Surgical groups | Total | Ratio Women/Men | Age groups | | | |
|---|--------|--------------------|------------|-------|-------|--------|
| | | | 0-24 | 25-54 | 55-74 | 75+ |
| <i>Arthritis and related conditions</i> | | | | | | |
| TJR | 28,157 | 1.5 | 21 | 567 | 9,317 | 18,253 |
| Arthroscopic repairs | 19,319 | 0.7 | 1,882 | 5,866 | 9,090 | 2,481 |
| Other repairs | 8,451 | 0.7 | 686 | 1,791 | 4,349 | 1,626 |
| Reductions with fixations | 466 | 1.0 | 78 | 117 | 144 | 127 |
| Reductions without fixations | 75 | 0.9 | 14 | 18 | 16 | 27 |
| Other | 15,256 | 1.0 | 1,326 | 4,298 | 6,909 | 2,723 |
| <i>Traumatic conditions</i> | | | | | | |
| TJR | 6,707 | 1.9 | 20 | 166 | 1,073 | 5,448 |
| Arthroscopic repairs | 754 | 0.5 | 196 | 303 | 221 | 34 |
| Other repairs | 3,672 | 0.4 | 530 | 1,312 | 1,282 | 548 |
| Reductions with fixations | 22,131 | 1.2 | 4,222 | 4,047 | 5,192 | 8,671 |
| Reductions without fixations | 7,173 | 0.9 | 3,342 | 897 | 1,311 | 1,623 |
| Other | 6,685 | 0.7 | 1,133 | 1,665 | 2,201 | 1,686 |
| <i>MSK conditions</i> | | | | | | |
| TJR | 760 | 1.6 | 12 | 134 | 284 | 330 |
| Arthroscopic repairs | 559 | 0.5 | 192 | 218 | 127 | 22 |
| Other repairs | 6,447 | 3.0 | 735 | 1,521 | 3,019 | 1,172 |
| Reductions with fixations | 181 | 0.7 | 48 | 40 | 50 | 43 |
| Reductions without fixations | 510 | 1.0 | 208 | 31 | 132 | 139 |
| Other | 7,215 | 1.2 | 851 | 2,065 | 2,823 | 1,476 |

The volume of surgery conducted according to diagnosis groupings and surgical groupings is presented in Table 2. TJRs were performed more commonly in people with arthritis and related conditions, women, and people 55 years or older. Knee arthroscopy was performed mainly in younger and middle aged men (between the ages of 24 to 54) with arthritis. There was also a significantly smaller group of arthroscopies performed in men under age 45 with a trauma diagnosis, probably related to sport's injuries. A large volume of reductions with fixations was seen among women 75 years or older and younger men, both with traumatic conditions. Reductions without fixations were more common among younger men (24 years or younger) with a trauma diagnosis. Repairs excluding those on the knee were more common among women with MSK conditions or with arthritis and related conditions.

Volume of care provided in ambulatory settings in Ontario

Of the 1.1 million ambulatory encounters with orthopaedic surgeons almost half were for traumatic conditions and another 37% were for arthritis and related conditions (osteoarthritis, rheumatoid arthritis and other arthritis). Visits for spine disorders accounted for 4% of all visits (Figure 10). The most common reasons for having ambulatory encounters with orthopaedic surgeons were fractures and dislocations (27%), strains and sprains (18%), osteoarthritis (16%), other arthritis (19%), and other MSK conditions (8%).

The 1.1 million encounters represent visits by 500 thousand people, a mean of 2.2 visits per person. Women with arthritis and related diagnosis and MSK conditions had on average 20%

and 40% more encounters than men with the same condition, respectively (Table 3). However, for traumatic conditions both men and women reported a similar number of encounters. On average, people reported two ambulatory encounters with orthopaedic surgeons for the conditions studied. However, fractures required more ambulatory encounters than any other diagnosis studied, with an average of 2.5 encounters per person.

A summary of the distribution of encounters with orthopaedic surgeons by patients with traumatic conditions according to body region is presented in Figure 11. The most common sites of fractures and dislocations were hand and wrist (35%) and the lower extremity (23%), which includes ankle and foot. Hip fractures accounted for 9% of all fractures and dislocations. These sites accounted for 67% of all encounters for fractures and dislocations. The most common sites for sprains and strains were the lower extremity (41%), which included the knee, the ankle and foot (18%) and the upper extremity (24%).

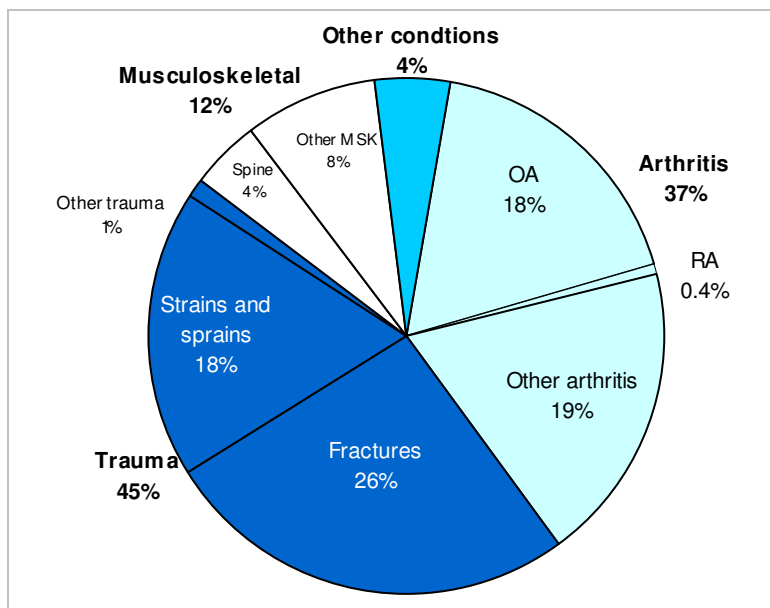


Figure 10. Distribution of ambulatory encounters by diagnosis group, Ontario, 2005/06

Data Sources: OHIP, RPDB

Table 3. **Ambulatory encounters** with orthopaedic surgeons, Ontario, 2005/06

| Condition | Number of visits | Number of people | Mean number of visits per person | Ratio (women/men) |
|---|-------------------------|-------------------------|---|--------------------------|
| All conditions | 1,125,800 | 515,859 | 2.2 | 1.1 |
| Arthritis and Related Conditions | 420,697 | 198,690 | 2.1 | 1.2 |
| Osteoarthritis | 199,873 | 90,851 | 2.2 | 1.5 |
| Rheumatoid Arthritis | 5,248 | 2,282 | 2.3 | 2.5 |
| Joint Derangement | 108,124 | 54,062 | 2.0 | 0.8 |
| Synovitis | 58,848 | 29,424 | 2.0 | 1.2 |
| Ankylosing Spondylitis | 540 | 360 | 1.5 | 1.2 |
| Traumatic Arthritis | 3,603 | 1,501 | 2.4 | 1.0 |
| Other arthritis | 44,461 | 20,210 | 2.2 | 1.2 |
| Traumatic Conditions | 496,042 | 215,568 | 2.3 | 1.0 |
| Fractures and dislocations | 260,047 | 104,019 | 2.5 | 1.0 |
| Strains, sprains | 215,965 | 102,840 | 2.1 | 1.0 |
| Other trauma | 20,030 | 8,709 | 2.3 | 1.0 |
| Musculoskeletal Conditions | 141,089 | 72,049 | 2.0 | 1.4 |
| Other spine | 53,306 | 29,615 | 1.8 | 1.3 |
| Bone Disorders | 26,570 | 13,285 | 2.0 | 2.4 |
| Not Yet Diagnosed | 61,213 | 29,149 | 2.1 | 1.2 |
| Other conditions | 67,972 | 29,553 | 2.3 | 0.9 |

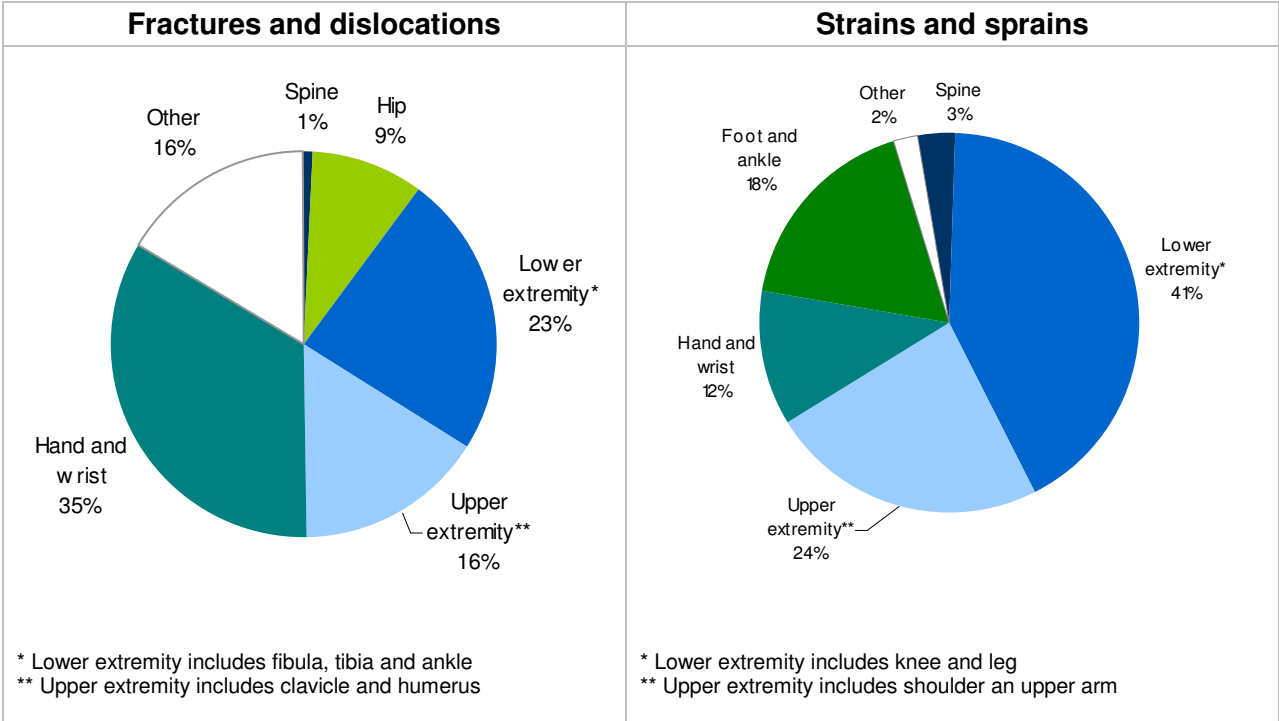


Figure 11. Number of encounters with orthopaedic surgeons for **fractures and dislocations** and **sprains and strains** according to anatomic location, Ontario, 2005/06

Data Source: OHIP, RPDB

Time trends in orthopaedic surgeries in Ontario from 1992/93 to 2005/06

The number of surgeries carried out by orthopaedic surgeons in Ontario between 1992/93 and 2001/02 increased from 115,992 to 135,195 in 2001/02 (Figure 12). As can be seen from the figure there was a discontinuity in numbers between 2001/02 and 2002/03 and instability in numbers thereafter, which is likely related to the change in the classification used to capture surgeries: the CCP was used between years 1992/93-2001/02 and the CCI for years 2002/03-2005/06. In this report, we describe the time trends in these two time periods separately.

Table 4 summarises the time trend in numbers of major types of orthopaedic surgeries. Of all surgeries performed by orthopaedic surgeons between 1992/93 and 2001/02, the number of TJRs increased substantially by 62% from 13 thousand to 21 thousand; and accounted for between 11% and 16% of all surgeries in the period. In the most recent years (2002/03 to 2005/06) the number has continued to increase and the proportion of all surgeries accounted for by TJR has increased from 19% in 2002/03 to 25% in 2005/06, representing an increase of 40% in the total number of TJRs. In 2005/06 orthopaedic surgeons carried out 36 thousand TJRs, which were ten thousand more than the number in 2002/03. Over six thousand of these surgeries were for patients with osteoarthritis. Much of this increase took place between 2004/05 and 2005/06 when the number of TJRs increased by over five thousand. This coincided with the initiation of the Ontario Wait Time Strategy. At the same time the number of other surgeries remained relatively stable.

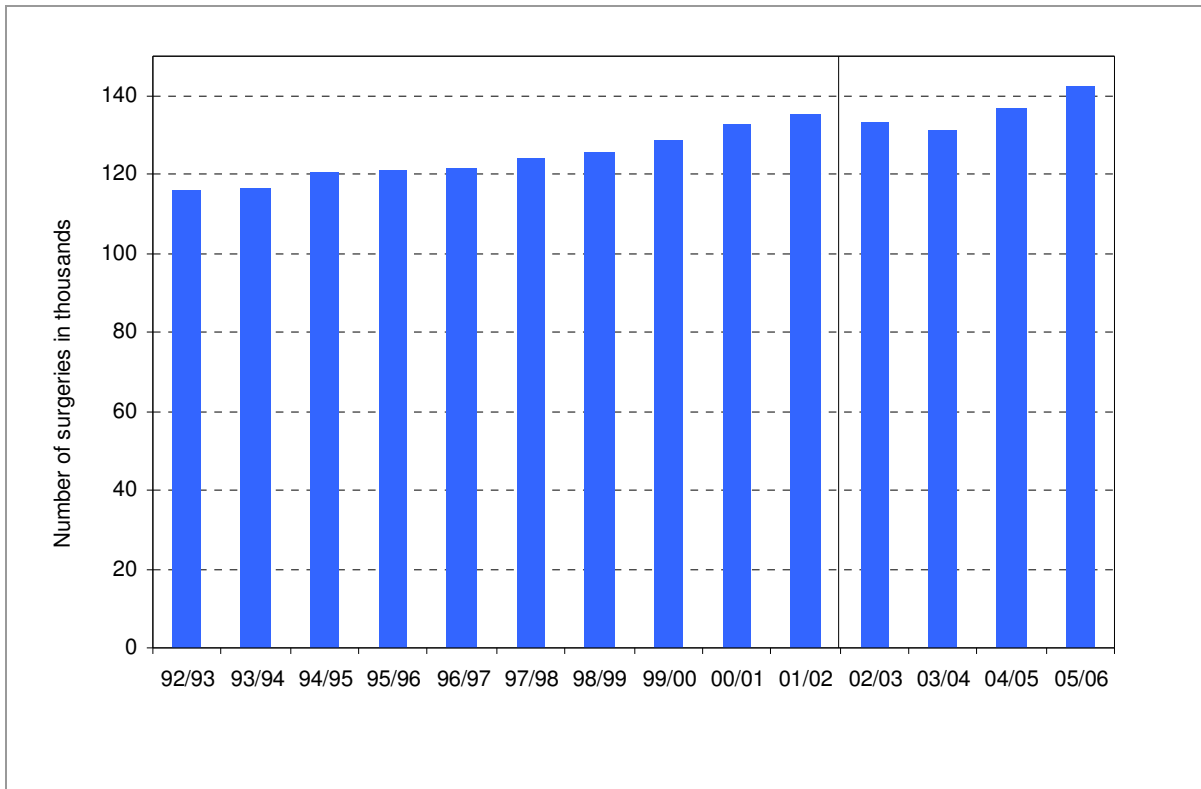


Figure 12. Total number of orthopaedic surgeries, in Ontario from 1992/93 to 2005/06

Data Source: DAD, NACRS, SDS

Note: The line represents when the change in classification of health interventions occurred

Table 4. Number of TJR, arthroscopy, reductions with or without fixations, repairs and other surgeries performed by orthopaedic surgeons in Ontario from 1992/93 to 2005/06

| Year | Total number of surgeries | TJR | | Arthroscopy | | Reductions with or without fixations | | Repairs | | Spinal surgeries | | Other | |
|---------|---------------------------|--------|------|-------------|------|--------------------------------------|------|---------|------|------------------|-----|--------|------|
| | | Number | % | Number | % | Number | % | Number | % | Number | % | Number | % |
| 1992/93 | 115,992 | 12,948 | 11.2 | 21,564 | 18.6 | 27,608 | 23.8 | 9,632 | 8.3 | 5,305 | 4.6 | 38,935 | 33.6 |
| 1993/94 | 116,698 | 13,733 | 11.8 | 19,490 | 16.7 | 25,852 | 22.2 | 10,126 | 8.7 | 4,580 | 3.9 | 42,917 | 36.8 |
| 1994/95 | 120,642 | 14,700 | 12.2 | 18,395 | 15.2 | 25,036 | 20.8 | 10,571 | 8.8 | 4,526 | 3.8 | 47,414 | 39.3 |
| 1995/96 | 121,198 | 15,437 | 12.7 | 18,587 | 15.3 | 25,186 | 20.8 | 11,024 | 9.1 | 4,235 | 3.5 | 46,729 | 38.6 |
| 1996/97 | 121,377 | 16,227 | 13.4 | 16,324 | 13.4 | 22,952 | 18.9 | 11,949 | 9.8 | 4,182 | 3.4 | 49,743 | 41.0 |
| 1997/98 | 124,059 | 17,263 | 13.9 | 17,689 | 14.3 | 24,012 | 19.4 | 12,498 | 10.1 | 3,872 | 3.1 | 48,725 | 39.3 |
| 1998/99 | 125,625 | 18,221 | 14.5 | 17,137 | 13.6 | 23,250 | 18.5 | 12,818 | 10.2 | 4,090 | 3.3 | 50,109 | 39.9 |
| 1999/00 | 128,935 | 19,379 | 15.0 | 17,536 | 13.6 | 23,953 | 18.6 | 13,685 | 10.6 | 4,423 | 3.4 | 49,959 | 38.7 |
| 2000/01 | 132,955 | 19,390 | 14.6 | 17,570 | 13.2 | 24,129 | 18.1 | 14,154 | 10.6 | 4,451 | 3.3 | 53,261 | 40.1 |
| 2001/02 | 135,195 | 20,973 | 15.5 | 18,534 | 13.7 | 24,964 | 18.5 | 14,704 | 10.9 | 4,323 | 3.2 | 51,697 | 38.2 |
| 2002/03 | 133,268 | 25,723 | 19.3 | 18,207 | 13.7 | 24,296 | 18.2 | 15,377 | 11.5 | 5,449 | 4.1 | 44,216 | 33.2 |
| 2003/04 | 131,236 | 27,570 | 21.0 | 19,847 | 15.1 | 26,237 | 20.0 | 14,875 | 11.3 | 4,921 | 3.7 | 37,786 | 28.8 |
| 2004/05 | 136,783 | 30,687 | 22.4 | 21,348 | 15.6 | 28,003 | 20.5 | 15,507 | 11.3 | 5,313 | 3.9 | 35,925 | 26.3 |
| 2005/06 | 142,228 | 35,903 | 25.2 | 23,663 | 16.6 | 31,093 | 21.9 | 15,859 | 11.2 | 5,044 | 3.5 | 30,666 | 21.6 |

Note: The discontinuous line represents when the change in classification of health interventions occurred

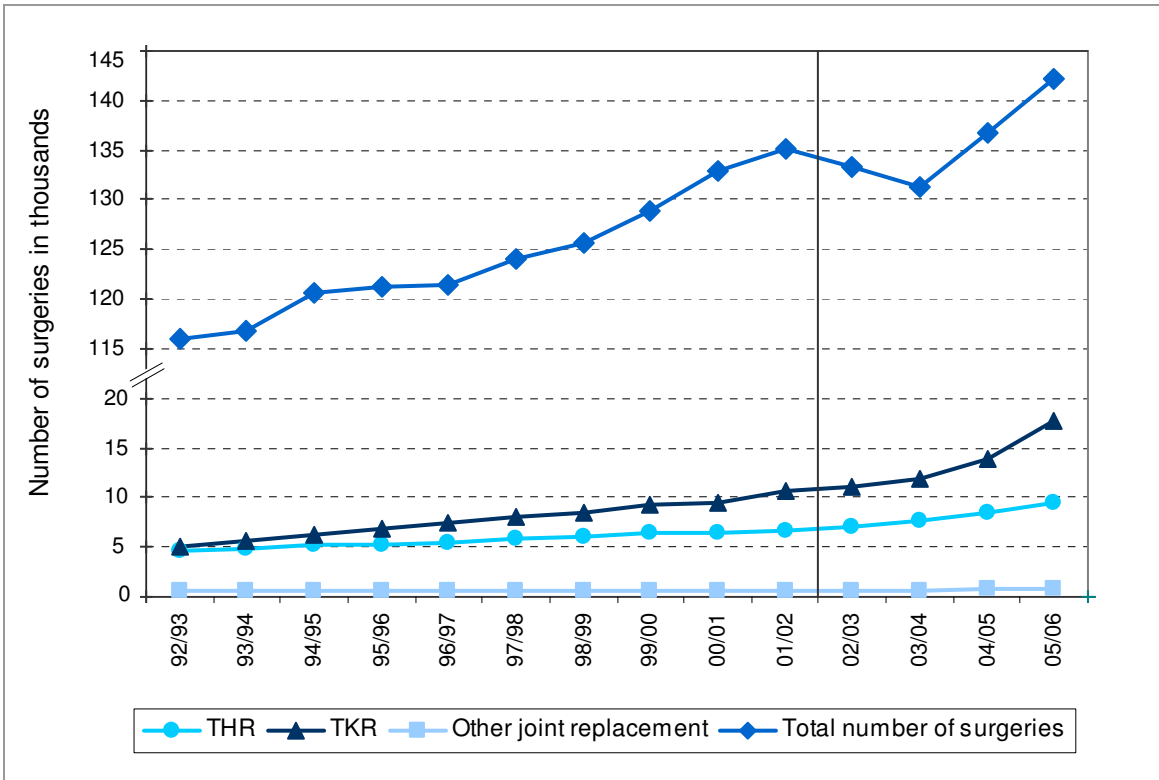


Figure 13. Number of **total hip replacements, total knee replacements and other joint replacements for arthritis and related conditions** in Ontario from 1992/93 to 2005/06

Data Source: DAD, NACRS, SDS

3.2 Part II: Geographic variation in use of orthopaedic services in Ontario, 2005/06

Orthopaedic ambulatory services provided to LHIN residents

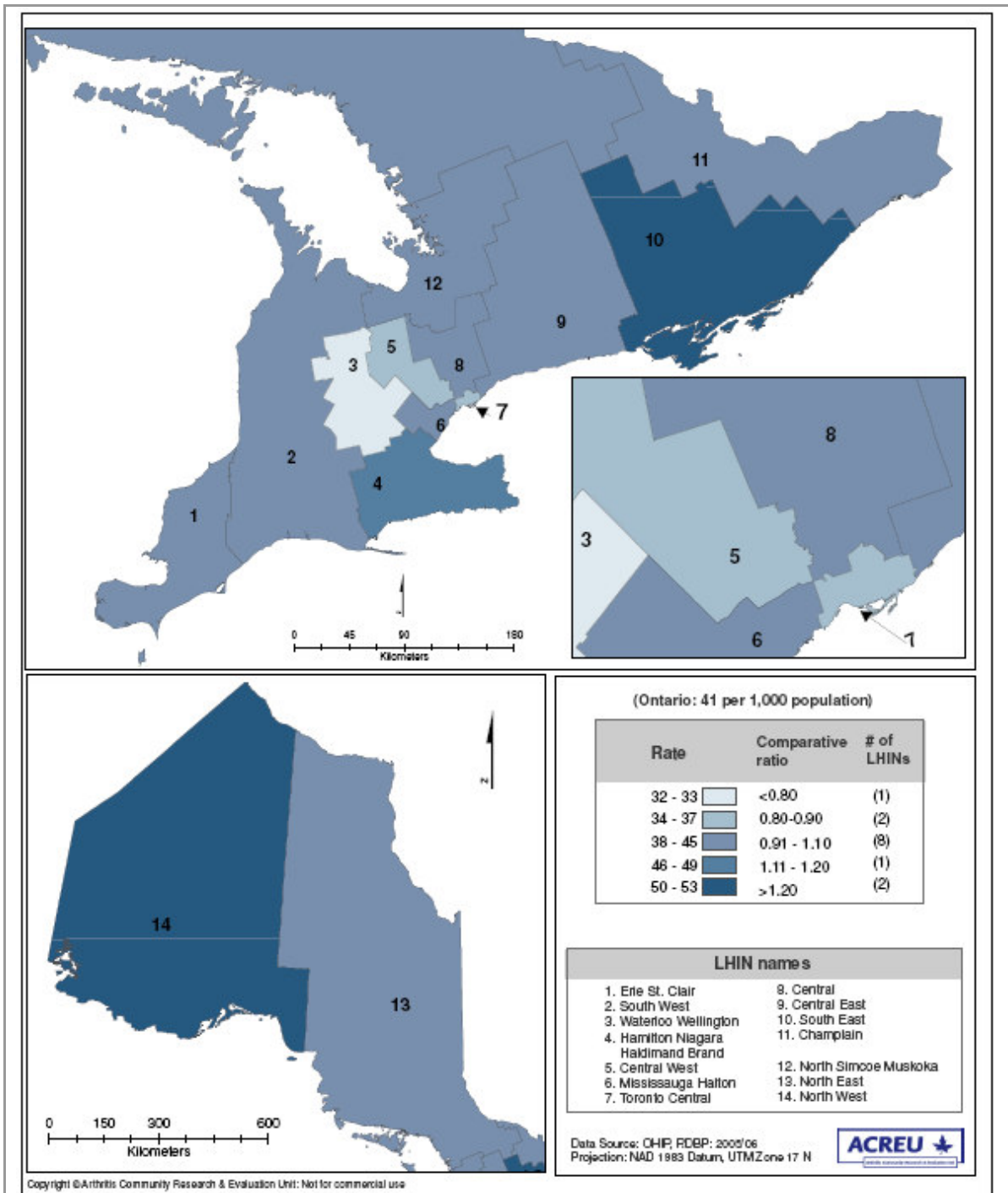
The overall age and sex standardised ambulatory person-visit rate to orthopaedic surgeons is displayed in map 1. The degree of regional variation in the standardised person-visit rate is relatively small with the highest rate 1.6 times the lowest rate. The standardised rate per 1,000 population ranged from 32 in Waterloo Wellington LHIN to over 50 in North West and South East LHINs. The rate for Waterloo Wellington LHIN was one standard deviation below the Ontario rate (41 per 1,000 population) while the rate for North West LHIN was two standard deviations above the provincial rate. South East and Hamilton Niagara Haldimand Brant LHINs also reported moderately higher standardised rates, one standard deviation above the Ontario rate.

Figure 14 displays the age and sex standardised rates according to diagnosis groups. Standardised rates for arthritis and related conditions show a two-fold variation. The standardised rate for North West LHIN (25 per 1,000 people) was two standard deviations above the provincial rate. The rate for Hamilton Niagara Haldimand Brant LHIN (22 per 1,000 people) was one standard deviation above the Ontario rate and the rate for Toronto Central LHIN (11 per 1,000 people) was one standard deviation below the Ontario rate. Standardised rates for trauma and related conditions show also a two-fold variation. South East LHIN reported the highest rate (24 per 1,000 people), two standard deviations above the provincial rate and Waterloo Wellington and North West LHINs reported the lowest rates (11 and 13 per 1,000 people, respectively), one standard deviation below the Ontario rate.

Orthopaedic in-hospital services provided to LHIN residents

The overall age and sex standardised rate of all orthopaedic surgeries is presented in map 2. The standardised rate of all surgeries varied by LHIN with the highest rate 1.9 times the lowest rate. The Toronto Central LHIN was one standard deviation below the provincial rate (844 surgeries per 100,000 people) while South East and North West LHINs reported rates one standard deviation above the Ontario rate (1,600 and 1,538 surgeries per 100,000 people, respectively).

Figure 15 shows the rates for the different type of orthopaedic surgeries studied. The highest standardised rate for TJR per 100,000 population (381 for North West LHIN) was 1.8 times the lowest rate (212 for Toronto Central LHIN). The LHINs with the highest rates were South West and North West. Standardised rates for knee arthroscopy showed a two-fold variation. North East LHIN reported the highest rate (227 per 100,000 population) and Toronto Central the lowest rate (115 per 100,000 population). Hamilton Niagara Haldimand Brant and Erie LHINs also reported higher rates while Central LHIN reported a lower rate.



Map 1. Age and sex standardised rate of **all ambulatory person-visits** rate to orthopaedic surgeons per 1,000 population, by Local Health Integration Networks, Ontario, 2005/06

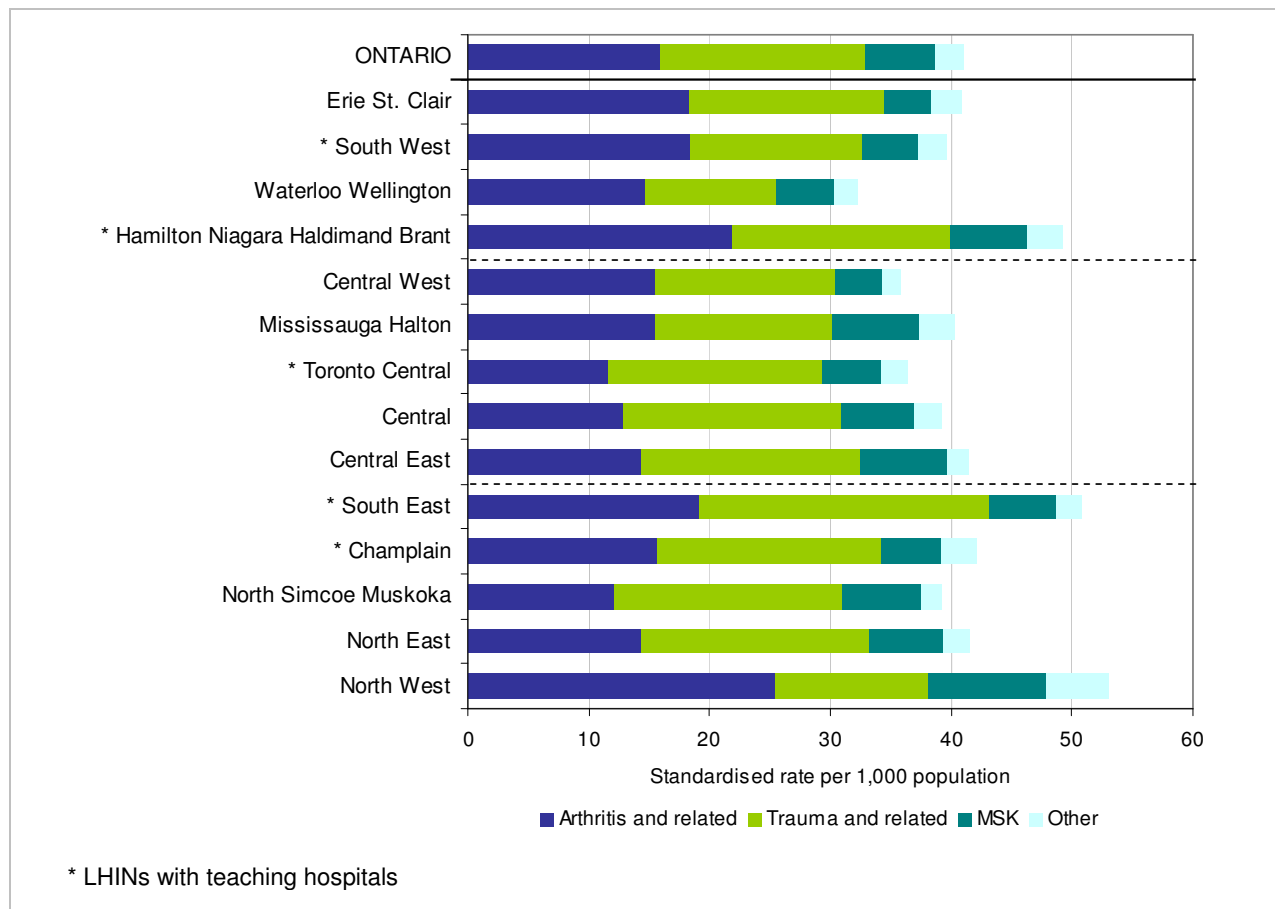
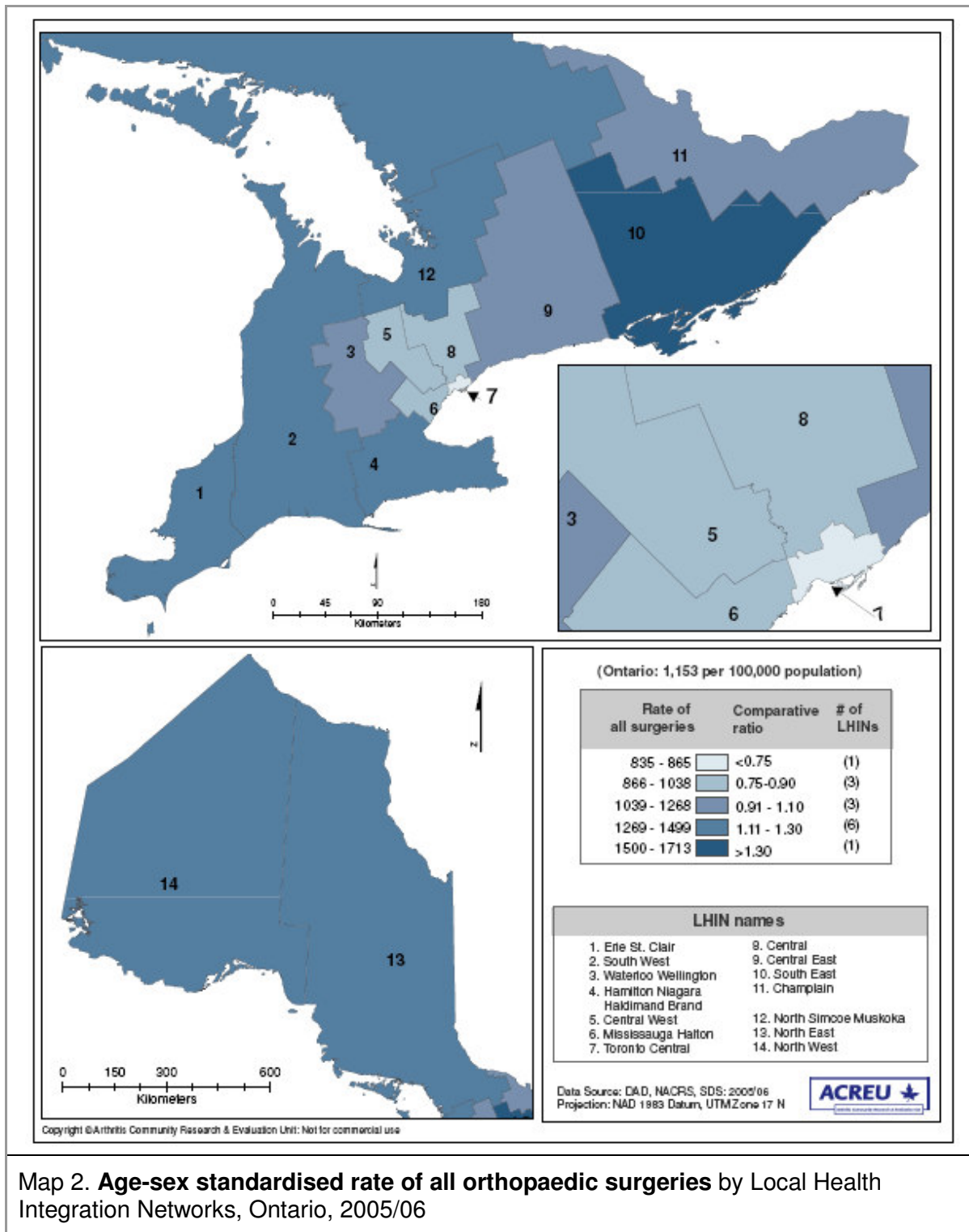


Figure 14. Age and sex standardised **ambulatory person-visit rates** per 1,000 population according to **diagnosis groupings**, by Local Health Integration Networks, in Ontario 2005/06

Data Sources: OHIP, RDBP
 LHINs that lie within the discontinuous line include the GTA area

The standardised rate for reductions with or without fixations ranged from 177 per 100,000 population (Mississauga Halton LHIN) to 395 per 100,000 population (South East LHIN). The standardised rate for South East LHIN was two standard deviations above the provincial rate and the rate for Hamilton Niagara Haldimand Brant LHIN was one standard deviation above. Mississauga Halton and Central LHINs reported standardised rates one standard deviation below the Ontario rate.

The highest standardised rate for spinal surgeries, 63 per 100,000 population (South East LHIN) was 2.2 times the lowest, 29 per 100,000 population (Mississauga Halton LHIN). The standardised rate for South East, North West and Hamilton Niagara Haldimand Brant LHINs were one standard deviation above the provincial rate.



Map 2. **Age-sex standardised rate of all orthopaedic surgeries** by Local Health Integration Networks, Ontario, 2005/06

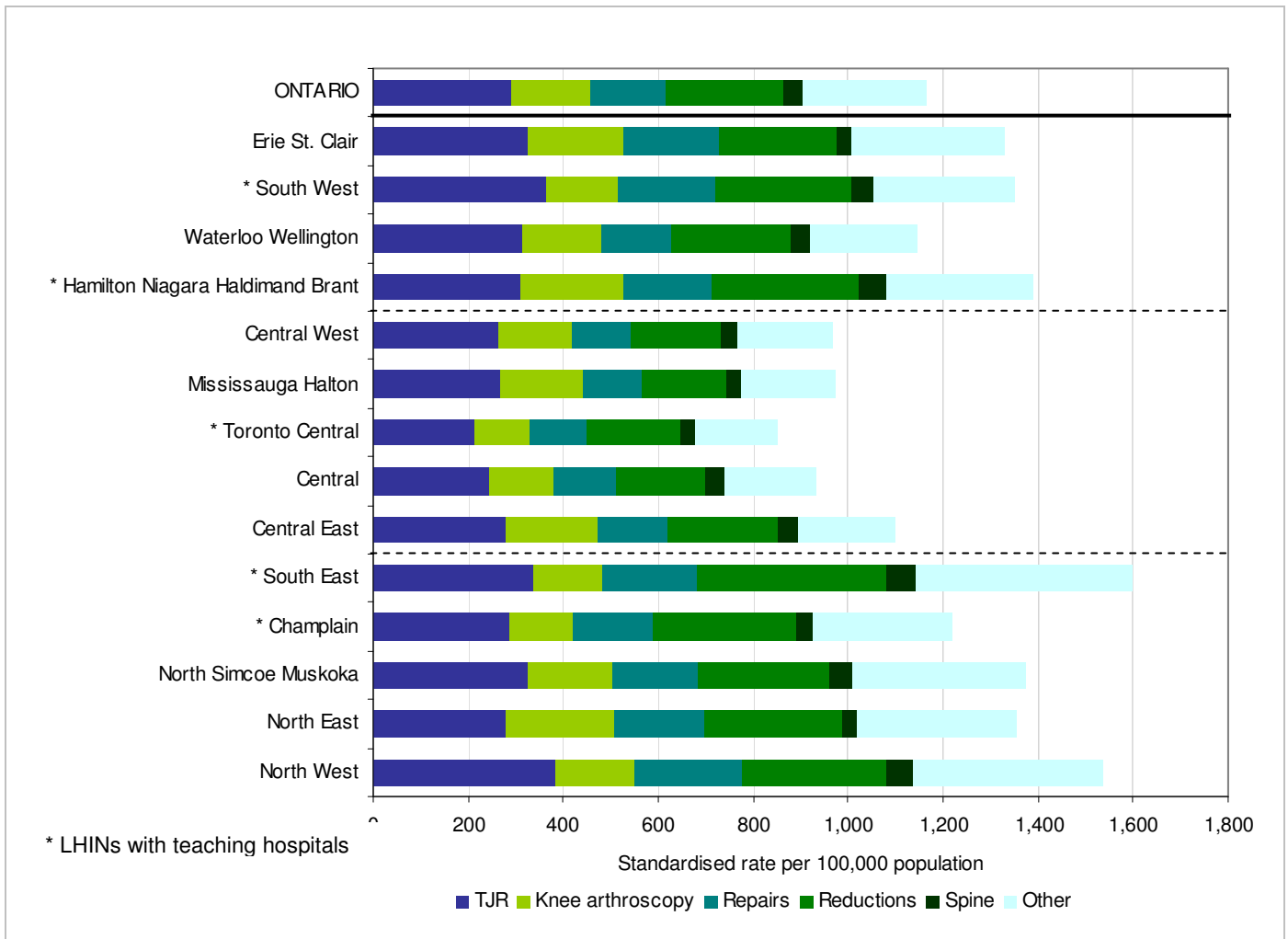


Figure 15. Age and sex standardised rates of **specific types of orthopaedic surgery**, by Local Health Integration Networks, Ontario, 2005/06

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA area

Relationship between volume of care provided to LHIN residents and the availability of orthopaedic services

Figure 16 displays the relationship between availability of orthopaedic services and person-visit rates in ambulatory settings among LHINs in Ontario. Standardised person-visit rates tend to increase as the number of orthopaedic surgeons per population increases. However, the association is relatively modest (correlation coefficient of 0.40). When Toronto Central LHIN was removed from the analysis (since this LHIN has the highest availability of orthopaedic surgeons but the lowest person-visit rate) a stronger relationship was observed (correlation coefficient of 0.70). Similar results were obtained when availability of services was measured as the number of office-half days per 100,000 population.

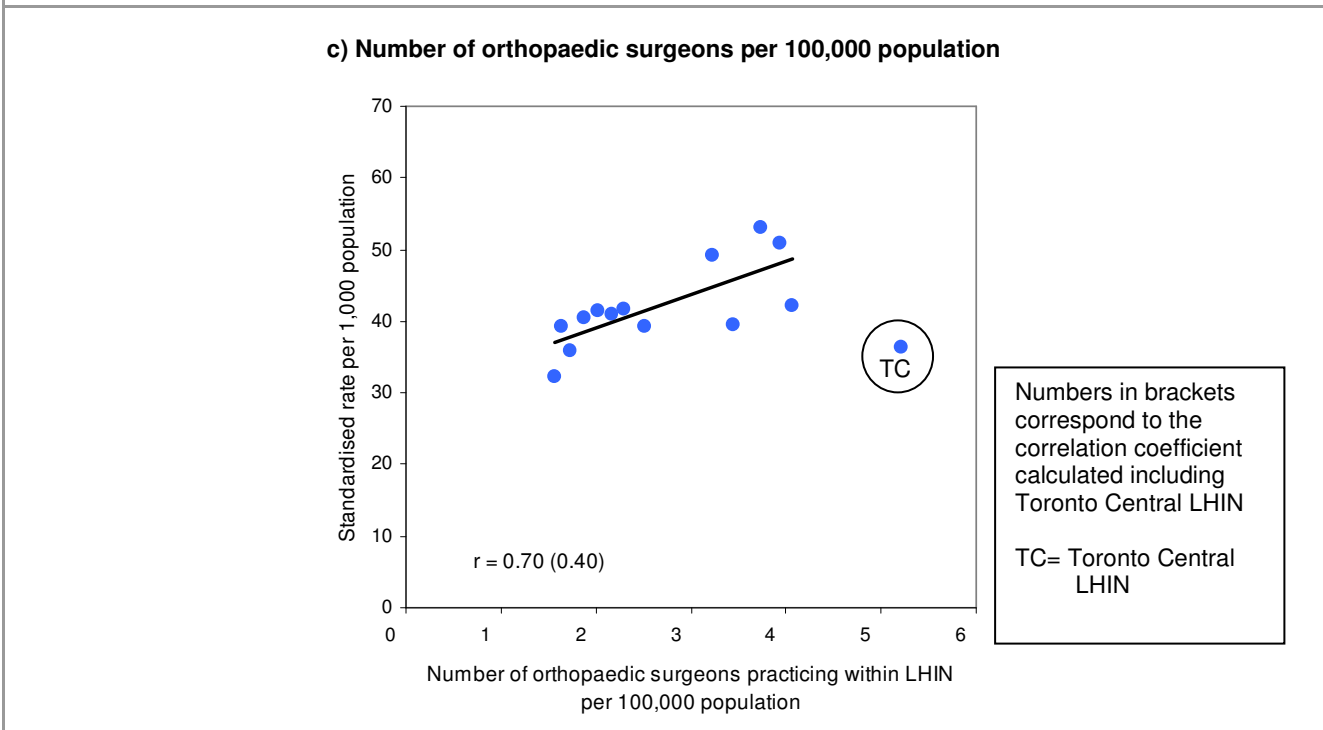
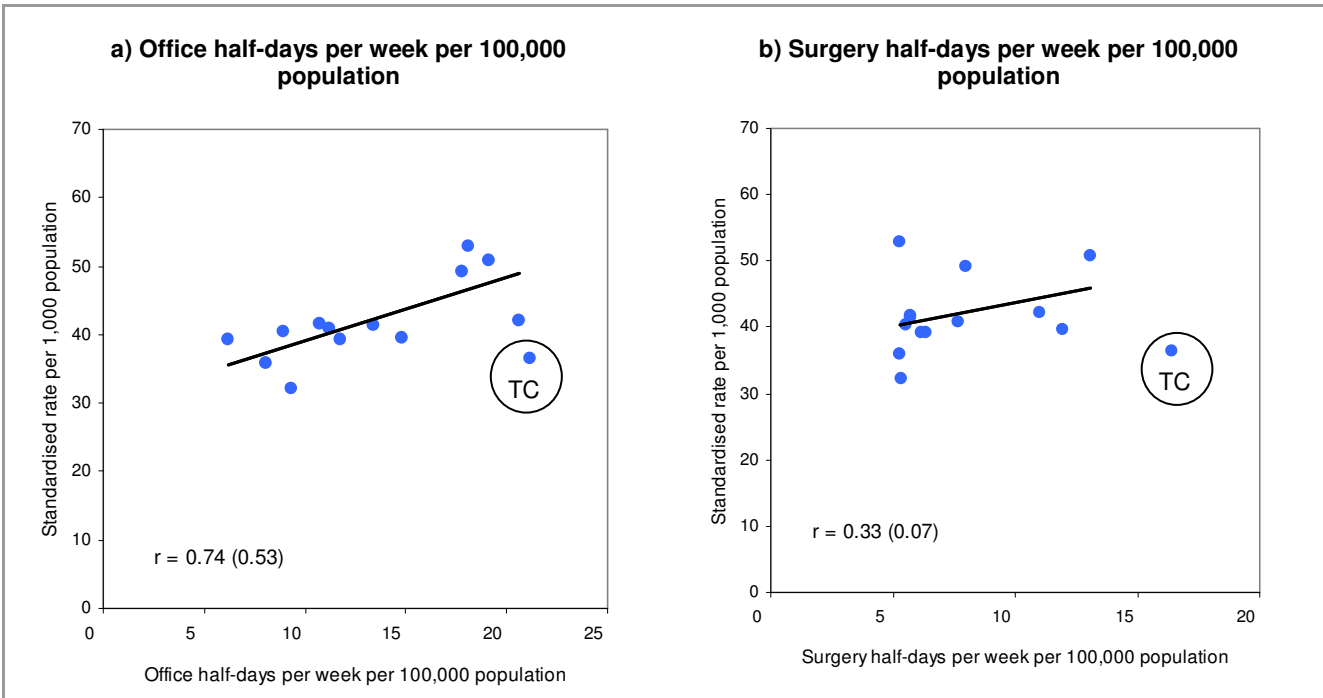
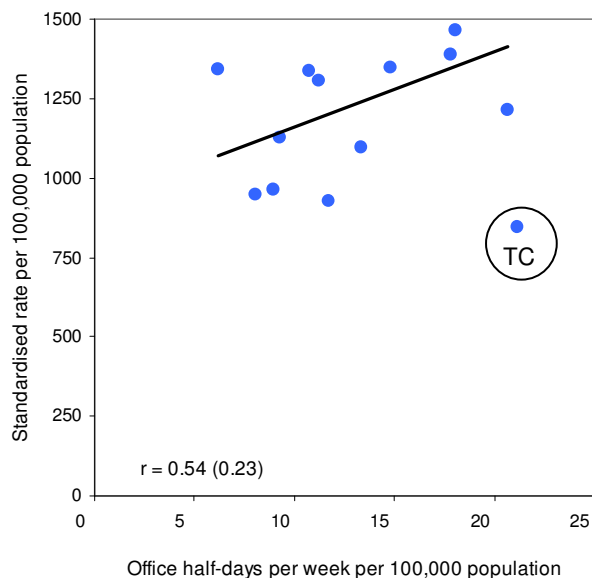


Figure 16. Relationship between the standardised **ambulatory person-visit rate** per 1,000 population and the **availability of orthopaedic services** by Local Health Integration Networks, Ontario, 2005/06

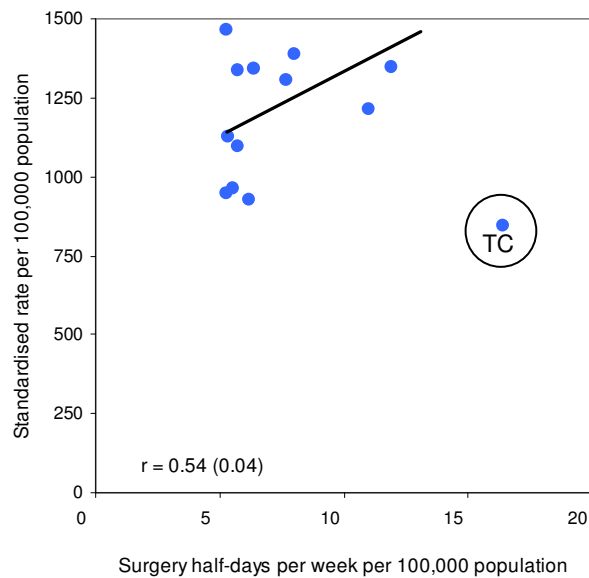
Data sources: OHIP, RDBP, ACREU Survey of Orthopaedic Surgeons

In the case of the rate of orthopaedic surgeries (Figure 17), the relationship with the availability of orthopaedic services was less apparent. With the exception of Toronto Central, LHINs with higher availability of orthopaedic services tended to have higher surgical rates. Similar results were obtained when availability of services was measured as the number of surgery-half days per 100,000 population.

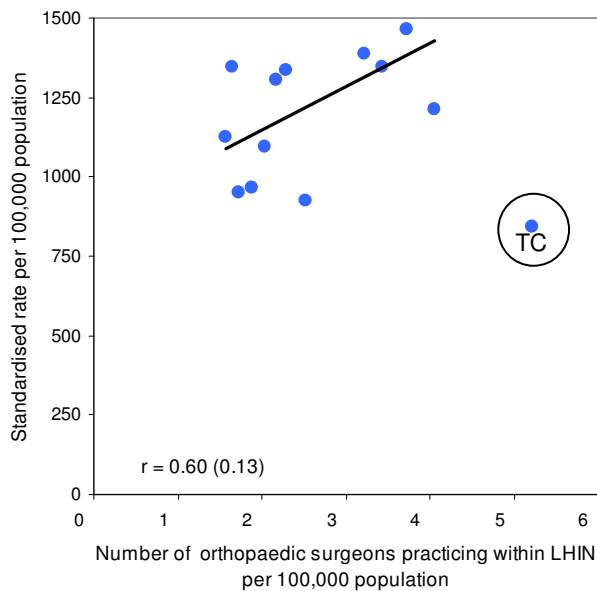
a) Office half-days per week per 100,000 population



b) Surgery half-days per week per 100,000 population



c) Number of orthopaedic surgeons per 100,000 population



Numbers in brackets correspond to the correlation coefficient calculated including Toronto Central LHN

TC= Toronto Central LHN

Figure 17. Relationship between the standardised rate for **all orthopaedic surgeries** per 100,000 population and the **availability of orthopaedic services** by Local Health Integration Networks, Ontario, 2005/06

Data sources: OHIP, RDBP, ACREU Survey of Orthopaedic Surgeons

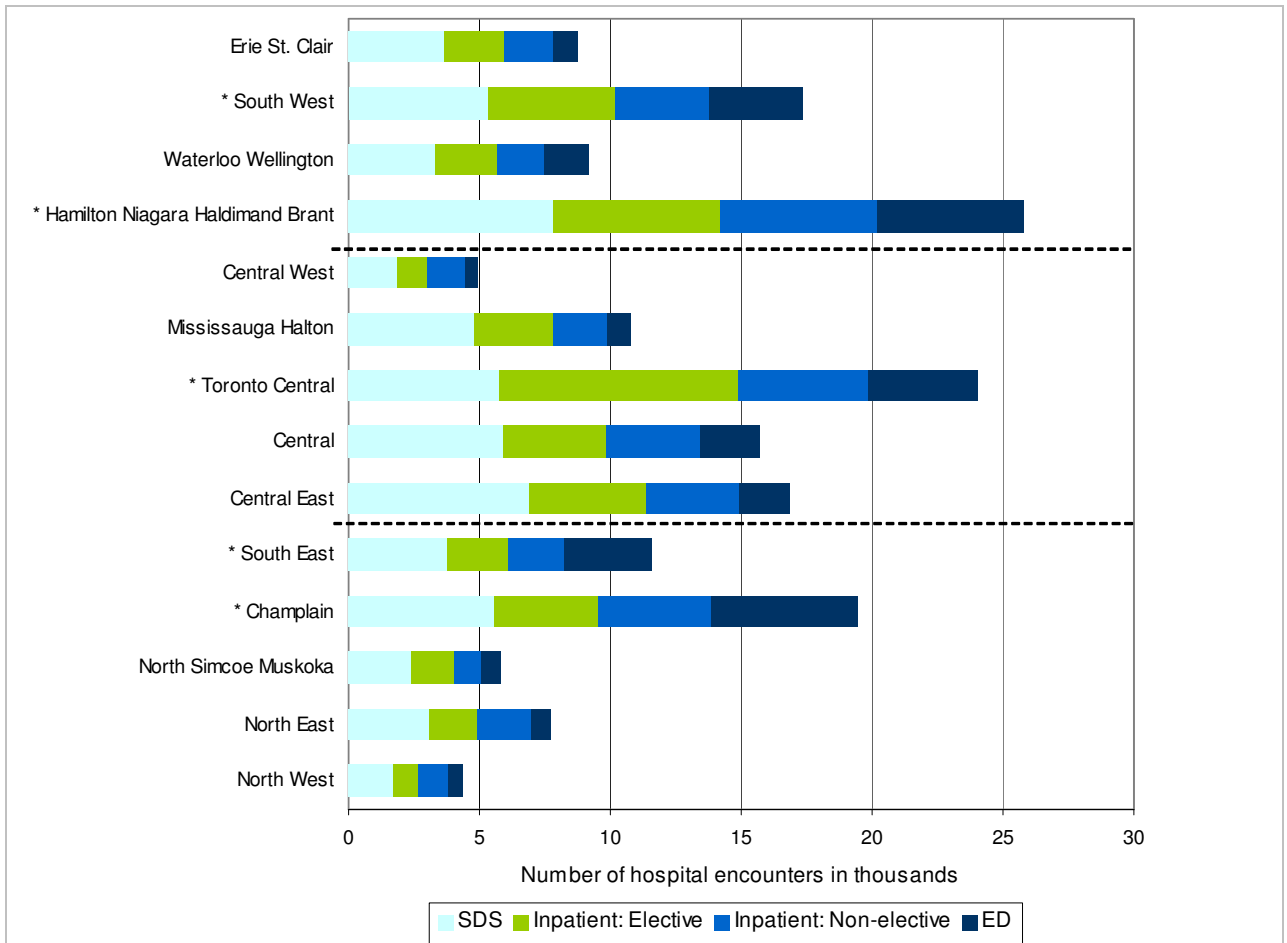
Volume of in-hospital service provided by orthopaedic surgeons within LHINs

Encounters with orthopaedic surgeons

The number of encounters with orthopaedic surgeons occurring within each LHIN is presented in Figure 18. The highest number of encounters took place in the Hamilton Niagara Haldimand Brant and the Toronto Central LHINs. The distribution of hospital encounters according to service setting display moderate variation. For example, of all encounters that took place in Toronto Central LHIN, 38% were for inpatient elective surgery (percentage two standard deviations above the provincial estimate) and South East and Champlain LHINs reported the lowest percentage of encounters for elective surgery (20%).

Central West LHIN had the highest percentage of hospitalizations for non-elective surgery (28%, two standard deviations above the provincial estimate). North East and North West LHINs reported the percentage of hospitalizations for non-elective surgery one standard deviation above the provincial estimate, while South East and North Simcoe Muskoka LHINs were one standard deviation below the Ontario estimate.

In Mississauga Halton, Erie St. Clair, Central East and North Simcoe Muskoka and North East LHINs encounters for day surgeries were one standard deviation above the provincial estimate; Toronto Central LHIN reported the lowest percentage (24%) of this type of hospital encounter. Mississauga Halton LHIN reported the lowest percentage (8%) of encounters in emergency departments while South East and Champlain LHINs reported the highest (above 28%).



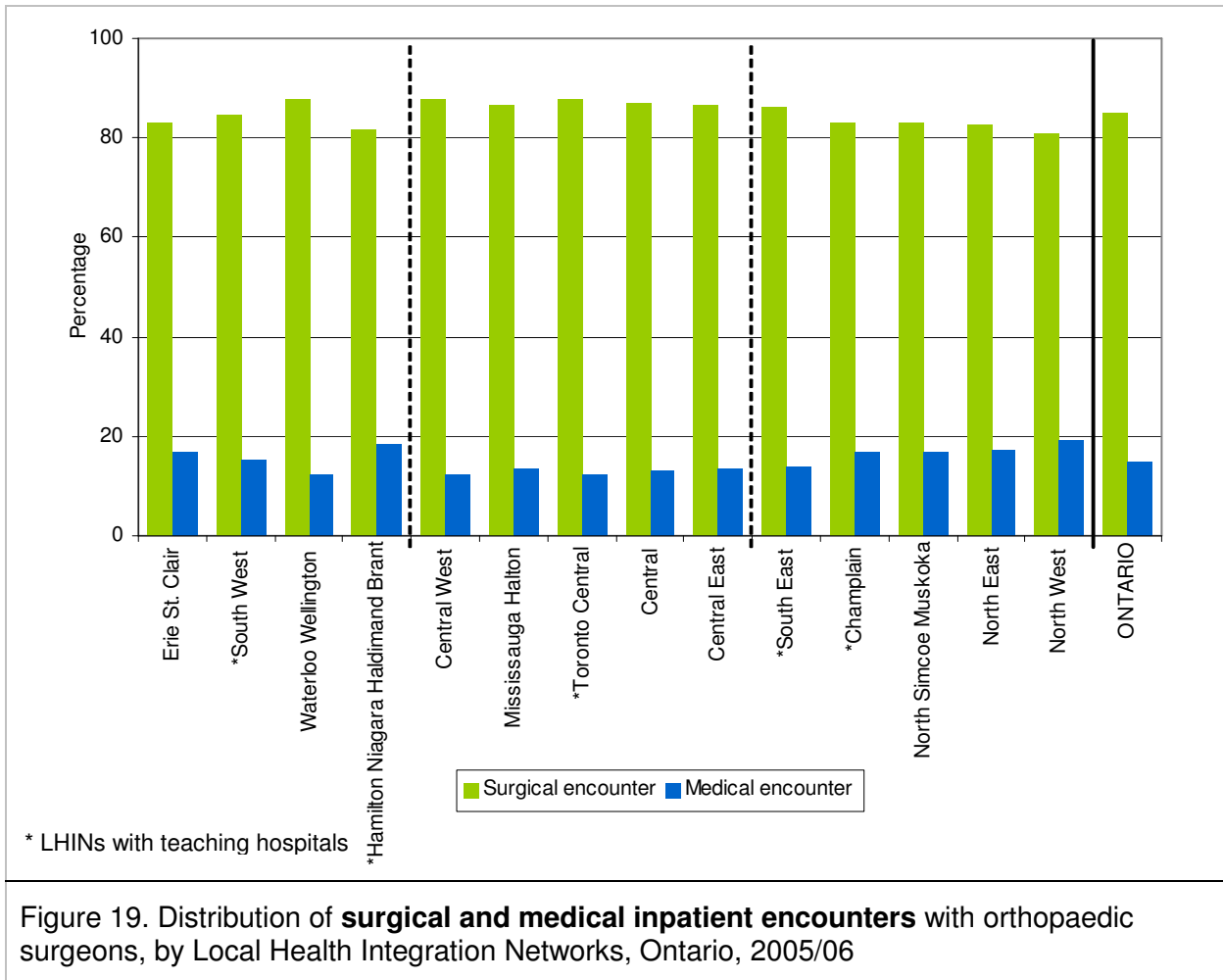
* LHINs with teaching hospitals

Figure 18. Distribution of **hospital encounters** with orthopaedic surgeons according to service setting, by Local Health Integration Networks, Ontario, 2005/06

Data Sources: DAD, NACRS, SDS

Note: LHINs correspond to where the encounter occurred regardless of patient's residence
LHINs that lie within the discontinuous line include the GTA

In Ontario, of all hospital encounters with orthopaedic surgeons 85% were surgical hospitalizations (hospitalizations where a surgical intervention was received) (Figure 19). The distribution of surgical hospitalizations across the province showed moderate variation ranging from 80% in North West LHIN to over 87% in Toronto Central, Waterloo Wellington and Central West LHINs.



Data Sources: DAD, NACRS, SDS

Note: LHINs correspond to where the encounter occurred regardless of patient's residence
 LHINs that lie within the discontinuous line include the GTA

Volume of surgeries provided within LHIN

The number of surgeries provided by orthopaedic surgeons in each LHIN in Ontario in 2005/06 is presented in Figure 20. Half of the surgeries were for arthritis and related diagnoses and almost one-third were for trauma and related diagnoses. The proportion accounted for the number of surgeries for arthritis and related diagnosis provided in the South West and Champlain LHINs (44.4% and 44.7%, respectively) was one standard deviation below the provincial estimate. In the Mississauga Halton LHIN over 60% of all surgeries performed were for these conditions, followed by Central East and Waterloo Wellington LHINs. The percentage of surgeries performed for trauma and related diagnoses varied from 24% in Mississauga Halton to 39% in Central West LHIN. The estimate for Mississauga Halton LHIN was two standard deviations below the Ontario estimate and South West and North Simcoe Muskoka LHINs reported percentages one standard deviation above the provincial estimate.

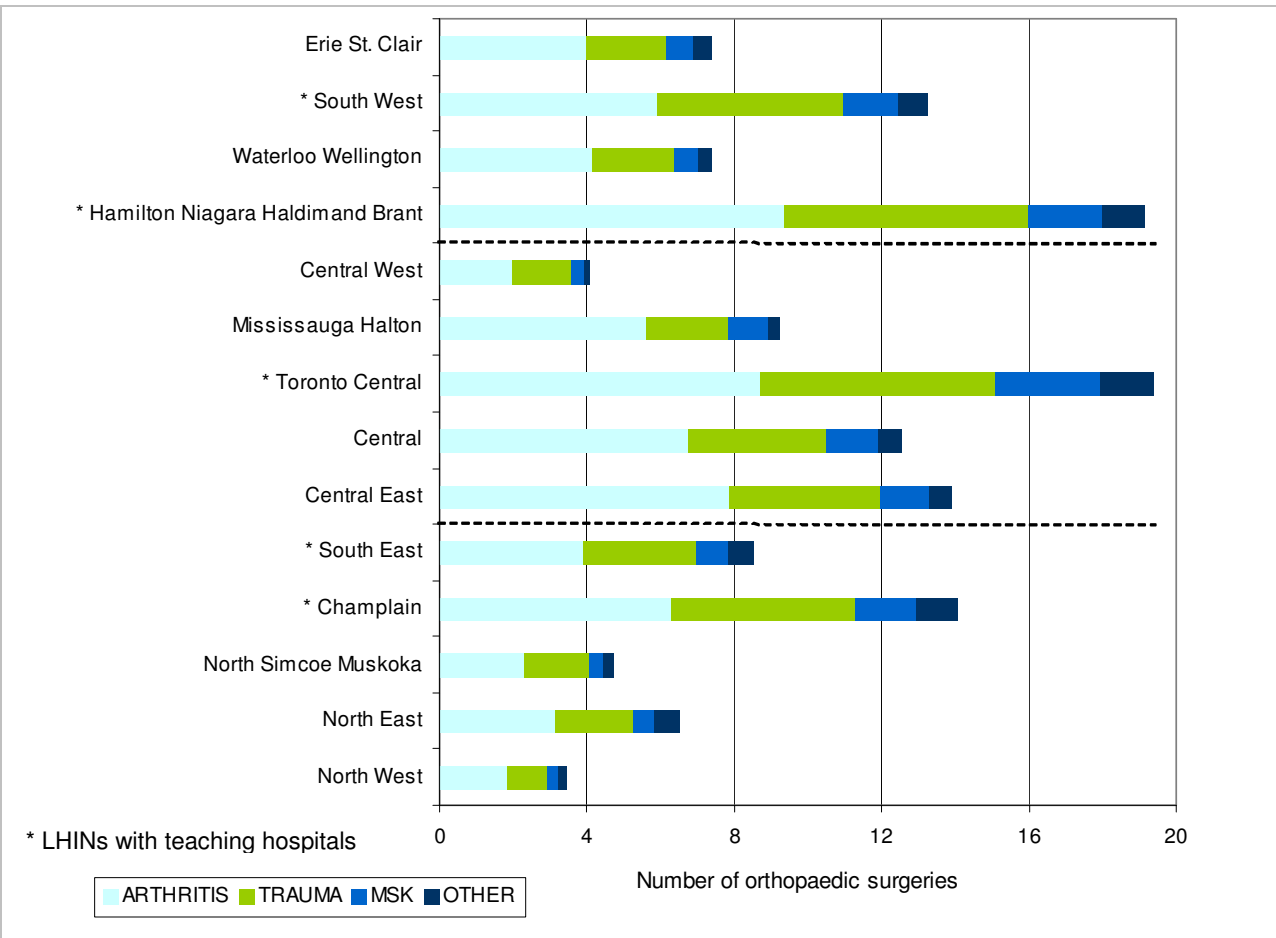


Figure 20. Number of orthopaedic surgeries provided within LHINs according to diagnosis groups, by Local Health Integration Networks, Ontario, 2005/06

Data Sources: DAD, NACRS, SDS
 Note: LHINs correspond to where the encounter occurred regardless of patient's residence
 LHINs that lie within the discontinuous line include the GTA

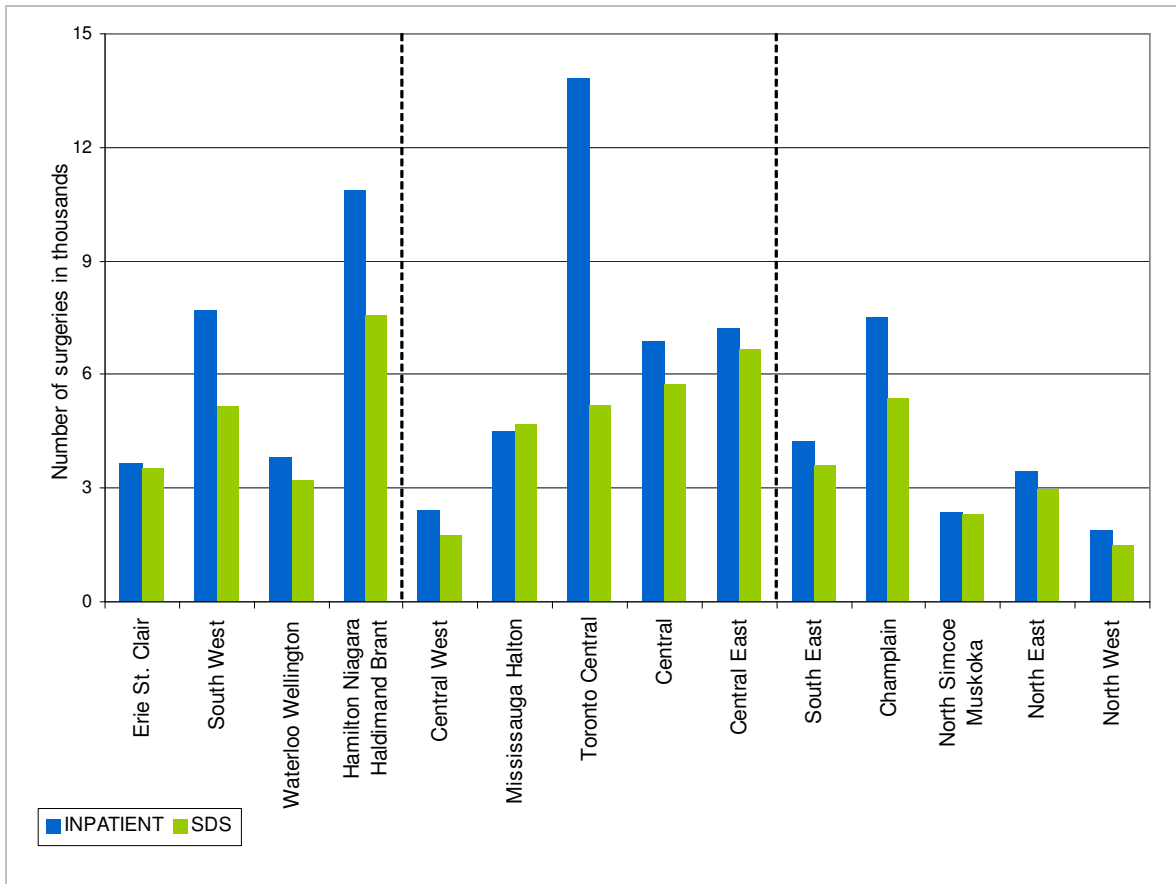


Figure 21. Number of **orthopaedic surgeries** provided within LHIN according to **service setting**, by Local Health Integration Networks, Ontario, 2005/06

Data Sources: DAD, NACRS, SDS

Note: LHINs correspond to where the encounter occurred regardless of patient's residence
LHINs that lie within the discontinuous line include the GTA

Figure 21 displays the number of surgeries carried out by orthopaedic surgeons as inpatient basis as well as day surgeries. Overall, 60% of the surgeries carried out in the province were provided as inpatient and 40% were day surgeries. The number of inpatient surgeries was higher than day surgeries in four of the five LHINs that have teaching hospitals (South West, Hamilton Niagara Haldimand Brant, Toronto Central, and Champlaine). Toronto Central LHIN had a distribution significantly different to the provincial distribution, with 73% of all surgeries conducted as inpatient and only 23% as day surgeries. The situation in Mississauga Halton LHIN was also slightly different to the provincial average with the volume of day surgeries being slightly higher than the volume of inpatient surgeries.

The volume of specific orthopaedic surgeries provided within LHINs is presented in Figure 22. The North East LHIN reported the lowest proportion of TJR (20%) and Waterloo Wellington and Toronto Central LHINs reported the highest proportion for this type of surgery (over 27%). The proportion accounted for by knee arthroscopy displays significant variation across LHINs in Ontario. The South West, South East and Champlaine LHINs reported the lowest proportion (10%) and Mississauga Halton LHIN the highest (23%).

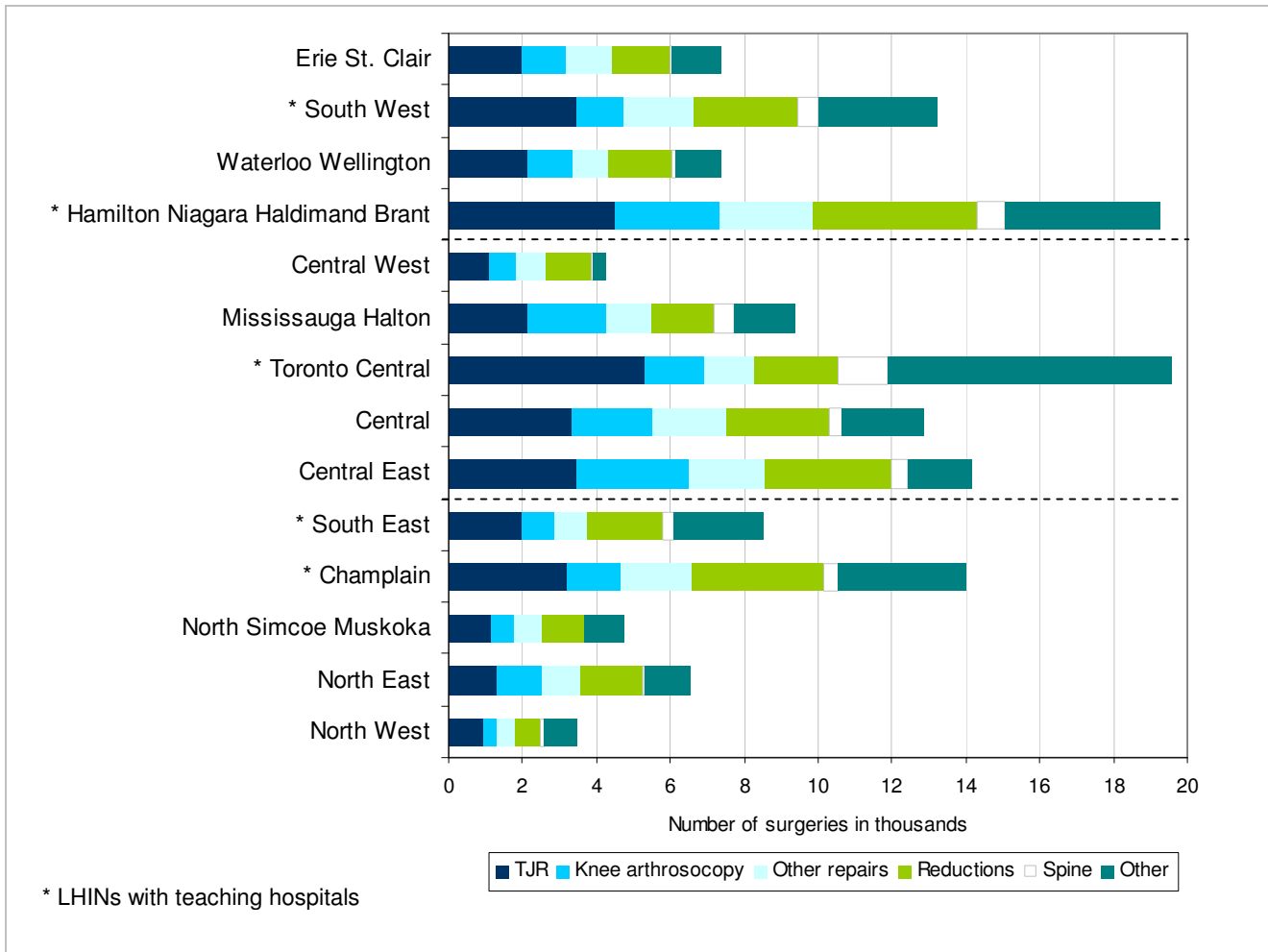


Figure 22. Number of **specific types of orthopaedic surgery** provided within LHIN, by Local Health Integration Networks, Ontario, 2005/06

Data Sources: DAD, NACRS, SDS

Note: LHINs correspond to where the encounter occurred regardless of patient's residence
LHINs that lie within the discontinuous line include the GTA

The distribution of surgeries according to anatomic location is presented in Table 5. Over 40% of all surgeries were of the knee, followed by hip (18%) and shoulder and elbow (17%). The distribution shows little variation across LHINs in Ontario. Surgeries of the knee were above the provincial value in Mississauga Halton LHIN, and in Champlain and Toronto Central LHINs were below the provincial estimate. Compared to the provincial average, hip surgeries were moderately high in Toronto Central LHIN and low in Mississauga Halton LHIN. The highest percentage of surgery accounted for by hand and wrist surgeries (in South East and North East LHINs) was 7 times higher than the lowest percentage (Central West LHIN). This could be related to difference in practice patterns across regions in Ontario, for example in some regions other specialists such as plastic surgeons might perform this type of surgery. Similar pattern was observed with respect to spinal surgeries.

Relationship between volume of care provided within LHIN, and the availability of orthopaedic services

As expected the volume of surgeries provided within the LHIN was positively associated with the availability of orthopaedic services in the LHIN (Figure 23). The volume (per 100,000 population) of all orthopaedic surgeries provided increased as the number of surgeons per 100,000 population increased (correlation coefficient of 0.81). Similar results were observed when the number of surgery half-days per week per population was used.

Cross-boundary flow of patients receiving orthopaedic surgery

Over 77% of Ontarians who had orthopaedic surgery in 2005/06 had their surgery performed in their respective residential LHINs. In other words approximately 23% of people getting orthopaedic surgery in Ontario traveled outside their residential LHIN to get the surgery.

Figure 24 shows some notable differences among LHINs in the number of surgeries provided within LHIN and the number of surgeries provided to LHIN residents. This figure also shows the retention rate (left side of the graph) and the local service rate (right side of the graph). In South East, Champlain and North West LHINs over 90% of LHIN residents received orthopaedic surgery in their residential LHIN. In contrast, less than 60% of residents of Central and Central West LHINs obtained their orthopaedic surgery within the residential LHIN. Other LHINs reporting relatively low retention rates were Central East (68.5%), North Simcoe (68.7%), Toronto Central (73.3%) and Waterloo Wellington (79.2%). The remaining LHINs reported retention rates between 80% and 90%. When analyzing the volume of surgeries provided (right side of the chart) most of the LHINs reported local service rates (that is the percentage of all service provided to LHIN residents) above 80% with the exception of the LHINs that include the GTA area. The local service rate for these LHINs ranged from 36.4% in Toronto Central LHIN to 78.1% in Central East LHIN. Generally, the lower local service rates reflect relatively high percentages of inflow. From this figure it can be noted also that the volume of surgeries provided within Toronto Central LHIN is twice as big as the volume provided to residents in this LHIN. In contrast, the volume provided to residents in Central West LHIN was 50% higher than the volume of surgeries provided within this LHIN.

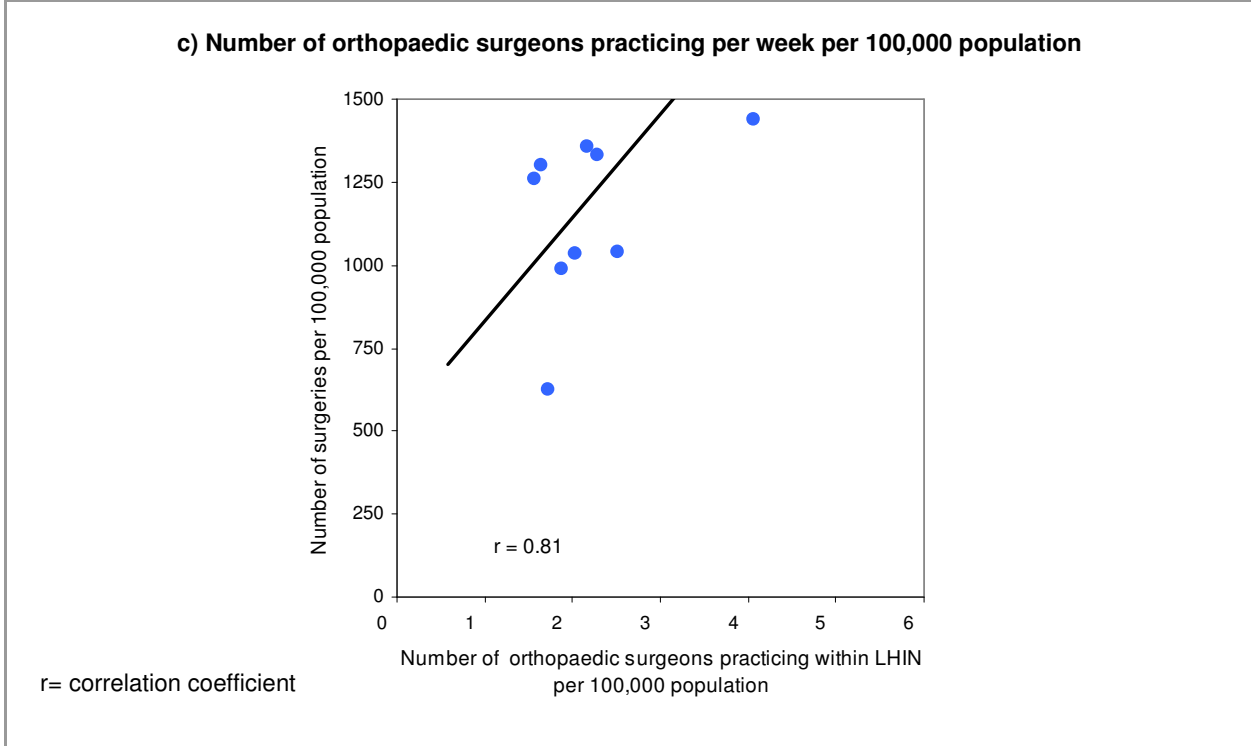
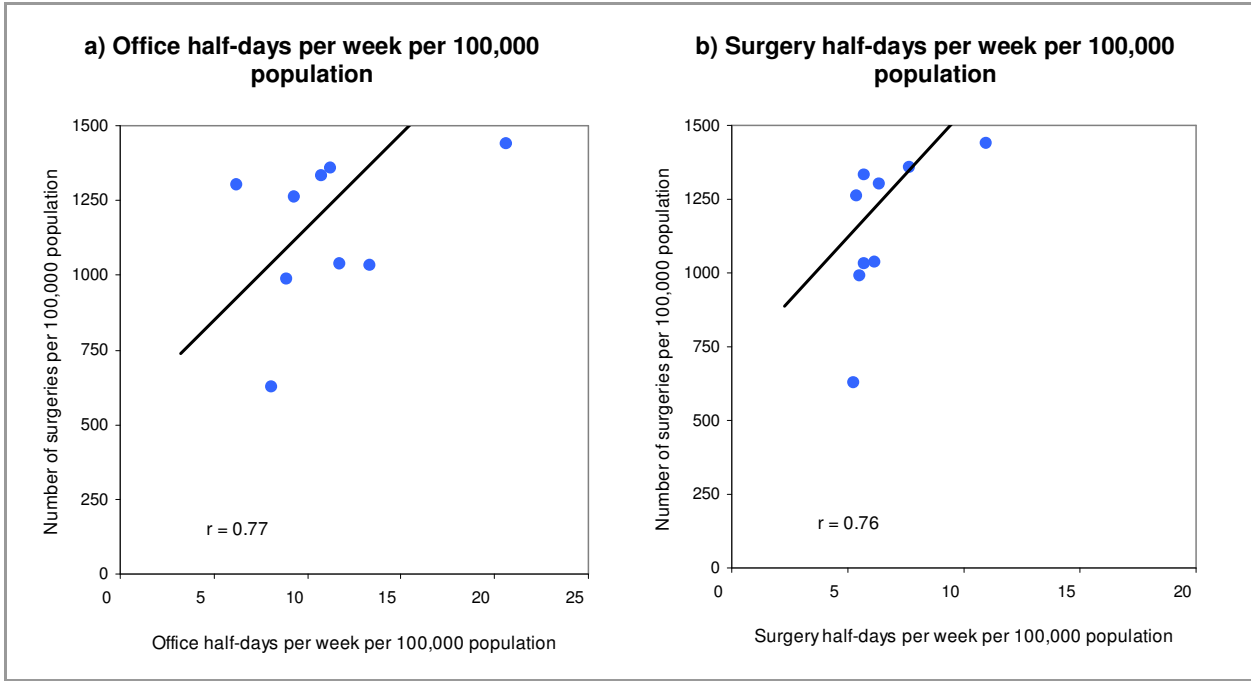


Figure 23. Relationship between the number of **all orthopaedic surgeries** provided per 100,000 population and the **availability of orthopaedic services** by Local Health integration Networks, Ontario, 2005/06

Data sources: DAD, NACRS, SDS

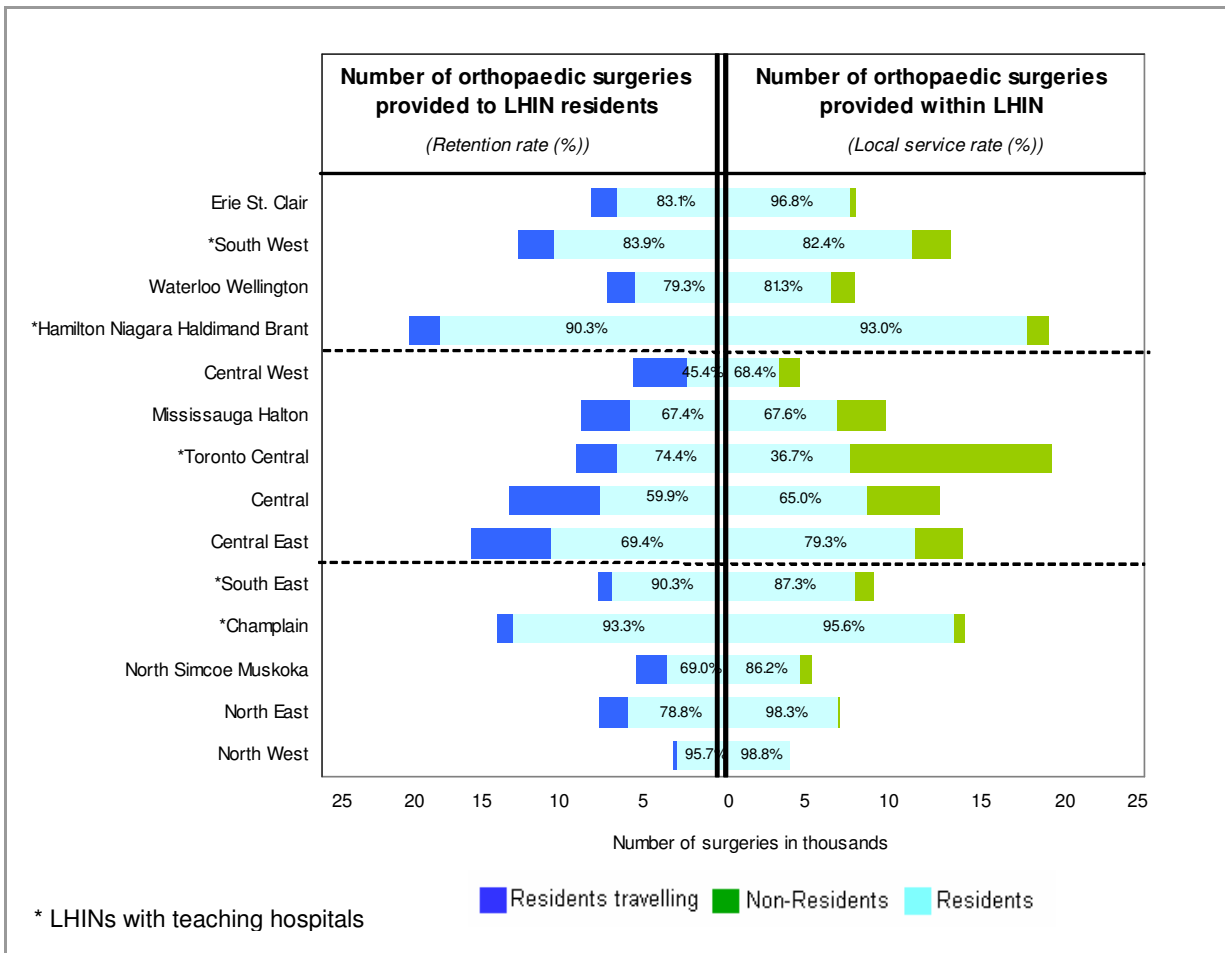


Figure 24. Number of **all orthopaedic surgeries** performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Networks, Ontario, 2005/06.

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

Figures 25 and 26 present the number of surgeries provided to LHIN residents and provided within LHIN for arthritis and related conditions and for trauma related conditions, respectively. There are some differences among LHINs in the retention rate and the local service rate for surgeries for arthritis and related conditions as well as for traumatic conditions. The pattern is similar to the pattern observed for all conditions. However, in general retention rates were higher for surgeries related to traumatic conditions compared to those of arthritis and related conditions, with the exception of Mississauga Halton LHIN. The retention rate for arthritis and related surgeries varied from 43.3% in Central West LHIN to 96.5% in North West LHIN and for trauma related surgeries ranged from 54.4% in Central West to over 95% in Champlain and North West LHINs.

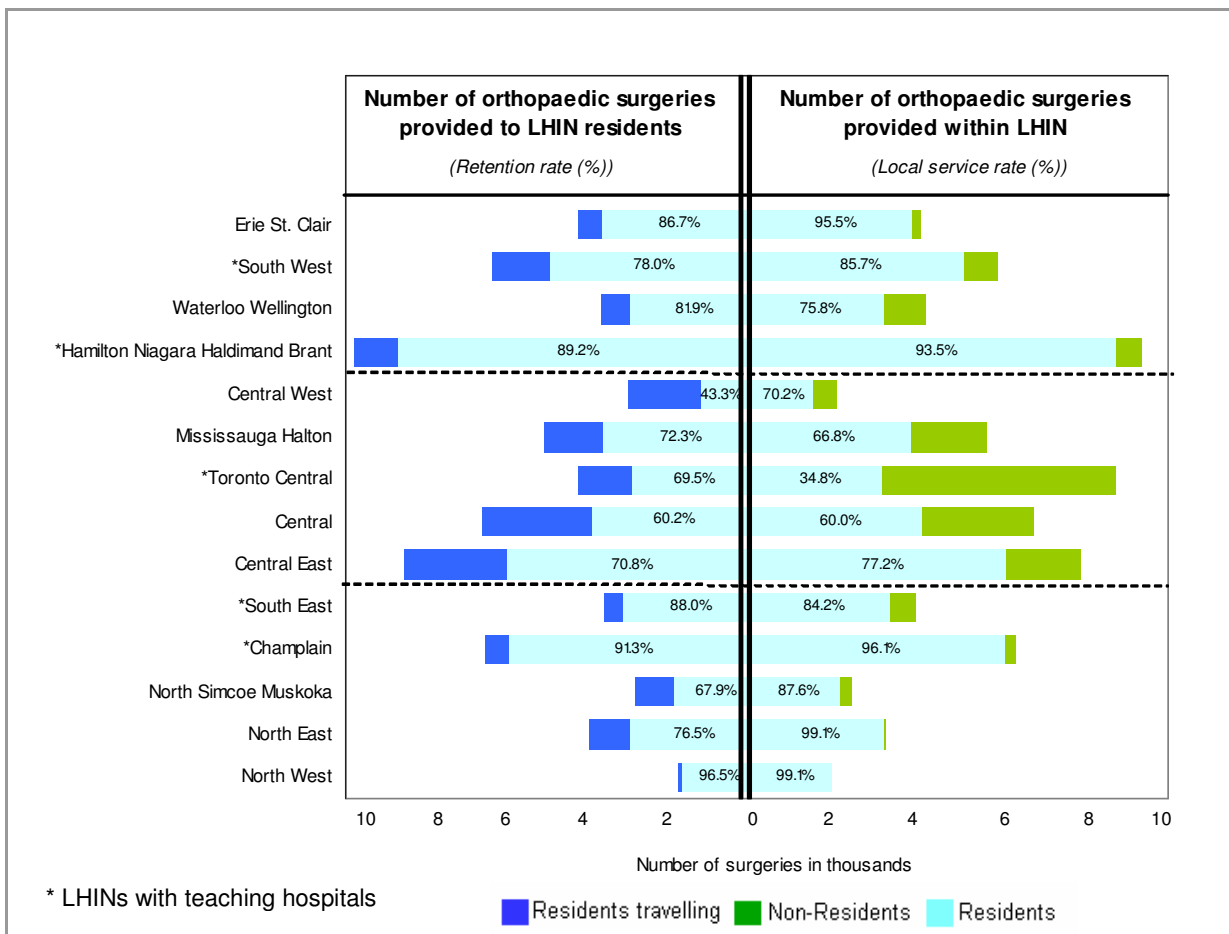


Figure 25. Number of **arthritis and related surgeries** performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06.

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

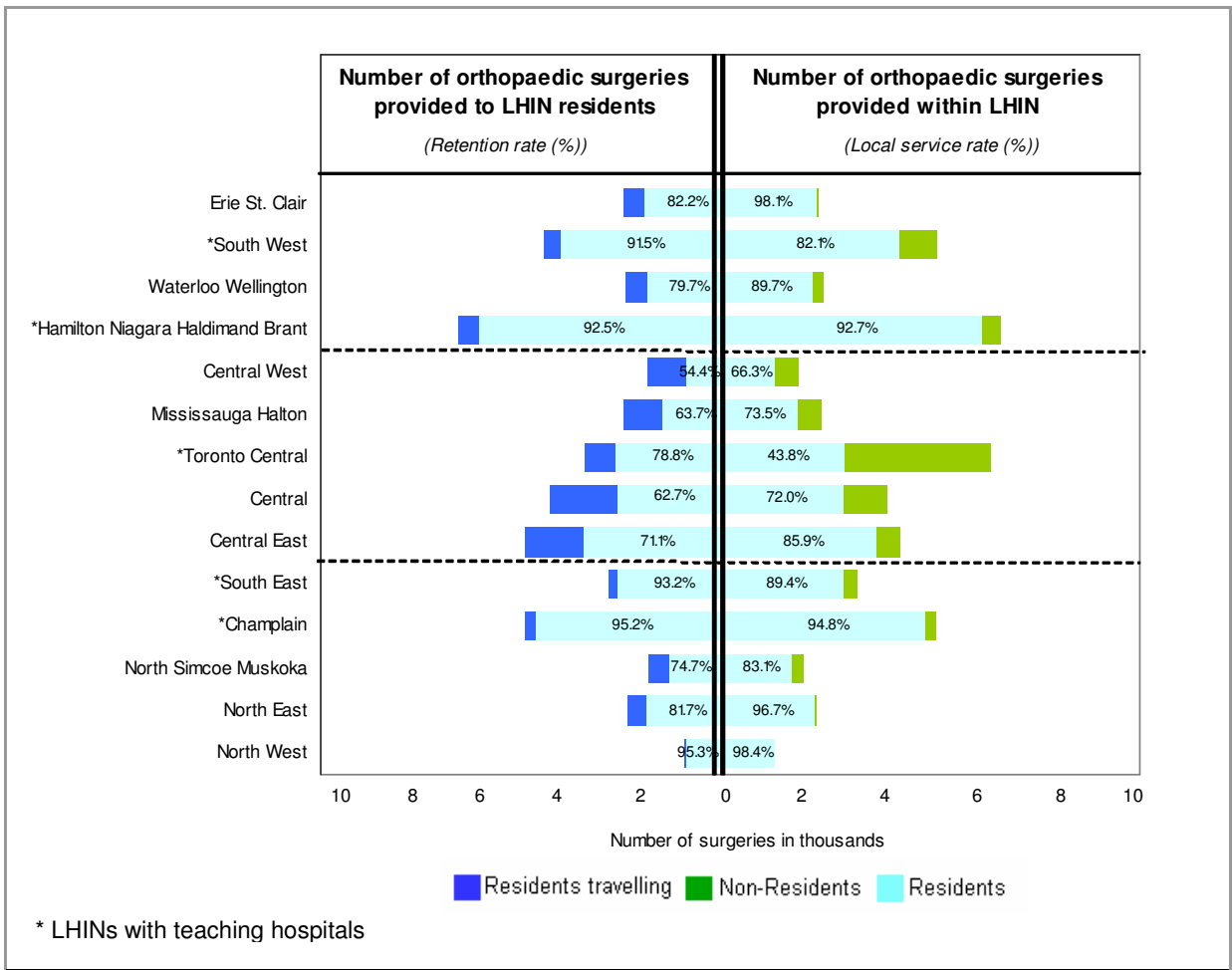


Figure 26. Number of **trauma and related surgeries** performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06.

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

In general, the retention rate was higher for day surgeries than for inpatient elective surgeries with the exception of the Toronto Central and Central West LHINs (Figures 27 and 28). Retention rates for day surgeries ranged from 41% in Central West LHIN to 97% in North West LHIN. Retention rates for inpatient elective surgeries varied from 42% in Central West LHIN to 94% in North West LHIN. Toronto Central LHIN reported lower local service rate for both type of surgeries, however the rate for inpatient elective surgeries was significantly lower (29%) than the rate for day surgeries (41%). This is an indication that Toronto Central LHIN is a net receiver of people from other LHINs for elective inpatient surgeries while the inflow for day surgeries is more evenly distributed among LHINs that include the GTA.

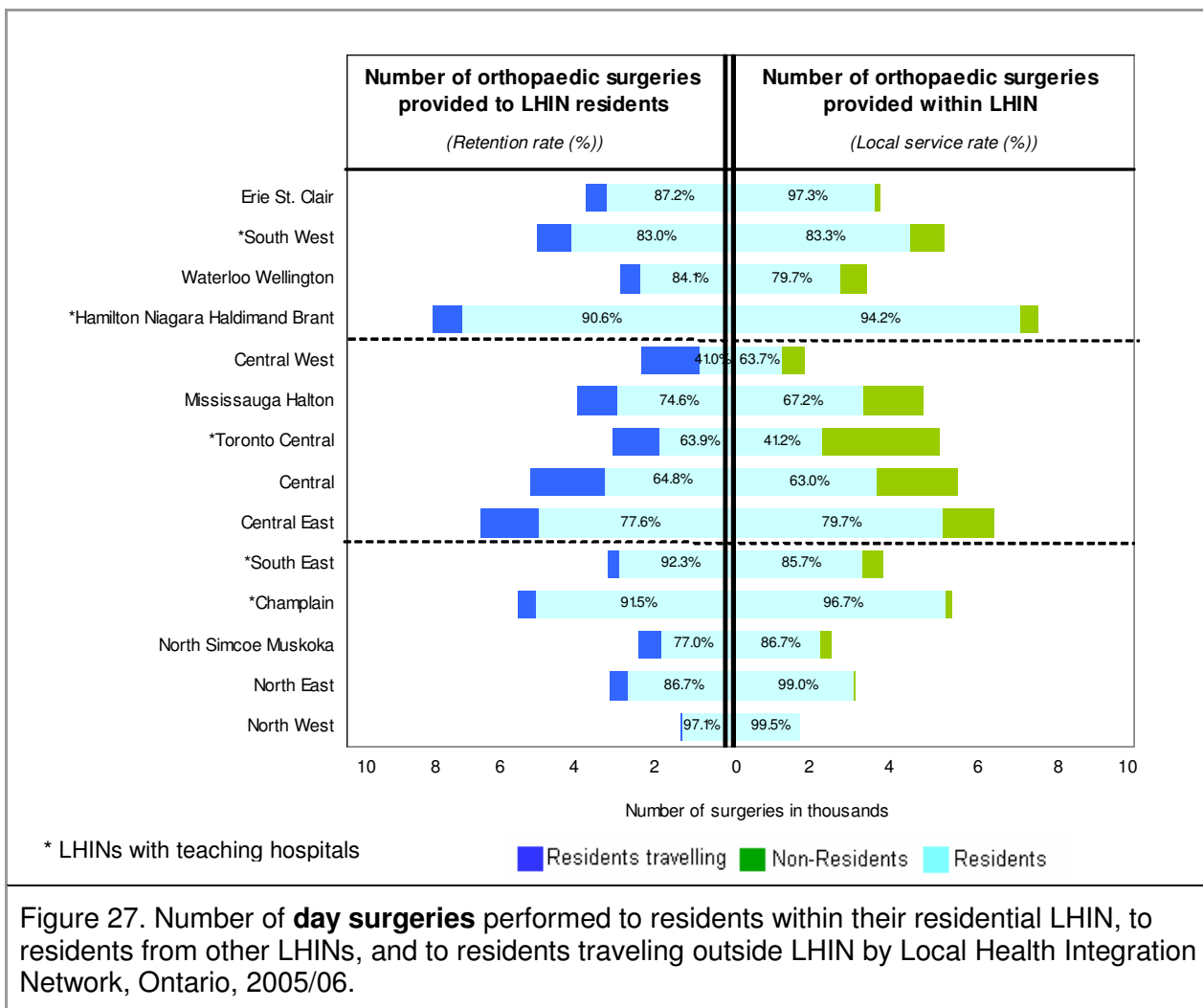


Figure 27. Number of **day surgeries** performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06.

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

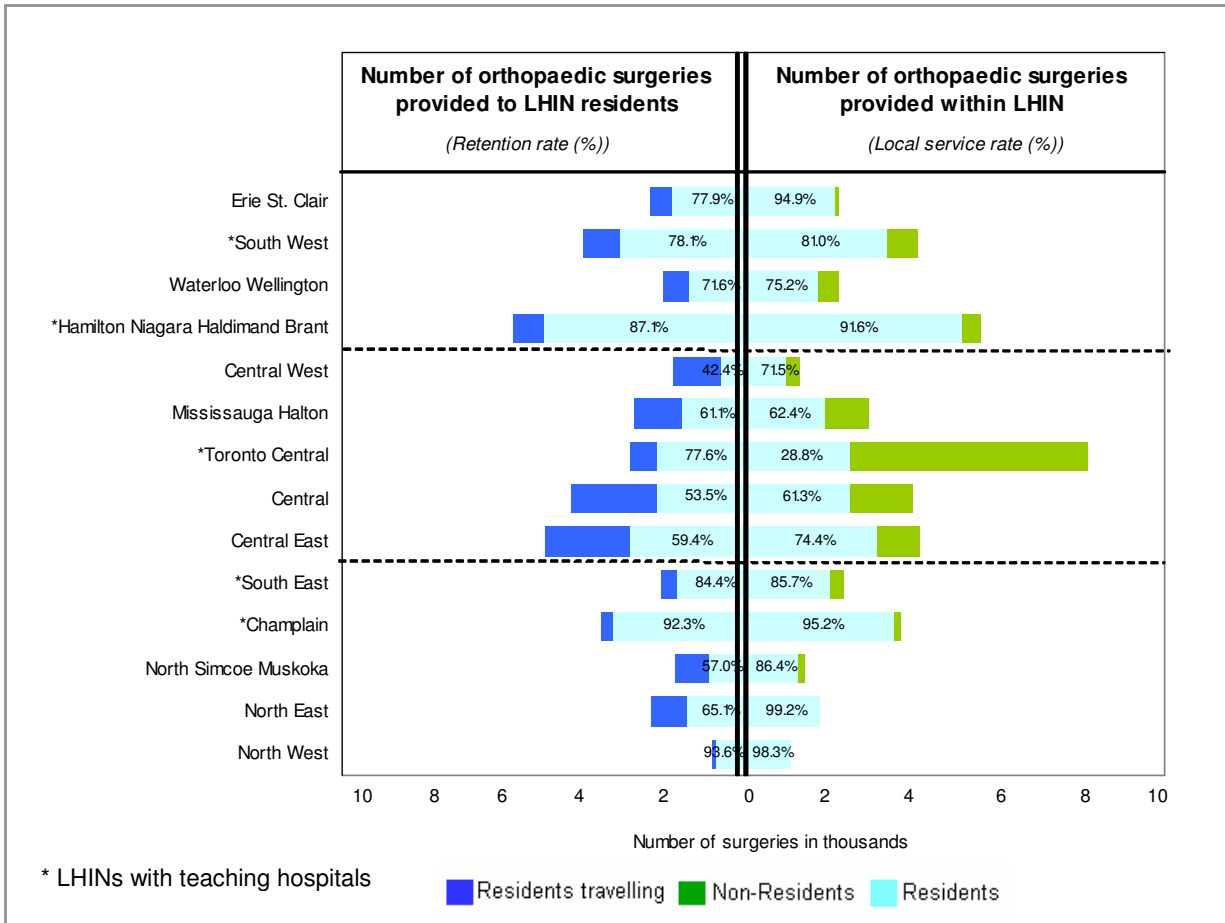
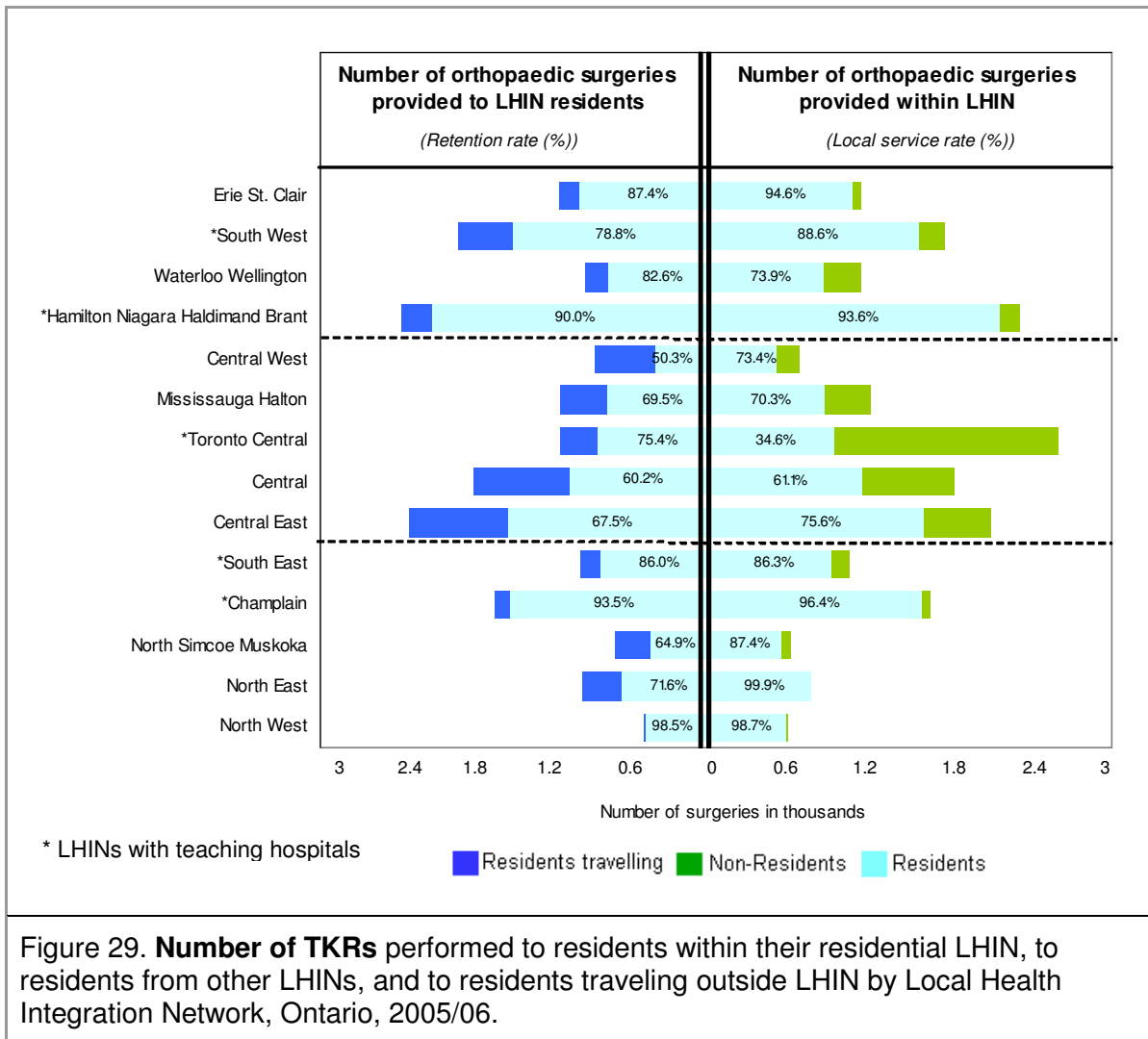


Figure 28. Number of **inpatient elective surgeries** performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06.

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

The number of TKR and knee arthroscopy provided to LHIN residents and provided within LHIN is presented in figure 29 and 30, respectively. Champlain, Toronto Central and Central West LHINs reported retention rates for TKR notable higher than the retention rate for knee arthroscopy. In contrast, North Simcoe, Central East and Mississauga Halton LHINs reported retention rates for knee arthroscopy higher than the rate for TKR.



Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

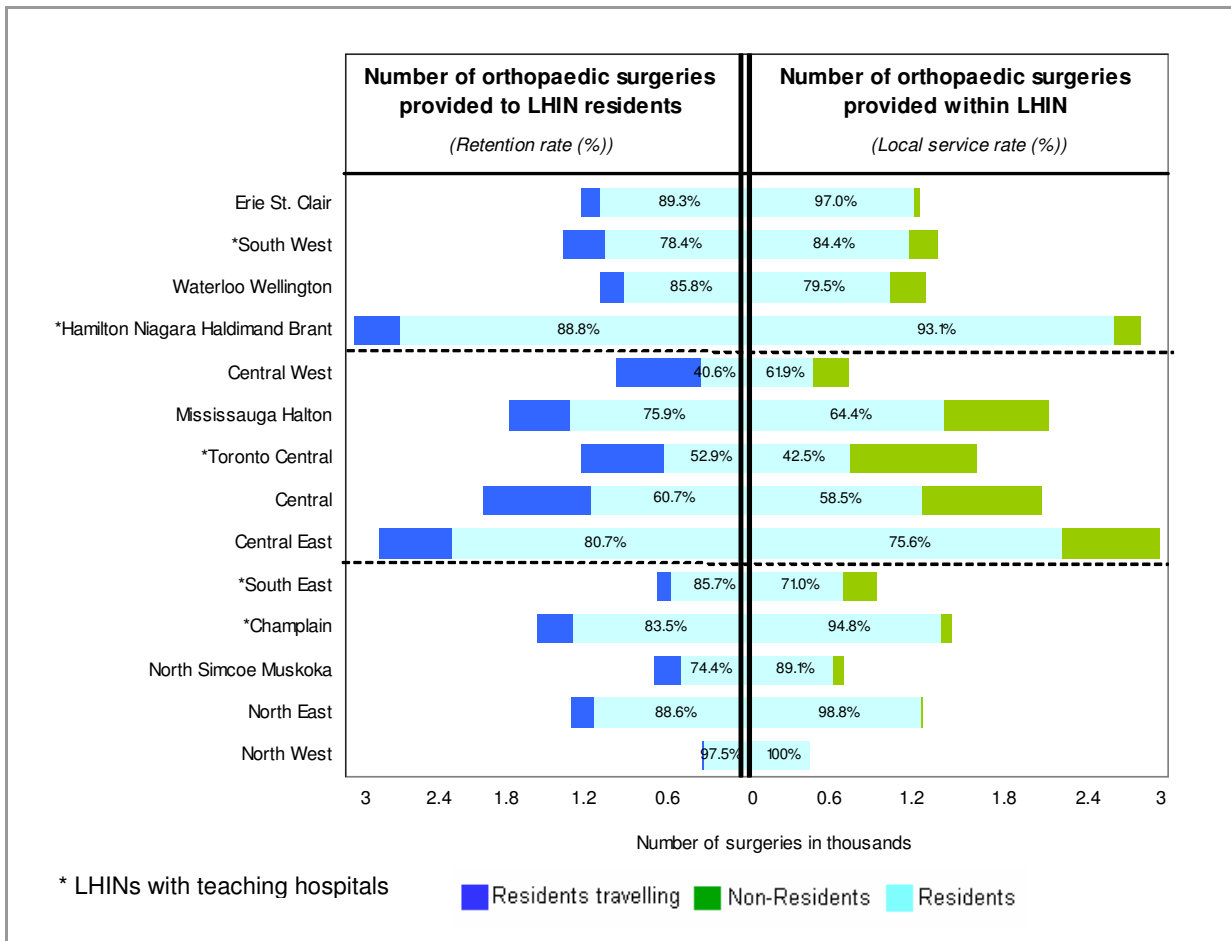


Figure 30. Number of **knee arthroscopies** performed to residents within their residential LHIN, to residents from other LHINs, and to residents traveling outside LHIN by Local Health Integration Network, Ontario, 2005/06.

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

Table 6 illustrates differences among LHINs in the percentage of surgeries obtained by LHIN residents in adjacent and outlying LHINs. Most of the surgeries provided outside of the residential LHIN are conducted in adjacent LHINs, with the exception of residents in Central East, North Simcoe Muskoka, North East, and North West LHINs. Residents from these LHINs will travel to Toronto Central LHIN to obtain the necessary care (Table 6).

Table 6. Retention rate achieved by each LHIN and percentage of outflow to adjacent and non-adjacent LHINs for all orthopaedic surgery by Local Health Integration Networks, Ontario, 2005/06

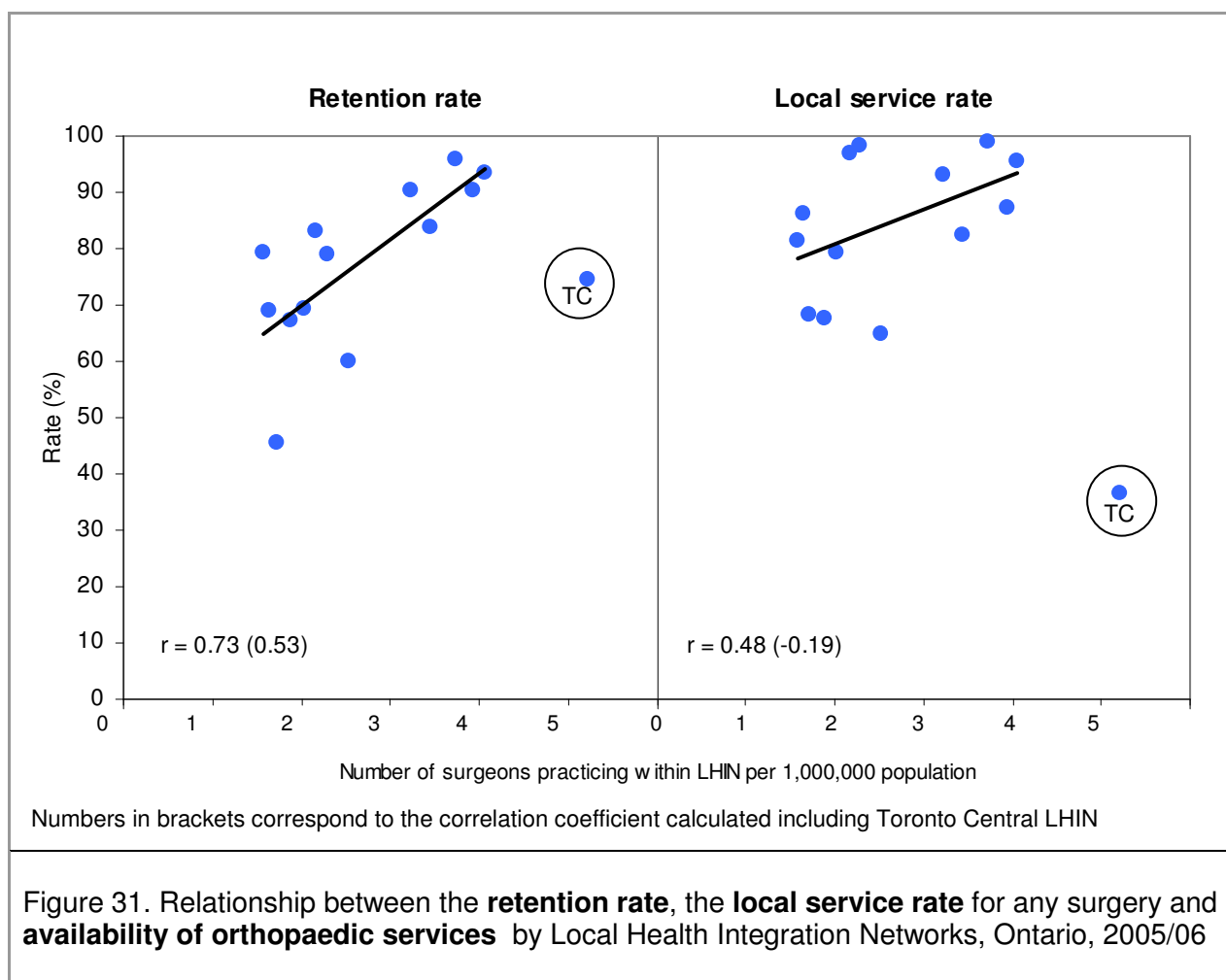
| Local Health Integration Networks | Retention rate (%) | Outflow (%) | | |
|-----------------------------------|--------------------|-------------|--------------|-------------|
| | | Adjacent | Non-adjacent | Total |
| Erie St. Clair | 83.1 | 12.9 | 4.0 | 16.9 |
| South West | 83.9 | 11.9 | 4.2 | 16.1 |
| Waterloo Wellington | 79.3 | 14.2 | 6.5 | 20.7 |
| Hamilton Niagara Haldimand Brant | 90.3 | 5.5 | 4.2 | 9.7 |
| Central West | 45.4 | 50.6 | 4.0 | 54.6 |
| Mississauga Halton | 67.4 | 27.2 | 5.4 | 32.6 |
| Toronto Central | 74.4 | 24.2 | 1.4 | 25.6 |
| Central | 59.9 | 37.8 | 2.3 | 40.1 |
| Central East | 69.4 | 28.5 | 2.1 | 30.6 |
| South East | 90.3 | 6.2 | 3.5 | 9.7 |
| Champlain | 93.3 | 4.8 | 1.9 | 6.7 |
| North Simcoe Muskoka | 69.0 | 14.0 | 17.0 | 31.0 |
| North East | 78.8 | 5.7 | 15.5 | 21.2 |
| North West | 95.7 | 0.5 | 3.8 | 4.3 |
| ONTARIO | 78.0 | 17.4 | 4.6 | 22.0 |

Data Sources: DAD, NACRS, SDS
 LHINs that lie within the discontinuous line include the GTA

Relationship between level of cross-boundary flow and availability of orthopaedic services

The relationship between the local service rate and the retention rate with the number of orthopaedic surgeons per 100,000 population is presented in Figure 18. LHINs with higher provision of orthopaedic surgeons also reported higher retention rates (correlation coefficient of 0.53). That is, residents in LHINs with lower provision of orthopaedic services will travel outside the residential LHIN to obtain the necessary orthopaedic services. When Toronto Central LHIN was removed from the analysis the relationship was stronger (correlation coefficient of 0.73).

The correlation between the level of provision and the local service rate was less apparent. When Toronto Central LHIN was removed from the analysis the correlation coefficient was 0.48, indicating a moderate increase of the proportion of services provided to local residents when the level of orthopaedic services provision increased.



Data sources: DAD, NACRS, SDS

Figures 32 and 33 display the relationship between the retention rate, local service rate and median wait times for THR and TKR, respectively. There is not apparent relationship between wait times and the measures of cross-boundary flow.

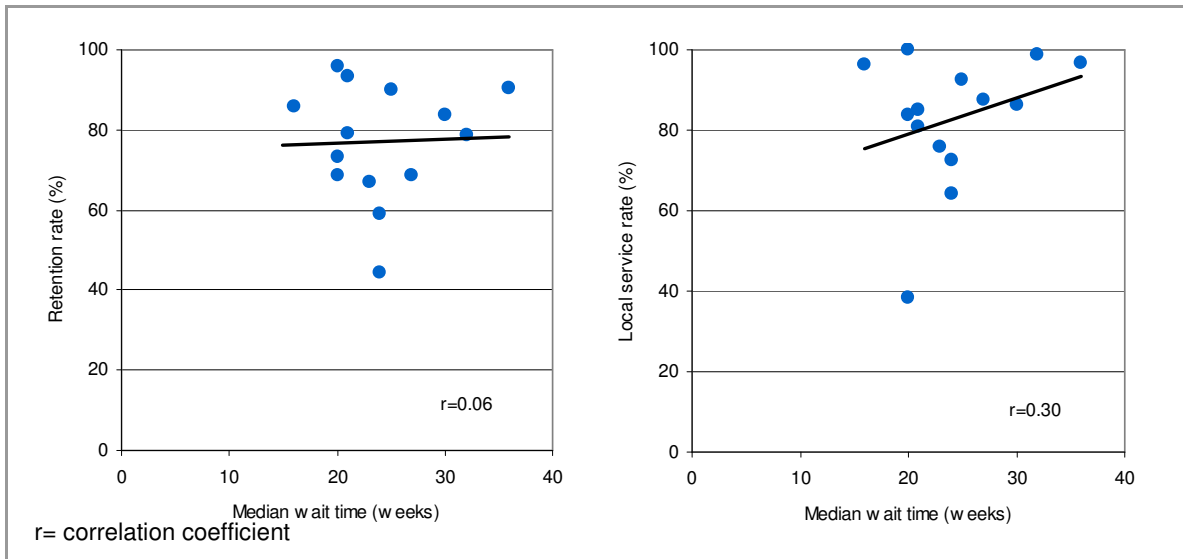


Figure 32. Relationship between the retention rate, the local service rate and **median wait time** for THR by Local Health Integration Network, Ontario, 2005/06

Data sources: DAD, NACRS, SDS. Health Services in Ontario. ICES Atlas

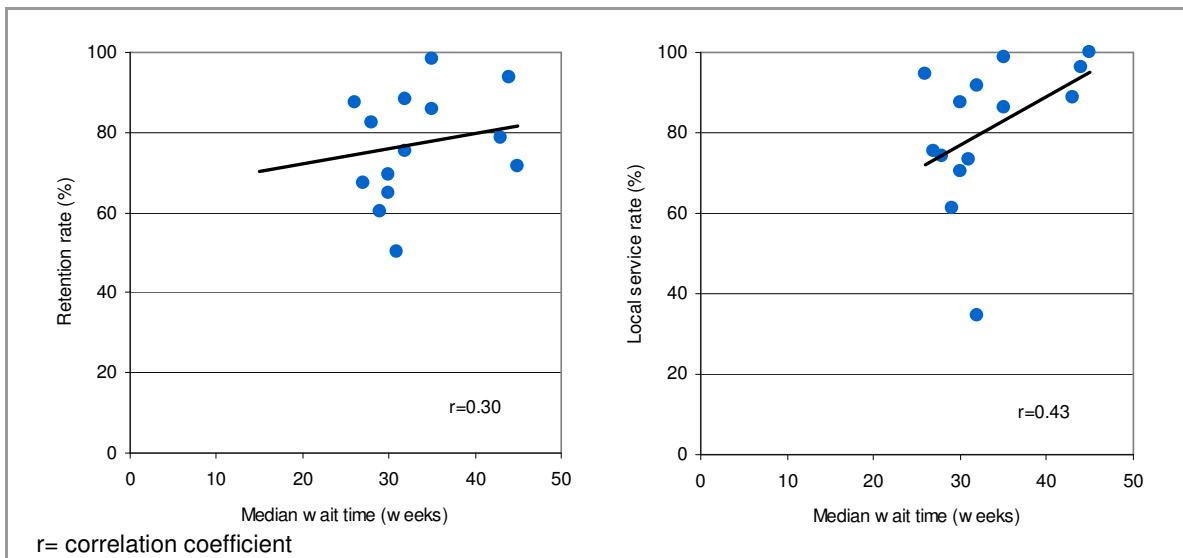


Figure 33. Relationship between the retention rate, the local service rate and **median wait time** for TKR by Local Health Integration Network, Ontario, 2005/06

Data sources: DAD, NACRS, SDS. Health Services in Ontario. ICES Atlas

4.0 Limitations

This report relates to fiscal year 2005/06. In this year CIHI data were collected using ICD-10 for diagnostic codes and the CCI for procedures. Fiscal year 2005/06 was the fourth year of implementation of these new classification systems. In developing grouping of variables for data analysis certain assumptions had to be made. We also recognize a need for sensitivity analyses, in particular related to our decisions about where to group diagnostic terms relating to spinal conditions.

While the Canadian Classification of Interventions is indeed systematic in its structure, it is often difficult to decode types of intervention such as repair, removal, etc. into the terms used by orthopaedic surgeons. There are coding rules which continued to be elaborated by CIHI, and we were fortunate to be able to consult with the coders at the Toronto Western Hospital about the practical aspects of how the terms entered by the orthopaedic team in the patients' charts were translated into CCI codes for reporting to CIHI. The change to the CCI for coding types of surgery has major implications. To study time trends, it is necessary to examine codes using both the CCP and CCI. Methodologies to identify TJR are well established and trends in this type of surgery have been reported elsewhere (3). For other surgeries, it is more challenging to study time trends. For example, in the CPP, there is a specific code for arthroscopic surgery, while in the CCI, we selected 'repairs' that were conducted arthroscopically. While this includes common arthroscopic procedures such as meniscectomy with or without debridement (captured under 'arthroscopy' in the CCP), it also includes a range of other procedures performed arthroscopically. There is potential that this overestimates what health professionals consider typical arthroscopy.

5.0 Discussion

This report provides a snapshot of the work carried out by orthopaedic surgeons in 2005/06 and sets this in the context of time trends in surgery from 1992/93 to 2005/06. The report also looks at orthopaedic surgery by LHIN in the context of the availability of orthopaedic surgeons, including a description of the extent of cross boundary flow.

This snapshot provides a basis for the development of a provincial framework for the stewardship of resource allocation and delivery of orthopaedic services and the development of strategies and priorities to meet the needs of the people of Ontario. It will also provide a baseline for LHINs to plan for such services in their local areas and to work with local providers to support the integrated and cost-effective delivery of orthopaedic and related services such as associated rehabilitation and community programs. It also provides background for policy makers within the MOHLTC to support the stewardship and accountability of the health care system as a whole in providing orthopaedic surgical services to meet the needs of the population. The major categories of health problem dealt with by orthopaedic surgeons are musculoskeletal disorders including arthritis and trauma. A visit to an orthopaedic surgeon and possible subsequent surgery is only one part of the management of these disorders. Managing the health care system and planning to meet the needs of people with these disorders needs to be integrated in the context of community services, primary care, and rehabilitation as well as consideration of prevention and chronic disease management in general.

Overall trends in the number of surgeries point to an accelerated increase from 2002/03 to 2005/06, during which period the Wait Time Strategy was implemented. Most of this was associated with an increase in the number of TJRs. At the same time the number of other surgeries remained relatively stable, a finding which has been confirmed by the Canadian Institute of Health Information(30).

It is clear that TJR is only one component of the overall contribution of orthopaedic surgeons to the care of people with musculoskeletal conditions. In this report we looked at the work of orthopaedic surgeons by juxtaposing different sources of data, in particular data from the OHIP and on surgical procedures from the Canadian Institute of Health Information, and relating this to the provision of orthopaedic surgeons in Ontario at the LHIN level.

Overall, the results reported here demonstrate that the number of encounters with patients in ambulatory settings far exceeds the number of procedures carried out. While it is clear that encounters associated with a surgery are the minority, a major limitation in our work is that we were not able to take into account the amount of time spent by a surgeon for each encounter. Encounters involving a surgery are more time consuming than an ambulatory visit. It should also be recognized that a proportion of ambulatory encounters are likely to be pre- or post-surgical assessments. Approximately 25% of people seeing an orthopaedic surgeon are likely to have an orthopaedic procedure. This is in line with findings from the UK, which have shown that, in some surgeon's practices, less than 30% of patients referred to orthopaedic surgeons are candidates for surgery on their initial consultation (31). Nevertheless, that only a minority of encounters are associated with a surgery is in line with the survey of Ontario Orthopaedic Surgeons which showed that only a third of time was spent in the operating room(15;29;32).

These findings also point to the high volume of encounters for traumatic conditions both in ambulatory care and hospital settings, where traumatic conditions account for the majority of encounters. The traumatic conditions seen ranged from simple strains and sprains, which were unlikely to need surgical intervention, to fractures and more serious conditions. While most of the encounters in hospital related either to same day or inpatient surgery, a substantial minority was in the emergency room.

We showed that encounters with orthopaedic surgeons for arthritis and related conditions account for less than half of all encounters with orthopaedic surgeons. In addition, the number of encounters from patients with arthritis and related conditions far exceeds the number of surgeries carried out. However, it is not known what proportion of patients seen by surgeons eventually has surgery. Analysis of linked data for a number of years would be necessary to establish this. However, anecdotal accounts from surgeons suggest that a sizeable proportion of patients referred for hip or knee arthritis are not yet ready for surgery, and neither are patients fully aware of other treatment options for the management of their arthritis, including the role of exercise, physical therapy and use of appropriate medications. Other studies have pointed to deficiencies in the primary care management including both under and over use of non-steroidal anti-inflammatory medications and lack of referral for physical therapy (33).

The higher frequency of ambulatory versus surgical encounters is also found at the LHIN level, although the variations by LHIN for these are somewhat different (Figures 14 and 15). It is not known to what extent variation in rates of ambulatory visits and of surgery at the level of the LHIN relates to variations in need or to other factors associated with the health care system. If evidence relating to TJR is any indication, need is not likely to be the whole story. Studies

looking at access to TJR surgery in two areas with historically high and low rates of surgery have shown that need does not explain the difference, and that factors relating both to the characteristics of individuals and also to the health care system are important (34-37).

About half of the surgeries performed by orthopaedic surgeons are arthritis-related surgery, with trauma-related surgery accounting for a further third. This pattern is seen across the LHINs with some variations. Spinal surgery is only a minority of procedures and is mainly concentrated in LHINs with teaching hospitals. This is consistent with the findings from the 2006 Survey of Ontario Orthopaedic Surgeons which showed that less than 1 in 5 did this kind of surgery (29).

One factor which contributes at least to some extent to the differences between LHINs is the amount of provision of orthopaedic surgeon services. The ambulatory care person visit rate at the LHIN level is, as might be expected, more highly correlated with the local provision of orthopaedic surgeons office half days per week than surgical half days, where a half day represents 4 hours of service. An office visit is a necessary first step in the processes leading to surgery, whether or not the surgery eventually takes place. The differential association with the amount of office versus surgery hours suggests that ambulatory care services need to be considered separately from surgery in the development of integrated services to meet the needs of the population.

The absolute volume of orthopaedic surgeries provided within each LHIN is moderately correlated with the availability of orthopaedic surgeons, as is the proportion of surgeries received by residents within their LHIN of residence. This applies to both office and surgical half days per week as an indicator of surgeon supply. An exception to the general pattern is the Toronto Central LHIN with its concentration of major teaching hospitals with orthopaedic expertise.

Toronto Central is a net recipient of orthopaedic patients, a substantial proportion of whom come from adjacent LHINs (of all inflow to Toronto Central LHIN, 73% is from adjacent LHINs and 13% is from North Simcoe Muskoka and North East LHINs) some patients are also likely to come for complicated surgeries requiring the expertise of surgeons with particular areas of specialisation. Clearly this LHIN represents a major provincial resource for the provision of orthopaedic care.

An unexpected finding is that patterns of cross boundary flow are remarkably similar for all types of orthopaedic services and different types of condition. The variations we document are ones of degree rather than difference. As might be expected the degree of cross boundary flow is somewhat less for non-elective than for elective surgery and is less for day surgery than inpatient surgery, but it is still present. This suggests that structural issues such as the location of hospitals as well as the overall provision of services underpin these patterns.

We used two indicators of cross-boundary flow: the proportion of all surgeries within a LHIN that are provided to local residents (Local Service Rate) and the proportion of residents receiving surgeries within their LHIN (Retention Rate). Their relative magnitude points to different underlying mechanisms. Studies in other settings point to several factors that might account for variation in residents flow. A study conducted in Quebec (38) looking at factors that explain residents mobility for elective surgery explored three dimensions of general mobility. First, *forced mobility* occurs in the absence of resources necessary to offer the service demand, and people living in areas with lower provision of the required services are forced to travel elsewhere

to obtain the necessary service. Our overall findings for the North Simcoe Muskoka and North East LHINs, show a high local service rate, and a relatively low retention rate, which coupled with a low provision of local orthopaedic services suggest that a proportion of residents are 'forced' to travel elsewhere (most likely to Toronto Central LHIN) for some types of surgery.

The second dimension is the *mobility induced* by the suppliers of the services; this can arise from the medical affiliations of professionals with hospitals which might be the potential suppliers. Adequate resources exist in the residential area but individuals are induced to move because of factors linked to the organization of physician's practice. Residents might cross health area boundaries to obtain care especially if such care is closer in distance than other sources of care existing within the residential area(23;38;39). This is likely to be the case for LHINs spanning the GTA which include parts of the city of Toronto, where cross-boundary flow is characterized by both low local service and low retention rates with a high provision of orthopaedic surgeons in most of the LHINs. Indeed the vast majority of cross-boundary flow within the GTA LHINs occurred to adjacent LHINs. This cross boundary flow is likely associated with the location of hospitals within the GTA as well as transportation patterns and other aspects of individual travel, for example associated with work and other activities. A more fine-grained analysis taking into account the location of individuals' residences within the LHIN would be necessary to better understand the extent to which this cross-boundary flow is induced by placement of boundaries. It may be a phenomenon associated with the micro geography of the LHIN so that it is mainly patients who live close to boundaries that are travelling, or it could be a more general phenomenon related to the patient and provider choice to go to specialist centres.

The third dimension is *chosen mobility*, which is the result of individual preferences and characteristics (38). Adequate resources might exist in the residential area, but individuals decide to obtain service outside for personal reasons. Seasonal migration might be another factor that explains patient flow. Studies such as the present one are not able to shed light on this.

Notwithstanding the implementation of the Ontario Wait Time Strategy the pattern of cross boundary flow for TKR surgery is similar to that for other types of surgery, although the inflow of patients to Toronto Central LHIN in particular is more marked. Clearly more work looking at time trends would be necessary to document the impact that the Strategy has had on the provincial pattern of surgery.

Studies of the geographic patterns of care and cross-boundary flow raises questions as to what might be the desirable level. Researchers (24;26;39;40) have suggested that the ideal percentage of people entering or exiting the market area be 10% or less, but some studies have relaxed this standard to 25% or for some urban settings to 40%. As the transformation of Ontario's health systems progresses these will be issues that perhaps will need to be addressed as the LHINs play a more prominent role in planning local services. This is also relevant to the Ministry's stewardship to ensure better service integration and equitable resource allocation based on local population health needs. Hopefully this report can provide a baseline for such discussions.

A major finding from this study is that there is a substantial correlation between the volume of surgery within a LHIN and the availability of orthopaedic surgeons. Clearly the extent of availability of orthopaedic services at the local level matters.

The information presented here is for one year only (2005/06) it is likely that these patterns are representative of the general situation, but this needs to be confirmed. The Ontario Wait Time Strategy, which in orthopaedic services relates to access to hip and knee replacement surgery, was already in place at this time. This strategy provided extra resources to certain centres for an increased number of total joint replacement surgeries. The time trends in orthopaedic surgery rates included in this report showed overall increases for Ontario. There is only a weak relationship between wait times and measures of cross-boundary flow suggesting other factors influence wait times. These could relate to the availability of other resources such as OR time and nursing and the anaesthesiology resources. These are aspects which were highlighted by our survey of orthopaedic surgeons as barriers to providing timely care (29). It would be instructive for further strategic planning relating to the health care system to see to what extent the implementation of the strategy influenced patterns of cross boundary flow for surgery.

The context of this report is the Ontario Wait Time Strategy which has initially focussed attention on TJR. We have suggested previously that a strategy for increasing availability of orthopaedic surgeons for TJR would be to ensure that patients who were referred are those who are most likely to need surgery (16). Our analysis of OHIP billing data points to the important role that orthopaedic surgeons play in the management of musculoskeletal disorders in general. Enhancement of the capacity of primary care physicians to diagnose and treat musculoskeletal conditions is clearly important, including musculoskeletal trauma and back and other soft-tissue disorders. It is also timely given primary care reform in Ontario with the formation of primary care teams to look at other options including a wider role for other health professionals.

It may be possible to increase capacity for total joint replacement by decreasing the amount of clinic time of orthopaedic surgeons by delegating some of the routine follow-up and triage of patients to another arthritis health professional. Elective surgical wait times have three components: the time between the physician referral and the date of the first consult with surgeon; the time from date of the patient's first surgical consult to the date the surgeon and patient decide to proceed with a total joint replacement; and the time between the decision date for surgery and the actual date of surgery. Studies in the UK show that pre-screening of potential surgical patients by specially trained physical therapists has increased the proportion of patients who are seen by surgeons and need surgery from 30% to 70% (31). Studies have shown that specially trained physiotherapists can assess and manage some patients with musculoskeletal conditions while working with orthopaedic surgeons (42-44). Alternative models of care are discussed further in ACREU working report 2006-02 (41).

It is clear, however, from the spectrum of patients seen in ambulatory care by orthopaedic surgeons that patients are referred for advice on managing a wide range of musculoskeletal problems. It is important that the use of other health professionals does not have the unintended consequence of reducing access to needed care. These considerations underline the importance of ensuring that appropriately trained health professionals can manage the full spectrum of the non-surgical management of musculoskeletal and joint conditions, and correctly identify those patients likely to benefit from surgical intervention.

Finally, while initiatives such as those described above could increase the capacity of orthopaedic surgeons to carry out needed surgeries, it is imperative that the resources for these surgeries be available. Barriers to orthopaedic surgery, such as those identified in the 2006 survey of Ontario orthopaedic surgeons will need to be addressed. These include the provision

of range of resources including operating room time, nurses, anaesthesiologists and hospital beds and so on.

In summary, the preliminary findings for 2005/06 presented here point to the wide scope of the work of orthopaedic surgeons in dealing with arthritis, trauma and other musculoskeletal conditions in both ambulatory and hospital settings. It begins to set work in the operating room, and in particular TJR, in the context of all procedures and the major contribution made by orthopaedic surgeons to the ambulatory care of patients. The increase in surgeries in recent years is mainly accounted for by the increase in TJR. There was considerable variation in the per capita volume of ambulatory and surgical encounters by LHIN, as well as in the number of surgeries carried within each LHIN. These variations were correlated with the supply of orthopaedic surgeon services to each LHIN. There was also considerable cross-boundary flow between LHINs for all aspects of surgery, which was similar for all types of surgery. We anticipate that our findings will provide a factual basis for discussions of ways to increase efficiencies in use of orthopaedic resources and will link with ongoing initiatives to develop comprehensive chronic disease management strategies, which are relevant to the increasing number of people with arthritis and other musculoskeletal conditions. These findings also provide a factual background for policy makers steering the implementation of transformation of Ontario's Health System to aid planning at the local LHIN level and to provide a bigger picture for the MOHLTC to support their stewardship of the system in terms of strategy, accountability and the longer term picture.

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Glossary of Terms

1. *Encounter*: an encounter is a visit to an orthopaedic surgeon where medical care was provided.
2. *Hospital encounter*: a hospital encounter is a visit to an Emergency Department, an admission as inpatient (one hospital stay was considered one encounter) or a same day surgery with an orthopaedic surgeon.
3. *Ambulatory encounter*: an ambulatory encounter is a visit to an orthopaedic surgeon in his/her office.
4. *Consultation*: a consultation is defined as an in hospital encounter with orthopaedic surgeons where either non-surgical procedures were recorded or other non-orthopaedic surgery.
5. *Orthopaedic surgery*: all surgical procedure codes recorded on the same patient, same date and the same body region.
6. *Body region*: using CIHI databases body region was defined as follows,
 - a. Ankle and foot: includes ankle joint, foot ligaments, tarsal bones, intertarsal joints, foot, tarsometatarsal joints, metatarsal bones, metatarsophalangeal joints, phalanx of foot, interphalangeal joints of toe, tendons of ankle and foot
 - b. Hand and wrist: wrist joint, radioulnar and carpal joints, metacarpal bones, metacarpophalangeal joints, phalanx of hand, interphalangeal joint of hand, joints of finger and hand, tendons of finger and thumb, soft tissue wrist and hand
 - c. Shoulder and elbow: shoulder joint, acromioclavicular and sternoclavicular joints, rotator cuff, arm muscles around shoulder, humerus, elbow joint, muscles of forearm, radius and ulna, clavicle, scapula
 - d. Hip: hip joint, femur, muscles of hip and thigh
 - e. Knee: knee joint, meniscus, cruciate ligaments, collateral ligaments, patella, tibia and fibula, muscles of lower leg, soft tissue of leg
 - f. Spine: spinal vertebrae, intervertebral disc, sacrum and coccyx, atlas and axis, soft tissue of back, back,

Technical Appendix

A1. Methods

Data Sources

Several data sources were used from the preparation of this report (Table A1).

Table A1. Description of databases used in this report.

| |
|--|
| <p>OHIP databases</p> <ul style="list-style-type: none"> ▪ <i>Claims History Database (CHDB)</i>. For every claim, includes date of service, type of services or procedures received, associated diagnosis, patient and physician identification numbers, and physician specialty type. This was used to identify service encounters. ▪ <i>Corporate Provider Database</i>. Contains data about health care providers and organizations in Ontario. ▪ <i>Registered Persons Database (RPDB)</i>. Used to collect and maintain information about individuals who are registered with OHIP. Contains demographic information such as age, sex and residential postal code. |
| <p>CIHI's Discharge Abstract Database (DAD)</p> <p>Contains clinical, demographic and administrative data for hospital discharges. The information recorded includes: physician specialty, procedures received, diagnostic codes, residential postal code, age and sex.</p> |
| <p>CIHI's National Ambulatory Care Reporting System (NACRS)</p> <p>Contains demographic characteristics, diagnostic and procedure codes for patients visiting emergency departments from all hospitals in Ontario.</p> |
| <p>CIHI's Same Day Surgery (SDS)</p> <p>Visits for same day surgeries have been separated from NACRS since 2003/2004 and they are stored independently in a separate database. The database contains demographic characteristics, diagnostic codes, and procedures received.</p> |
| <p>2006 ACREU Survey of Orthopaedic Surgeons</p> <p>The survey was conducted by the Arthritis Community Research and Evaluation (ACREU) in partnership with the Ontario Orthopaedic Association. All practicing orthopaedic surgeons in Ontario were invited to complete a self-administered questionnaire to examine geographic distribution, supply of orthopaedic surgeons, workload (office, surgery and on call time) and practice patterns. Detailed description of the methods employed as well as results can be found in ACREU's report 2007-03.</p> |

Identification of encounters with orthopaedic services

From each of the databases described above, the population accessing orthopaedic services was identified based on physician specialty. All individuals with an orthopaedic surgeon listed as a health care provider were considered as having an encounter with orthopaedic services in the time period selected.

For the analyses using the OHIP database, doctor specialty was defined according to the ICES Physician Database (IPDB), which incorporates information from the OHIP Corporate Provider Database (CPDB), the Ontario Physician Human Resource Data Centre (OPHRDC) database and the OHIP database of physician billings. The CPDB contains information about physician demographics, specialty training and certification, and practice location. This information is validated against the OPHRDC database, which verifies this information through periodic telephone interviews with all physicians practicing in Ontario. The IPDB was linked to the OHIP database to identify orthopaedic surgeons.

CIHI's databases (DAD, NACRS, and SDS) collect information on up to eight health care providers for each encounter. An encounter with an orthopaedic surgeon was defined as such if a health care record has an orthopaedic surgeon or paediatric orthopaedic specialist listed as a health care provider in any of the eight health care provider fields.

Definition of ambulatory and hospital encounters

Encounters with orthopaedic surgeons were further classified as being either ambulatory encounters, these are visits to orthopaedic surgeons in office or hospital outpatient department settings, or hospital encounters, which were further classified as inpatient hospitalizations, emergency department encounters, and same day surgeries. The OHIP services database was used to identify ambulatory encounters, based on physician claims that contained a fee code with a prefix of "A" or "K". Encounters with an "A" fee code in combination with an orthopaedic procedure fee code were excluded as these encounters would also be captured in the CIHI databases. All claims made by the same doctor on the same date for the same patient were considered one ambulatory encounter.

Hospital encounters were identified according to the 'admission category' field in DAD, NACRS and SDS databases. Day surgeries with missing information about orthopaedic interventions received were excluded from the analysis.

Developing groupings of diagnosis codes

In this report data from different sources were used. These data used two different classification schemes of diagnosis. OHIP used a classification system based on ICD-9 and CIHI's databases used diagnostic codes based on ICD10. The process adopted to create the diagnostic groupings was similar for all sources of data where we attempted to create equivalent and comparable groups.

General strategy for identifying relevant diagnosis codes

After the cohort of encounters with orthopaedic surgeons was created, a frequency distribution of all diagnoses was produced. First, diagnoses associated with musculoskeletal conditions were grouped using categories from previous work (1;45); the remaining diagnoses were initially

grouped in broader categories in such a way that diseases with similar clinical and epidemiological profiles were aggregated. This was an iterative process that required several consultations with team members who have orthopaedic expertise, until the following groups were formed:

- **Arthritis and related conditions:** includes osteoarthritis, rheumatoid arthritis, synovitis, ankylosing spondylitis, fibrositis, connective tissue disorders, joint derangements and other arthritis. Disseminated lupus erythematosus, scleroderma, dermatomyositis and polyarteritis were joined to form a single group of connective tissue diseases. 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: recurrent dislocation, ankylosis, pyogenic arthritis, and traumatic arthritis.
- **Musculoskeletal conditions (MSK):** includes some disorders of the spine (e.g. lumbar strains, sciatica, scoliosis), conditions of the bone (e.g. osteomyelitis, osteoporosis, osteochondritis), conditions of the foot (e.g. corns and calluses, hallux vagus, hammer toe, ingrown nails and onychogryposis), and other MSK conditions.
- **Traumatic conditions:** includes fractures and dislocations; strains and sprains; and other trauma (e.g. concussions, lacerations, other injuries). Fractures and dislocations of the spine are included in this category.
- **Other conditions:** includes a wide range of diseases such as benign and malignant neoplasms, conditions of the childhood and adolescence, psoriasis, bedsores, and cellulites, cerebrovascular diseases, acute poliomyelitis, obesity, and birth trauma.

Assigning a diagnosis group

The classification system of diagnoses used in OHIP consists of 3-digit truncated codes adapted from ICD9. In the OHIP database each record corresponds to a physician claim for each encounter. Each claim can only have one diagnosis code and one procedure fee code. However, for a patient's encounter it is possible to claim several codes and therefore have several diagnoses for that particular encounter. In this analysis if a patient had more than one diagnosis code for one encounter it was decided to consider all available diagnosis codes.

Each hospital encounter could have more than one diagnosis recorded (up to 25 in the DAD and up to 10 in the NACRS and the SDS). Diagnoses are further classified according to the type; for example the first diagnosis corresponds to the most responsible diagnosis (MRD), which is defined as the most significant contributor, to the length of stay. Additional diagnoses are recorded that correspond to comorbidities or secondary diagnoses (a condition that had a significant contribution to the length of stay). Using only the most responsible diagnosis might not reflect all the diagnoses relevant to the orthopaedic encounter. It was decided that diagnoses recorded would be used in addition to the most responsible diagnosis.

With OHIP and CIHI databases we used a hierarchical mutually exclusive classification rule to assign a diagnosis group to each MRD whenever this was possible. If the MRD was an arthritis, traumatic or MSK diagnosis then this group was used. Otherwise encounters were classified using all available secondary diagnoses. When an encounter had several diagnoses falling in different groups the following prioritization rule was applied:

1. If an encounter had a diagnosis in the 'traumatic conditions' group in combination with any other diagnosis, it was classified as being a 'traumatic conditions' encounter.
2. If an encounter had a diagnosis in the 'arthritis conditions' group in combination with any other diagnosis except a 'traumatic conditions' diagnosis, it was classified as being a 'arthritis conditions' encounter.
3. If an encounter had a diagnosis in the 'MSK conditions' group in combination with any other diagnosis except a 'traumatic conditions' or 'arthritis conditions' diagnosis, it was classified as being an encounter in the 'MSK conditions' group.

The decision to prioritize 'traumatic conditions' over 'arthritis and related conditions' and 'MSK conditions' was based on the assumption that if an individual had a traumatic diagnosis as well as other diagnosis in one encounter, the reason for that particular encounter was more likely to be the acute condition and in this case the remaining diagnoses were considered comorbidities.

Groups of surgical procedures

Data on the type of surgical procedure were obtained from the CIHI databases. Up until 2001 these databases used the Canadian Classification of Procedures (CCP). In 2002 CIHI began using the Canadian Classification of Interventions (CCI). This is a systematic classification, which codes interventions by body part and standard types of intervention (e.g. excision, fixation, repair). CIHI provides coding notes to relate these to particular types of surgical procedures. A major challenge was to develop groupings based on this classification that were roughly equivalent to those developed using the CCP. Table A2 provides an outline of the content of the groups. In the CIHI databases each hospitalization might have recorded multiple CCI codes recorded corresponding to the interventions received during the hospital encounter. Each CCI code has a date associated with it.

Developing groupings of orthopaedic procedures

Procedures performed by orthopaedic surgeons were identified using data from DAD, NACRS and SDS. In CIHI's databases each in hospital encounter recorded up to 20 procedure codes in DAD and up to 10 procedure codes in NACRS and SDS. Beginning in 2002, the procedures were classified using the Canadian Classification of Health Interventions (CCI). This new classification system is more specific and it is organized first by body region and then by main types of interventions. In the CCI, health interventions are defined as a service performed for a client with the purpose of improving health, altering or diagnosing the course of disease or promoting wellness (46). The term intervention is used instead of procedure to reflect the expanded scope beyond the traditional medical/surgical settings. The intervention codes are organized in eight sections.

One limitation of these data is the inability to link the interventions to the specific type of physician that performed them. As a starting point, a list of interventions was devised in consultation with a practicing orthopaedic surgeon. Interventions were classified into therapeutic interventions (codes recorded in section 1 in CCI) and other non-surgical interventions (codes recorded in the remaining sections). Therapeutic interventions on the MSK system were included with the exception of those on the sternum, ribs, chest and abdomen.

Therapeutic interventions were further classified as surgical or non-surgical. Non-surgical procedures included pharmacotherapy, exercise, hypothermy, hyperthermy, therapy, management of external appliance and drainage. Hospital encounters with orthopaedic surgeons where only non-surgical procedures were recorded were classified as consultations. Surgical procedures were classified according to table A3.

Table A2. Description of surgical groupings used in this report

| Surgical groupings | Description in CCI classification | Description in CCP classification |
|----------------------------|--|---|
| TJR | Implantation of internal devices | Total joint replacement |
| Arthroscopic repairs | Repairs done arthroscopically. This includes joint repair with meniscectomy, meniscoplasty with or without concomitant debridement of meniscus. | Arthroscopy |
| Open repairs | Repairs using open approach. This includes joint repair with meniscectomy, meniscoplasty with or without concomitant debridement of meniscus. | Repair of joints, total osteotomy |
| Reduction with fixation | Reductions of joint with fixation device inserted into joint without fusion of joint. Codes can be found under "fixation" rubric in the CCI classification system. | Open or closed reductions of fracture with internal fixations |
| Reduction without fixation | Reductions of joint only. Codes can be found under "reduction" rubric in the CCI classification system. | Open or closed reductions of fracture without internal fixation |
| Other surgeries | Include amputation, fusion, excision, reattachment, removal of foreign body, etc. | Include amputation, fusion, excision, reattachment, removal of foreign body, etc. |

A2. Supplemental Tables

Table A3. Number of LHIN resident encounters* with orthopaedic surgeons according to service setting by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | All encounters | AMBULATORY | | HOSPITALIZATIONS | |
|----------------------------------|------------------|------------------|-------------|------------------|-------------|
| | | Encounters | % | Encounters | % |
| Erie St. Clair | 66,866 | 56,696 | 84.8 | 10,170 | 15.2 |
| South West | 98,314 | 81,406 | 82.8 | 16,908 | 17.2 |
| Waterloo Wellington | 58,097 | 48,643 | 83.7 | 9,454 | 16.3 |
| Hamilton Niagara Haldimand Brant | 198,487 | 172,070 | 86.7 | 26,417 | 13.3 |
| Central West | 58,356 | 51,057 | 87.5 | 7,299 | 12.5 |
| Mississauga Halton | 99,062 | 87,953 | 88.8 | 11,109 | 11.2 |
| Toronto Central | 101,318 | 88,722 | 87.6 | 12,596 | 12.4 |
| Central | 144,997 | 127,895 | 88.2 | 17,102 | 11.8 |
| Central East | 149,762 | 130,374 | 87.1 | 19,388 | 12.9 |
| South East | 67,636 | 56,413 | 83.4 | 11,223 | 16.6 |
| Champlain | 128,505 | 108,803 | 84.7 | 19,702 | 15.3 |
| North Simcoe Muskoka | 42,687 | 35,718 | 83.7 | 6,969 | 16.3 |
| North East | 64,124 | 54,686 | 85.3 | 9,438 | 14.7 |
| North West | 29,918 | 25,364 | 84.8 | 4,554 | 15.2 |
| ONTARIO | 1,308,129 | 1,125,800 | 86.1 | 182,329 | 13.9 |

Data Sources: OHIP, DAD, NACRS, SDS

* Encounters include all encounters by LHIN residents regardless of whether encounters were within or outside of residential LHIN

Table A4. Number of LHIN resident hospital encounters* with orthopaedic surgeons according to hospital service setting by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Hospital encounters | INPATIENT | | SDS | ED |
|----------------------------------|---------------------|--------------|-------------|-------------|-------------|
| | | Non elective | Elective | | |
| Erie St. Clair | 10,170 | 16.8 | 32.7 | 39.7 | 10.8 |
| South West | 16,908 | 16.6 | 31.7 | 31.7 | 19.9 |
| Waterloo Wellington | 9,454 | 18.6 | 29.1 | 33.3 | 18.9 |
| Hamilton Niagara Haldimand Brant | 26,417 | 18.9 | 29.1 | 30.7 | 21.3 |
| Central West | 7,299 | 20.2 | 30.6 | 37.6 | 11.5 |
| Mississauga Halton | 11,109 | 17.9 | 31.8 | 39.2 | 11.1 |
| Toronto Central | 12,596 | 22.0 | 29.5 | 29.0 | 19.5 |
| Central | 17,102 | 18.9 | 31.5 | 34.0 | 15.6 |
| Central East | 19,388 | 18.5 | 31.6 | 37.0 | 12.9 |
| South East | 11,223 | 17.0 | 23.1 | 31.2 | 28.8 |
| Champlain | 19,702 | 19.7 | 22.7 | 29.8 | 27.8 |
| North Simcoe Muskoka | 6,969 | 15.3 | 35.0 | 39.4 | 10.3 |
| North East | 9,438 | 21.2 | 32.0 | 37.3 | 9.5 |
| North West | 4,554 | 23.8 | 25.3 | 38.4 | 12.4 |
| ONTARIO | 182,329 | 18.8 | 29.5 | 33.9 | 17.8 |

Data Sources: OHIP, DAD, NACRS, SDS

* Encounters include all encounters by LHIN residents regardless of whether encounters were within or outside of residential LHIN

Table A5. Percentage of LHIN resident encounters* with orthopaedic surgeons by diagnosis group in ambulatory and hospital setting by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | AMBULATORY ENCOUNTERS | | | | | HOSPITAL ENCOUNTERS | | | | |
|----------------------------------|-----------------------|---------------|-------------|-------------|------------|---------------------|---------------|-------------|-------------|------------|
| | All | Arthritis (%) | Trauma (%) | MSK (%) | Other (%) | All | Arthritis (%) | Trauma (%) | MSK (%) | Other (%) |
| Erie St. Clair | 56,696 | 43.6 | 41.7 | 8.8 | 5.9 | 10,170 | 44.4 | 35.2 | 11.0 | 9.4 |
| South West | 81,406 | 45.6 | 38.1 | 10.7 | 5.7 | 16,908 | 39.6 | 39.9 | 9.3 | 11.2 |
| Waterloo Wellington | 48,643 | 44.2 | 36.6 | 12.7 | 6.5 | 9,454 | 41.4 | 42.1 | 9.2 | 7.3 |
| Hamilton Niagara Haldimand Brant | 172,070 | 44.5 | 37.5 | 11.2 | 6.8 | 26,417 | 39.0 | 43.1 | 9.6 | 8.3 |
| Central West | 51,057 | 39.3 | 46.2 | 9.9 | 4.6 | 7,299 | 45.3 | 37.4 | 10.3 | 7.0 |
| Mississauga Halton | 87,953 | 35.5 | 40.3 | 16.2 | 8.0 | 11,109 | 48.0 | 34.2 | 10.6 | 7.2 |
| Toronto Central | 88,722 | 30.2 | 51.7 | 11.5 | 6.6 | 12,596 | 36.7 | 44.9 | 11.7 | 6.7 |
| Central | 127,895 | 30.5 | 49.8 | 13.7 | 6.0 | 17,102 | 41.4 | 39.5 | 11.1 | 8.0 |
| Central East | 130,374 | 33.6 | 47.0 | 14.7 | 4.7 | 19,388 | 45.9 | 37.7 | 9.8 | 6.7 |
| South East | 56,413 | 35.2 | 51.3 | 9.8 | 3.7 | 11,223 | 34.8 | 45.8 | 9.3 | 10.2 |
| Champlain | 108,803 | 36.1 | 45.0 | 12.4 | 6.6 | 19,702 | 35.3 | 45.1 | 10.7 | 9.0 |
| North Simcoe Muskoka | 35,718 | 30.1 | 50.5 | 15.0 | 4.5 | 6,969 | 44.3 | 36.4 | 10.1 | 9.2 |
| North East | 54,686 | 33.9 | 48.3 | 13.2 | 4.7 | 9,438 | 44.1 | 34.3 | 9.8 | 11.7 |
| North West | 25,364 | 45.5 | 27.6 | 16.9 | 10.0 | 4,554 | 44.8 | 33.7 | 8.8 | 12.8 |
| ONTARIO | 1,125,800 | 37.4 | 44.1 | 12.5 | 6.0 | 182,329 | 41.0 | 40.2 | 10.1 | 8.7 |

Data Sources: OHIP, DAD, NACRS, SDS

* Encounters include all encounters by LHIN residents regardless of whether encounters were within or outside of residential LHIN

Table A6. Ambulatory person-visit rates to orthopaedic surgeons per 1,000 population by diagnosis groups by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | ARTHRITIS | | TRAUMA | | MSK | | OTHER | |
|----------------------------------|----------------|-------------|---------------|-------------|---------------|------------|---------------|------------|
| | Adjusted rate* | Crude rate | Adjusted rate | Crude rate | Adjusted rate | Crude rate | Adjusted rate | Crude rate |
| Erie St. Clair | 18.3 | 18.7 | 16.2 | 16.4 | 3.9 | 3.9 | 2.5 | 2.5 |
| South West | 18.4 | 19.4 | 14.2 | 14.5 | 4.7 | 4.7 | 2.3 | 2.3 |
| Waterloo Wellington | 14.7 | 14.0 | 10.8 | 10.7 | 4.8 | 4.6 | 1.9 | 1.9 |
| Hamilton Niagara Haldimand Brant | 21.9 | 23.1 | 18.1 | 18.5 | 6.4 | 6.6 | 2.9 | 2.9 |
| Central West | 15.5 | 13.7 | 14.9 | 13.9 | 4.0 | 3.7 | 1.5 | 1.5 |
| Mississauga Halton | 15.4 | 14.1 | 14.7 | 14.0 | 7.3 | 6.9 | 3.0 | 2.8 |
| Toronto Central | 11.5 | 11.5 | 17.8 | 17.6 | 4.9 | 4.8 | 2.3 | 2.2 |
| Central | 12.9 | 12.2 | 18.0 | 17.5 | 6.2 | 6.0 | 2.2 | 2.1 |
| Central East | 14.4 | 14.5 | 18.1 | 18.1 | 7.1 | 7.1 | 1.8 | 1.8 |
| South East | 19.1 | 21.2 | 24.0 | 25.1 | 5.7 | 5.8 | 2.0 | 2.0 |
| Champlain | 15.6 | 15.7 | 18.6 | 18.5 | 5.0 | 5.0 | 3.0 | 2.9 |
| North Simcoe Muskoka | 12.2 | 12.8 | 18.9 | 19.2 | 6.6 | 6.8 | 1.6 | 1.6 |
| North East | 14.3 | 15.8 | 18.9 | 19.6 | 6.1 | 6.5 | 2.2 | 2.2 |
| North West | 25.4 | 25.7 | 12.8 | 12.9 | 9.7 | 9.8 | 5.1 | 5.1 |
| ONTARIO | 15.9 | 15.9 | 17.0 | 17.0 | 5.8 | 5.8 | 2.3 | 2.3 |

Data Source: OHIP
 * Age and sex adjusted

Table A7. Rates of all orthopaedic surgeries performed by orthopaedic surgeons per 100,000 population by diagnosis groups by Local Health Integration Networks in Ontario, in 2005/06

| Local Health Integration Network | ARTHRITIS | | TRAUMA | | MSK | | OTHER | |
|----------------------------------|---------------|--------------|---------------|--------------|---------------|--------------|---------------|-------------|
| | Adjusted rate | Crude rate | Adjusted rate | Crude rate | Adjusted rate | Crude rate | Adjusted rate | Crude rate |
| Erie St. Clair | 665.6 | 677.0 | 388.2 | 398.7 | 155.6 | 156.0 | 97.7 | 98.1 |
| South West | 666.2 | 696.0 | 464.7 | 486.9 | 143.4 | 144.9 | 73.1 | 73.7 |
| Waterloo Wellington | 571.6 | 543.7 | 376.9 | 366.0 | 112.8 | 110.3 | 64.7 | 63.8 |
| Hamilton Niagara Haldimand Brant | 688.4 | 723.9 | 460.5 | 486.7 | 150.7 | 153.4 | 86.3 | 88.5 |
| Central West | 499.3 | 431.9 | 302.6 | 266.8 | 99.8 | 92.8 | 46.1 | 43.5 |
| Mississauga Halton | 539.8 | 491.2 | 274.7 | 244.1 | 104.0 | 98.6 | 46.0 | 45.0 |
| Toronto Central | 387.0 | 385.5 | 305.4 | 308.8 | 107.2 | 106.6 | 44.3 | 44.0 |
| Central | 460.8 | 436.4 | 295.4 | 278.7 | 110.1 | 107.2 | 60.5 | 59.1 |
| Central East | 590.1 | 592.8 | 338.7 | 341.2 | 109.7 | 110.1 | 55.9 | 56.0 |
| South East | 691.4 | 770.0 | 576.5 | 617.9 | 169.5 | 179.2 | 141.6 | 145.5 |
| Champlain | 556.5 | 558.4 | 422.7 | 421.8 | 140.9 | 141.7 | 92.8 | 93.1 |
| North Simcoe Muskoka | 664.2 | 699.3 | 454.4 | 465.5 | 144.3 | 146.5 | 80.8 | 82.8 |
| North East | 651.6 | 717.3 | 419.7 | 439.8 | 135.5 | 141.2 | 129.5 | 132.2 |
| North West | 765.0 | 780.2 | 461.4 | 467.1 | 129.2 | 127.9 | 108.2 | 108.8 |
| ONTARIO | 575.8 | 575.8 | 378.0 | 378.0 | 125.7 | 125.7 | 73.4 | 73.4 |

Data Source: OHIP
 * Age and sex adjusted

Table A8. Age and sex adjusted rates of specific types of orthopaedic surgery per 100,000 population by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | TJR | | KNEE ARTHROSCOPY | | REPAIRS** | | REDUCTIONS WITH OR WITHOUT FIXATIONS | | SPINAL SURGERIES | | OTHER | |
|----------------------------------|-------------------|--------------|------------------|--------------|------------------|--------------|--------------------------------------|--------------|------------------|-------------|------------------|--------------|
| | AS adjusted rate* | Crude rate | AS adjusted rate | Crude rate | AS adjusted rate | Crude rate | AS adjusted rate | Crude rate | AS adjusted rate | Crude rate | AS adjusted rate | Crude rate |
| Erie St. Clair | 326.4 | 342.1 | 199.1 | 199.1 | 202.0 | 202.1 | 246.4 | 253.0 | 32.0 | 32.3 | 303.3 | 303.1 |
| South West | 362.6 | 400.0 | 153.6 | 153.0 | 203.2 | 204.6 | 288.4 | 300.3 | 46.3 | 46.8 | 287.8 | 290.9 |
| Waterloo Wellington | 312.9 | 287.5 | 167.0 | 164.6 | 146.4 | 142.5 | 254.0 | 249.1 | 40.3 | 39.2 | 208.8 | 204.8 |
| Hamilton Niagara Haldimand Brant | 311.1 | 350.6 | 214.6 | 215.7 | 185.3 | 188.0 | 310.8 | 325.2 | 57.1 | 58.3 | 304.4 | 311.9 |
| Central West | 264.4 | 200.9 | 155.5 | 147.6 | 121.6 | 113.3 | 189.9 | 170.2 | 33.9 | 30.7 | 188.0 | 178.1 |
| Mississauga Halton | 265.4 | 215.0 | 177.5 | 172.8 | 124.2 | 120.3 | 177.0 | 159.7 | 29.3 | 26.7 | 194.0 | 187.4 |
| Toronto Central | 212.3 | 215.0 | 114.8 | 114.4 | 121.8 | 121.0 | 197.9 | 198.8 | 30.1 | 29.9 | 167.5 | 166.3 |
| Central | 244.6 | 219.2 | 133.6 | 132.3 | 133.5 | 130.8 | 188.4 | 178.5 | 39.4 | 37.8 | 188.0 | 183.6 |
| Central East | 280.4 | 284.0 | 192.7 | 192.6 | 146.3 | 146.4 | 230.6 | 231.9 | 43.5 | 43.7 | 201.0 | 201.4 |
| South East | 336.0 | 409.0 | 149.5 | 153.4 | 197.3 | 203.3 | 395.3 | 416.9 | 62.9 | 65.6 | 447.2 | 472.9 |
| Champlain | 285.9 | 284.2 | 135.0 | 136.2 | 165.8 | 167.1 | 303.3 | 302.7 | 35.5 | 35.5 | 290.6 | 292.5 |
| North Simcoe Muskoka | 326.3 | 356.4 | 176.2 | 179.2 | 183.7 | 186.5 | 272.4 | 277.8 | 50.5 | 52.2 | 338.9 | 346.0 |
| North East | 278.7 | 327.5 | 227.4 | 240.5 | 189.0 | 196.3 | 291.9 | 302.0 | 32.2 | 33.3 | 321.8 | 335.3 |
| North West | 381.3 | 391.6 | 166.5 | 167.8 | 229.7 | 231.7 | 300.7 | 303.5 | 59.2 | 59.4 | 339.4 | 342.2 |
| ONTARIO | 289.0 | 289.0 | 166.3 | 166.3 | 158.8 | 158.8 | 249.5 | 249.5 | 40.6 | 40.6 | 250.1 | 250.1 |

Data Source: DAD, NACRS, SDS

* Age and sex adjusted, ** Excluding closed repairs of the knee

Table A9. Distribution of hospital encounters* with orthopaedic surgeons according to hospital service setting, within Local Health Integration Networks, Ontario, 2005/06

| LHIN | All hospital encounters | INPATIENT | | | | SDS | | ED | |
|----------------------------------|-------------------------|---------------|-------------|---------------|-------------|---------------|-------------|---------------|-------------|
| | | Elective | % | Non elective | % | Number | % | Number | % |
| Erie St. Clair | 8,733 | 2,627 | 30.1 | 1,604 | 21.1 | 3,608 | 41.3 | 900 | 10.3 |
| South West | 17,352 | 5,422 | 31.2 | 3,081 | 20.4 | 5,329 | 30.7 | 3,570 | 20.6 |
| Waterloo Wellington | 9,172 | 2,659 | 29.0 | 1,557 | 19.5 | 3,292 | 35.9 | 1,682 | 18.3 |
| Hamilton Niagara Haldimand Brant | 25,842 | 7,061 | 27.3 | 5,196 | 23.1 | 7,816 | 30.2 | 5,657 | 21.9 |
| Central West | 4,940 | 1,334 | 27.0 | 1,217 | 28.3 | 1,832 | 37.1 | 505 | 10.2 |
| Mississauga Halton | 10,744 | 3,374 | 31.4 | 1,758 | 18.8 | 4,779 | 44.5 | 886 | 8.2 |
| Toronto Central | 24,011 | 10,053 | 41.9 | 4,368 | 20.9 | 5,779 | 24.1 | 4,126 | 17.2 |
| Central | 15,670 | 4,416 | 28.2 | 3,082 | 22.6 | 5,898 | 37.6 | 2,234 | 14.3 |
| Central East | 16,869 | 4,960 | 29.4 | 3,083 | 21.0 | 6,910 | 41 | 1,934 | 11.5 |
| South East | 11,567 | 2,591 | 22.4 | 1,842 | 18.3 | 3,768 | 32.6 | 3,337 | 28.8 |
| Champlain | 19,467 | 4,374 | 22.5 | 3,778 | 22.3 | 5,552 | 28.5 | 5,609 | 28.8 |
| North Simcoe Muskoka | 5,788 | 1,774 | 30.6 | 917 | 18.2 | 2,420 | 41.8 | 706 | 12.2 |
| North East | 7,759 | 2,051 | 26.4 | 1,776 | 26.3 | 3,090 | 39.8 | 774 | 10.0 |
| North West | 4,415 | 1092 | 24.7 | 1,007 | 26.2 | 1,710 | 38.7 | 559 | 12.7 |
| ONTARIO | 182,329 | 53,788 | 29.5 | 34,266 | 18.8 | 61,828 | 33.9 | 32,479 | 17.8 |

Data Sources: DAD, NACRS, SDS

* LHINs correspond to where the encounter occurred regardless of patient's residence

Table A10. Distribution of hospital encounters* with orthopaedic surgeons according to diagnosis groups by Local Health Integration Networks, Ontario, 2005/06

| LHIN | All hospital encounters | AR | | TRAUMA | | MSK | | OTHER | |
|----------------------------------|-------------------------|---------------|-------------|---------------|-------------|---------------|-------------|---------------|------------|
| | | Number | % | Number | % | Number | % | Number | % |
| Erie St. Clair | 8,733 | 4,101 | 47.0 | 3,056 | 35.0 | 838 | 9.6 | 738 | 8.5 |
| South West | 17,352 | 6,115 | 35.2 | 7,379 | 42.5 | 1,746 | 10.1 | 2,112 | 12.2 |
| Waterloo Wellington | 9,172 | 4,215 | 46.0 | 3,662 | 39.9 | 734 | 8.0 | 561 | 6.1 |
| Hamilton Niagara Haldimand Brant | 25,842 | 9,858 | 38.1 | 11,370 | 44.0 | 2,450 | 9.5 | 2,164 | 8.4 |
| Central West | 4,940 | 2,094 | 42.4 | 2,146 | 43.4 | 390 | 7.9 | 310 | 6.3 |
| Mississauga Halton | 10,744 | 5,739 | 53.4 | 3,210 | 29.9 | 1,151 | 10.7 | 644 | 6.0 |
| Toronto Central | 24,011 | 9,110 | 37.9 | 9,475 | 39.5 | 3,322 | 13.8 | 2,104 | 8.8 |
| Central | 15,670 | 7,035 | 44.9 | 5,999 | 38.3 | 1,543 | 9.8 | 1,093 | 7.0 |
| Central East | 16,869 | 8,176 | 48.5 | 6,064 | 35.9 | 1,615 | 9.6 | 1,014 | 6.0 |
| South East | 11,567 | 4,067 | 35.2 | 5,305 | 45.9 | 1,036 | 9.0 | 1,159 | 10.0 |
| Champlain | 19,467 | 6,619 | 34.0 | 8,998 | 46.2 | 2,084 | 10.7 | 1,766 | 9.1 |
| North Simcoe Muskoka | 5,788 | 2,426 | 41.9 | 2,305 | 39.8 | 461 | 8.0 | 596 | 10.3 |
| North East | 7,759 | 3,243 | 41.8 | 2,824 | 36.4 | 695 | 9.0 | 997 | 12.8 |
| North West | 4,415 | 1,987 | 45.0 | 1,480 | 33.5 | 383 | 8.7 | 565 | 12.8 |
| ONTARIO | 182,329 | 74,787 | 41.0 | 73,271 | 40.2 | 18,447 | 10.1 | 15,824 | 8.7 |

Data Sources: DAD, NACRS, SDS

* LHINs correspond to where the encounter occurred regardless of patient's residence

Table A11. Proportion of all hospital encounters* which were surgical according to diagnosis groups by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | All hospital encounters | ARTHRITIS | | TRAUMA | | MSK | | OTHER | |
|----------------------------------|-------------------------|---------------|-------------|---------------|-------------|---------------|-------------|---------------|-------------|
| | | Number | % surgical | Number | % surgical | Number | % surgical | Number | % surgical |
| Erie St. Clair | 8,733 | 4,101 | 95.6 | 3,056 | 66.6 | 838 | 85.9 | 738 | 65.9 |
| South West | 17,352 | 6,115 | 94.3 | 7,379 | 62.2 | 1,746 | 82.6 | 2,112 | 37.2 |
| Waterloo Wellington | 9,172 | 4,215 | 96.6 | 3,662 | 59.1 | 734 | 85.7 | 561 | 61.0 |
| Hamilton Niagara Haldimand Brant | 25,842 | 9,858 | 94.0 | 11,370 | 53.8 | 2,450 | 77.5 | 2,164 | 52.1 |
| Central West | 4,940 | 2,094 | 97.0 | 2,146 | 72.8 | 390 | 89.3 | 310 | 53.7 |
| Mississauga Halton | 10,744 | 5,739 | 97.6 | 3,210 | 67.8 | 1,151 | 89.6 | 644 | 57.5 |
| Toronto Central | 24,011 | 9,110 | 93.2 | 9,475 | 57.4 | 3,322 | 81.3 | 2,104 | 61.3 |
| Central | 15,670 | 7,035 | 97.1 | 5,999 | 59.9 | 1,543 | 87.1 | 1,093 | 62.1 |
| Central East | 16,869 | 8,176 | 96.9 | 6,064 | 64.6 | 1,615 | 82.3 | 1,014 | 61.6 |
| South East | 11,567 | 4,067 | 93.2 | 5,305 | 52.8 | 1,036 | 76.0 | 1,159 | 59.1 |
| Champlain | 19,467 | 6,619 | 92.3 | 8,998 | 50.7 | 2,084 | 76.4 | 1,766 | 59.3 |
| North Simcoe Muskoka | 5,788 | 2,426 | 94.1 | 2,305 | 72.2 | 461 | 80.1 | 596 | 44.2 |
| North East | 7,759 | 3,243 | 95.6 | 2,824 | 68.9 | 695 | 80.9 | 997 | 65.2 |
| North West | 4,415 | 1,987 | 90.9 | 1,480 | 64.5 | 383 | 74.5 | 565 | 42.4 |
| ONTARIO | 182,329 | 74,787 | 94.9 | 73,271 | 59.4 | 18,447 | 81.5 | 15,824 | 55.3 |

Data Sources: DAD, NACRS, SDS

* LHINs correspond to where the encounter occurred regardless of patient's residence

Table A12. Number of surgeries provided by orthopaedic surgeons within LHIN* according to diagnosis groups by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | All surgeries | ARTHRITIS | | TRAUMA | | MSK | | OTHER | |
|-------------------------------------|----------------|---------------|-------------|---------------|-------------|---------------|-------------|--------------|------------|
| | | Number | % | Number | % | Number | % | Number | % |
| Erie St. Clair | 7,378 | 3,972 | 53.8 | 2,162 | 29.3 | 747 | 10.1 | 497 | 6.7 |
| South West | 13,265 | 5,895 | 44.4 | 5,042 | 38.0 | 1,517 | 11.4 | 811 | 6.1 |
| Waterloo Wellington | 7,386 | 4,101 | 55.5 | 2,269 | 30.7 | 659 | 8.9 | 357 | 4.8 |
| Hamilton Niagara Haldimand Brant | 19,163 | 9,388 | 49.0 | 6,594 | 34.4 | 1,984 | 10.4 | 1,197 | 6.2 |
| Central West | 4,075 | 1,974 | 48.4 | 1,586 | 38.9 | 355 | 8.7 | 160 | 3.9 |
| Mississauga Halton | 9,250 | 5,602 | 60.6 | 2,232 | 24.1 | 1,045 | 11.3 | 371 | 4.0 |
| Toronto Central | 19,377 | 8,734 | 45.1 | 6,331 | 32.7 | 2,865 | 14.8 | 1,447 | 7.5 |
| Central | 12,572 | 6,761 | 53.8 | 3,751 | 29.8 | 1,381 | 11.0 | 679 | 5.4 |
| Central East | 13,929 | 7,868 | 56.5 | 4,078 | 29.3 | 1,343 | 9.6 | 640 | 4.6 |
| South East | 8,537 | 3,878 | 45.4 | 3,101 | 36.3 | 845 | 9.9 | 713 | 8.4 |
| Champlain | 14,033 | 6,273 | 44.7 | 5,010 | 35.7 | 1,659 | 11.8 | 1,091 | 7.8 |
| North Simcoe Muskoka | 4,737 | 2,304 | 48.6 | 1,775 | 37.5 | 383 | 8.1 | 275 | 5.8 |
| North East | 6,493 | 3,137 | 48.3 | 2,103 | 32.4 | 588 | 9.1 | 665 | 10.2 |
| North West | 3,476 | 1,837 | 52.9 | 1,088 | 31.3 | 301 | 8.6 | 250 | 7.2 |
| ONTARIO | 143,671 | 71,724 | 49.9 | 47,122 | 32.8 | 15,672 | 10.9 | 9,153 | 6.4 |

Data Sources: DAD, NACRS, SDS

* LHINs correspond to where the encounter occurred regardless of patient's residence

Table A13. Number of surgeries provided by orthopaedic surgeons according to service setting by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | All surgeries | INPATIENT | | SDS | | ED | |
|-------------------------------------|----------------|---------------|-------------|---------------|-------------|--------------|------------|
| | | Number | % | Number | % | Number | % |
| Erie St. Clair | 7,379 | 3,655 | 49.5 | 3,530 | 47.8 | 194 | 2.6 |
| South West | 13,265 | 7,692 | 58.0 | 5,179 | 39.0 | 394 | 3.0 |
| Waterloo Wellington | 7,386 | 3,829 | 51.8 | 3,225 | 43.7 | 332 | 4.5 |
| Hamilton Niagara Haldimand Brant | 19,163 | 10,803 | 56.4 | 7,519 | 39.2 | 841 | 4.4 |
| Central West | 4,076 | 2,315 | 56.8 | 1,703 | 41.8 | 58 | 1.4 |
| Mississauga Halton | 9,250 | 4,475 | 48.4 | 4,662 | 50.4 | 113 | 1.2 |
| Toronto Central | 19,376 | 13,724 | 70.8 | 5,158 | 26.6 | 494 | 2.6 |
| Central | 12,572 | 6,708 | 53.4 | 5,641 | 44.9 | 223 | 1.8 |
| Central East | 13,928 | 7,120 | 51.1 | 6,566 | 47.1 | 242 | 1.7 |
| South East | 8,537 | 4,262 | 49.9 | 3,630 | 42.5 | 645 | 7.6 |
| Champlain | 14,032 | 7,517 | 53.6 | 5,379 | 38.3 | 1,136 | 8.1 |
| North Simcoe Muskoka | 4,738 | 2,338 | 49.3 | 2,334 | 49.3 | 66 | 1.4 |
| North East | 6,493 | 3,428 | 52.8 | 2,950 | 45.4 | 115 | 1.8 |
| North West | 3,476 | 1,899 | 54.6 | 1,512 | 43.5 | 65 | 1.9 |
| ONTARIO | 143,671 | 79,772 | 55.5 | 58,996 | 41.1 | 4,903 | 3.4 |

Data Sources: DAD, NACRS, SDS

Note: LHINs correspond to where the encounter occurred regardless of patient's residence

Table A14. Number of specific types of orthopaedic surgery provided within LHIN* by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | All surgeries | TJR | | KNEE ARTHROSCOPY | | REPAIRS | | REDUCTIONS | | SPINE | | OTHER | |
|----------------------------------|----------------|---------------|-------------|------------------|-------------|---------------|-------------|---------------|-------------|--------------|------------|---------------|-------------|
| | | Number | % | Number | % | Number | % | Number | % | Number | % | Number | % |
| Erie St. Clair | 7,379 | 1,962 | 26.6 | 1,185 | 16.1 | 1,249 | 16.9 | 1,603 | 21.7 | 44 | 0.6 | 1,336 | 18.1 |
| South West | 13,265 | 3,454 | 26.0 | 1,323 | 10.0 | 1,884 | 14.2 | 2,788 | 21.0 | 589 | 4.4 | 3,227 | 24.3 |
| Waterloo Wellington | 7,386 | 2,137 | 28.9 | 1,237 | 16.7 | 927 | 12.6 | 1,716 | 23.2 | 99 | 1.3 | 1,270 | 17.2 |
| Hamilton Niagara Haldimand Brant | 19,163 | 4,492 | 23.4 | 2,798 | 14.6 | 2,517 | 13.1 | 4,413 | 23.0 | 761 | 4.0 | 4,182 | 21.8 |
| Central West | 4,076 | 1,025 | 25.1 | 728 | 17.9 | 768 | 18.8 | 1,198 | 29.4 | 32 | 0.8 | 325 | 8.0 |
| Mississauga Halton | 9,250 | 2,095 | 22.6 | 2,137 | 23.1 | 1,228 | 13.3 | 1,665 | 18.0 | 546 | 5.9 | 1,579 | 17.1 |
| Toronto Central | 19,376 | 5,264 | 27.2 | 1,611 | 8.3 | 1,332 | 6.9 | 2,253 | 11.6 | 1,327 | 6.8 | 7,589 | 39.2 |
| Central | 12,572 | 3,252 | 25.9 | 2,125 | 16.9 | 1,969 | 15.7 | 2,735 | 21.8 | 324 | 2.6 | 2,167 | 17.2 |
| Central East | 13,928 | 3,421 | 24.6 | 2,965 | 21.3 | 2,068 | 14.8 | 3,328 | 23.9 | 440 | 3.2 | 1,706 | 12.2 |
| South East | 8,537 | 1,966 | 23.0 | 886 | 10.4 | 932 | 10.9 | 2,001 | 23.4 | 319 | 3.7 | 2,433 | 28.5 |
| Champlain | 14,032 | 3,231 | 23.0 | 1,416 | 10.1 | 1,930 | 13.8 | 3,575 | 25.5 | 406 | 2.9 | 3,474 | 24.8 |
| North Simcoe Muskoka | 4,738 | 1,142 | 24.1 | 631 | 13.3 | 734 | 15.5 | 1,142 | 24.1 | 15 | 0.3 | 1,074 | 22.7 |
| North East | 6,493 | 1,274 | 19.6 | 1,216 | 18.7 | 1,052 | 16.2 | 1,688 | 26.0 | 34 | 0.5 | 1,229 | 18.9 |
| North West | 3,476 | 926 | 26.6 | 385 | 11.1 | 485 | 14.0 | 677 | 19.5 | 126 | 3.6 | 877 | 25.2 |
| ONTARIO | 143,671 | 35,641 | 24.8 | 20,643 | 14.4 | 19,075 | 13.3 | 30,782 | 21.4 | 5,062 | 3.5 | 32,468 | 22.6 |

Data Sources: DAD, NACRS, SDS

* LHINs correspond to where the encounter occurred regardless of patient's residence

Table A15. Number of all orthopaedic surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN (A) | Number performed on residents from other LHINs (B) | Number performed on residents traveling outside of LHIN (C) | Total number of surgeries provided within LHIN (A+B) | Total number of surgeries provided to LHIN residents (A+C) | Retention rate (%) A/(A+C) | Local Service Rate (%) A/(A+B) |
|----------------------------------|--|---|--|---|---|-------------------------------|-----------------------------------|
| Erie St. Clair | 7,143 | 236 | 1,448 | 7,379 | 8,591 | 83.1 | 96.8 |
| South West | 10,930 | 2,335 | 2,095 | 13,265 | 13,025 | 83.9 | 82.4 |
| Waterloo Wellington | 6,005 | 1,381 | 1,564 | 7,386 | 7,569 | 79.3 | 81.3 |
| Hamilton Niagara Haldimand Brant | 17,822 | 1,341 | 1,911 | 19,163 | 19,733 | 90.3 | 93.0 |
| Central West | 2,788 | 1,288 | 3,350 | 4,076 | 6,138 | 45.4 | 68.4 |
| Mississauga Halton | 6,253 | 2,997 | 3,022 | 9,250 | 9,275 | 67.4 | 67.6 |
| Toronto Central | 7,111 | 12,265 | 2,443 | 19,376 | 9,554 | 74.4 | 36.7 |
| Central | 8,172 | 4,400 | 5,470 | 12,572 | 13,642 | 59.9 | 65.0 |
| Central East | 11,045 | 2,883 | 4,869 | 13,928 | 15,914 | 69.4 | 79.3 |
| South East | 7,453 | 1,084 | 801 | 8,537 | 8,254 | 90.3 | 87.3 |
| Champlain | 13,415 | 617 | 963 | 14,032 | 14,378 | 93.3 | 95.6 |
| North Simcoe Muskoka | 4,084 | 654 | 1,832 | 4,738 | 5,916 | 69.0 | 86.2 |
| North East | 6,383 | 110 | 1,712 | 6,493 | 8,095 | 78.8 | 98.3 |
| North West | 3,434 | 42 | 154 | 3,476 | 3,588 | 95.7 | 98.8 |
| ONTARIO | 112,037 | 31,634 | 31,634 | 143,671 | 143,671 | 78.0 | 78.0 |

Data Sources: DAD, NACRS, SDS

Table A16. Number of orthopaedic surgeries for arthritis and related conditions performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 3,793 | 178.74 | 580 | 3,972 | 4,373 | 86.7 | 95.5 |
| South West | 5,052 | 843 | 1,418 | 5,895 | 6,470 | 78.0 | 85.7 |
| Waterloo Wellington | 3,109 | 992 | 682 | 4,101 | 3,791 | 81.9 | 75.8 |
| Hamilton Niagara Haldimand Brant | 8,778 | 610 | 1,056 | 9,388 | 9,834 | 89.2 | 93.5 |
| Central West | 1,386 | 588 | 1,808 | 1,974 | 3,193 | 43.3 | 70.2 |
| Mississauga Halton | 3,742 | 1,860 | 1,425 | 5,602 | 5,167 | 72.3 | 66.8 |
| Toronto Central | 3,039 | 5,695 | 1,325 | 8,734 | 4,364 | 69.5 | 34.8 |
| Central | 4,057 | 2,704 | 2,675 | 6,761 | 6,732 | 60.2 | 60.0 |
| Central East | 6,074 | 1,794 | 2,498 | 7,868 | 8,572 | 70.8 | 77.2 |
| South East | 3,265 | 613 | 444 | 3,878 | 3,709 | 88.0 | 84.2 |
| Champlain | 6,028 | 245 | 573 | 6,273 | 6,601 | 91.3 | 96.1 |
| North Simcoe Muskoka | 2,018 | 286 | 952 | 2,304 | 2,970 | 67.9 | 87.6 |
| North East | 3,109 | 28 | 953 | 3,137 | 4,062 | 76.5 | 99.1 |
| North West | 1,820 | 16 | 65 | 1,836 | 1,885 | 96.5 | 99.1 |
| ONTARIO | 55,271 | 16,453 | 16,453 | 71,724 | 71,724 | 77.1 | 77.1 |

Data Sources: DAD, NACRS, SDS

Table A17. Number of orthopaedic surgeries for trauma and related conditions performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 2,121 | 41 | 462 | 2,162 | 2,583 | 82.2 | 98.1 |
| South West | 4,139 | 903 | 388 | 5,042 | 4,527 | 91.5 | 82.1 |
| Waterloo Wellington | 2,035 | 234 | 521 | 2,269 | 2,557 | 79.7 | 89.7 |
| Hamilton Niagara Haldimand Brant | 6,113 | 481 | 499 | 6,594 | 6,611 | 92.5 | 92.7 |
| Central West | 1,052 | 534 | 892 | 1,586 | 1,943 | 54.2 | 66.3 |
| Mississauga Halton | 1,641 | 591 | 938 | 2,232 | 2,578 | 63.7 | 73.5 |
| Toronto Central | 2,773 | 3,558 | 749 | 6,331 | 3,522 | 78.8 | 43.8 |
| Central | 2,701 | 1,050 | 1,607 | 3,751 | 4,308 | 62.7 | 72.0 |
| Central East | 3,503 | 575 | 1,424 | 4,078 | 4,927 | 71.1 | 85.9 |
| South East | 2,772 | 329 | 205 | 3,101 | 2,977 | 93.2 | 89.4 |
| Champlain | 4,749 | 260 | 243 | 5,009 | 4,992 | 95.2 | 94.8 |
| North Simcoe Muskoka | 1,475 | 300 | 503 | 1,775 | 1,978 | 74.7 | 83.1 |
| North East | 2,034 | 69 | 459 | 2,103 | 2,492 | 81.7 | 96.7 |
| North West | 1,071 | 18 | 56 | 1,089 | 1,127 | 95.3 | 98.4 |
| ONTARIO | 38,259 | 8,944 | 8,944 | 47,122 | 47,122 | 81.0 | 81.0 |

Data Sources: DAD, NACRS, SDS

Table A18. Number of orthopaedic surgeries for musculoskeletal conditions performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 735 | 11 | 272 | 746 | 1,007 | 73.0 | 98.5 |
| South West | 1,129 | 383 | 215 | 1,512 | 1,344 | 84.0 | 74.7 |
| Waterloo Wellington | 534 | 123 | 235 | 657 | 769 | 69.4 | 81.3 |
| Hamilton Niagara Haldimand Brant | 1,813 | 172 | 272 | 1,985 | 2,085 | 87.0 | 91.3 |
| Central West | 245 | 101 | 435 | 346 | 680 | 36.0 | 70.8 |
| Mississauga Halton | 612 | 419 | 412 | 1,031 | 1,024 | 59.8 | 59.4 |
| Toronto Central | 893 | 1,920 | 257 | 2,813 | 1,150 | 77.7 | 31.7 |
| Central | 867 | 471 | 751 | 1,338 | 1,618 | 53.6 | 64.8 |
| Central East | 904 | 391 | 642 | 1,295 | 1,546 | 58.5 | 69.8 |
| South East | 754 | 89 | 107 | 843 | 861 | 87.6 | 89.4 |
| Champlain | 1,585 | 73 | 90 | 1,658 | 1,675 | 94.6 | 95.6 |
| North Simcoe Muskoka | 347 | 32 | 272 | 379 | 619 | 56.1 | 91.6 |
| North East | 575 | 8 | 220 | 583 | 795 | 72.3 | 98.6 |
| North West | 297 | * | <20 | <303 | <317 | 94.6 | 98.7 |
| ONTARIO | 11,290 | <4,200 | <4,200 | <15,490 | <15,4490 | 72.9 | 72.9 |

Data Sources: DAD, NACRS, SDS

* Cell frequency is less than 6

Table A19. Number of total hip replacement surgery performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 723 | 28 | 119 | 751 | 842 | 85.9 | 96.3 |
| South West | 1,310 | 209 | 272 | 1,519 | 1,582 | 82.8 | 86.2 |
| Waterloo Wellington | 757 | 183 | 137 | 940 | 894 | 84.7 | 80.5 |
| Hamilton Niagara Haldimand Brant | 1,873 | 127 | 189 | 2,000 | 2,062 | 90.8 | 93.7 |
| Central West | 286 | 110 | 241 | 396 | 527 | 54.3 | 72.2 |
| Mississauga Halton | 660 | 210 | 309 | 870 | 969 | 68.1 | 75.9 |
| Toronto Central | 934 | 1,492 | 240 | 2,426 | 1,174 | 79.6 | 38.5 |
| Central | 897 | 502 | 572 | 1,399 | 1,469 | 61.1 | 64.1 |
| Central East | 1,093 | 212 | 567 | 1,305 | 1,660 | 65.8 | 83.8 |
| South East | 754 | 109 | 85 | 863 | 839 | 89.9 | 87.4 |
| Champlain | 1,436 | 47 | 98 | 1,483 | 1,534 | 93.6 | 96.8 |
| North Simcoe Muskoka | 444 | 79 | 235 | 523 | 679 | 65.4 | 84.9 |
| North East | 492 | * | 250 | <498 | 742 | 66.3 | 98.8 |
| North West | 328 | * | * | <334 | <334 | 98.2 | 98.2 |
| ONTARIO | 11,987 | <3,320 | <3,320 | <15,307 | <15,307 | 78.3 | 78.3 |

Data Sources: DAD, NACRS, SDS

* Cell frequency is less than 6

Table A20. Number of total knee replacement surgery performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 1,036 | 59 | 150 | 1,095 | 1,186 | 87.4 | 94.6 |
| South West | 1,539 | 198 | 414 | 1,737 | 1,953 | 78.8 | 88.6 |
| Waterloo Wellington | 814 | 287 | 172 | 1,101 | 986 | 82.6 | 73.9 |
| Hamilton Niagara Haldimand Brant | 2,148 | 148 | 239 | 2,296 | 2,387 | 90.0 | 93.6 |
| Central West | 462 | 167 | 457 | 629 | 919 | 50.3 | 73.4 |
| Mississauga Halton | 825 | 349 | 362 | 1,174 | 1,187 | 69.5 | 70.3 |
| Toronto Central | 896 | 1,693 | 292 | 2,589 | 1,188 | 75.4 | 34.6 |
| Central | 1,105 | 703 | 732 | 1,808 | 1,837 | 60.2 | 61.1 |
| Central East | 1,572 | 507 | 756 | 2,079 | 2,328 | 67.5 | 75.6 |
| South East | 877 | 139 | 143 | 1,016 | 1,020 | 86.0 | 86.3 |
| Champlain | 1,563 | 58 | 108 | 1,621 | 1,671 | 93.5 | 96.4 |
| North Simcoe Muskoka | 498 | 72 | 269 | 570 | 767 | 64.9 | 87.4 |
| North East | 721 | * | 286 | <722 | 1,007 | 71.6 | 99.9 |
| North West | 535 | * | 8 | <542 | 543 | 98.5 | 98.7 |
| ONTARIO | 14,591 | <4,388 | 4,388 | <18,979 | 18,979 | 76.9 | 76.9 |

Data Sources: DAD, NACRS, SDS

* Cell frequency is less than 6

Table A21. Number of knee arthroscopies performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 1,148 | 37 | 149 | 1,185 | 1,297 | 89.3 | 97.0 |
| South West | 1,112 | 211 | 318 | 1,323 | 1,430 | 78.4 | 84.4 |
| Waterloo Wellington | 979 | 258 | 174 | 1,237 | 1,154 | 85.8 | 79.5 |
| Hamilton Niagara Haldimand Brant | 2,613 | 185 | 342 | 2,798 | 2,955 | 88.8 | 93.1 |
| Central West | 414 | 314 | 618 | 728 | 1,032 | 40.6 | 61.9 |
| Mississauga Halton | 1,370 | 767 | 447 | 2,137 | 1,817 | 75.9 | 64.4 |
| Toronto Central | 678 | 933 | 616 | 1,611 | 1,294 | 52.9 | 42.5 |
| Central | 1,211 | 914 | 796 | 2,125 | 2,006 | 60.7 | 58.2 |
| Central East | 2,224 | 741 | 544 | 2,965 | 2,768 | 80.7 | 75.6 |
| South East | 627 | 259 | 117 | 886 | 744 | 85.7 | 71.0 |
| Champlain | 1,340 | 76 | 276 | 1,416 | 1,616 | 83.5 | 94.8 |
| North Simcoe Muskoka | 558 | 73 | 204 | 631 | 762 | 74.4 | 89.1 |
| North East | 1,198 | ** | 165 | 1,216 | 1,364 | 88.6 | 98.8 |
| North West | 384 | * | 21 | <390 | 405 | 97.5 | 100.0 |
| ONTARIO | 15,856 | <4,792 | 4,787 | 20,643 | 20,643 | 76.8 | 76.8 |

Data Sources: DAD, NACRS, SDS

* Cell frequency is less than 6, ** Cell frequency is less than 20

Table A22. Number of reductions with or without fixations performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| Local Health Integration Network | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 1,388 | 215 | 197 | 1,415 | 1,605 | 86.5 | 98.1 |
| South West | 2,590 | 198 | 190 | 3,036 | 2,802 | 92.5 | 85.3 |
| Waterloo Wellington | 1,459 | 257 | 242 | 1,605 | 1,720 | 84.8 | 90.9 |
| Hamilton Niagara Haldimand Brant | 4,146 | 267 | 259 | 4,434 | 4,426 | 93.7 | 93.5 |
| Central West | 732 | 466 | 499 | 1,027 | 1,252 | 58.5 | 71.3 |
| Mississauga Halton | 1,107 | 558 | 553 | 1,427 | 1,679 | 65.9 | 77.6 |
| Toronto Central | 1,828 | 425 | 426 | 3,685 | 2,275 | 80.4 | 49.6 |
| Central | 1,808 | 927 | 975 | 2,463 | 2,801 | 64.5 | 73.4 |
| Central East | 2,574 | 754 | 788 | 2,965 | 3,384 | 76.1 | 86.8 |
| South East | 1,883 | 118 | 102 | 2,125 | 2,005 | 93.9 | 88.6 |
| Champlain | 3,405 | 170 | 155 | 3,592 | 3,580 | 95.1 | 94.8 |
| North Simcoe Muskoka | 903 | 239 | 232 | 1,089 | 1,154 | 78.2 | 82.9 |
| North East | 1,473 | 215 | 208 | 1,528 | 1,699 | 86.7 | 96.4 |
| North West | 658 | * | * | <671 | <680 | 96.8 | 98.1 |
| ONTARIO | 25,953 | <4,829 | <4,829 | <31,062 | <31,062 | 84.5 | 84.5 |

Data Sources: DAD, NACRS, SDS

* Cell frequency is less than 6, ** Cell frequency is less than 20

Table A23. Number of other repairs performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| LHIN | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 961 | 288 | 277 | 1,249 | 1,238 | 77.0 | 94.8 |
| South West | 1,442 | 442 | 428 | 1,884 | 1,870 | 76.7 | 78.2 |
| Waterloo Wellington | 698 | 229 | 219 | 927 | 917 | 75.2 | 69.0 |
| Hamilton Niagara Haldimand Brant | 2,243 | 274 | 275 | 2,517 | 2,518 | 88.7 | 93.2 |
| Central West | 310 | 458 | 480 | 768 | 791 | 38.7 | 62.8 |
| Mississauga Halton | 738 | 490 | 491 | 1,228 | 1,229 | 59.5 | 70.0 |
| Toronto Central | 944 | 388 | 392 | 1,332 | 1,335 | 70.1 | 30.8 |
| Central | 1,224 | 745 | 778 | 1,969 | 2,002 | 60.8 | 61.4 |
| Central East | 1,289 | 779 | 800 | 2,068 | 2,089 | 61.4 | 73.3 |
| South East | 807 | 125 | 114 | 932 | 921 | 86.6 | 90.9 |
| Champlain | 1,830 | 100 | 89 | 1,930 | 1,919 | 94.8 | 96.2 |
| North Simcoe Muskoka | 499 | 235 | 227 | 734 | 726 | 67.8 | 84.1 |
| North East | 733 | 319 | 313 | 1,052 | 1,047 | 69.4 | 97.0 |
| North West | 442 | 43 | 32 | 485 | 474 | 91.3 | 100.0 |
| ONTARIO | 14,160 | 4,915 | 4,915 | 19,075 | 19,075 | 74.2 | 74.2 |

Data Sources: DAD, NACRS, SDS

Table A24. Number of spinal surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| LHIN | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 44 | 0 | 180 | 44 | 224 | 18.8 | 100.0 |
| South West | 353 | 236 | 71 | 589 | 425 | 81.3 | 60.0 |
| Waterloo Wellington | 85 | ** | 176 | <99 | 261 | 31.4 | 85.9 |
| Hamilton Niagara Haldimand Brant | 628 | 133 | 152 | 761 | 780 | 79.5 | 82.5 |
| Central West | 26 | * | 180 | <32 | 206 | 12.2 | 82.4 |
| Mississauga Halton | 160 | 386 | 111 | 546 | 271 | 56.9 | 29.3 |
| Toronto Central | 263 | 1,064 | 66 | 1,327 | 329 | 77.5 | 19.8 |
| Central | 205 | 119 | 364 | 324 | 569 | 35.4 | 63.4 |
| Central East | 301 | 139 | 319 | 440 | 621 | 47.8 | 68.5 |
| South East | 268 | 51 | 38 | 319 | 306 | 84.8 | 84.0 |
| Champlain | 369 | 37 | 40 | 406 | 409 | 88.1 | 90.9 |
| North Simcoe Muskoka | 15 | 0 | 301 | 15 | 316 | 4.6 | 100.0 |
| North East | 34 | 0 | 177 | 34 | 211 | 15.4 | 100.0 |
| North West | 126 | 0 | ** | 126 | <135 | 87.1 | 100.0 |
| ONTARIO | 2,878 | <2,184 | <2,184 | <5,062 | <5,062 | 56.9 | 56.9 |

Data Sources: DAD, NACRS, SDS

* Cell frequency is less than 6, ** Cell frequency is less than 20

Table A25. Number of inpatient-elective surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| LHIN | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 1,974 | 106 | 559 | 2,080 | 2,533 | 77.9 | 94.9 |
| South West | 3,237 | 757 | 907 | 3,994 | 4,144 | 78.1 | 81.0 |
| Waterloo Wellington | 1,562 | 515 | 621 | 2,077 | 2,183 | 71.6 | 75.2 |
| Hamilton Niagara Haldimand Brant | 5,072 | 466 | 753 | 5,538 | 5,825 | 87.1 | 91.6 |
| Central West | 817 | 325 | 1,108 | 1,142 | 1,925 | 42.4 | 71.5 |
| Mississauga Halton | 1,753 | 1,057 | 1,117 | 2,810 | 2,870 | 61.1 | 62.4 |
| Toronto Central | 2,337 | 5,780 | 675 | 8,117 | 3,012 | 77.6 | 28.8 |
| Central | 2,372 | 1,499 | 2,060 | 3,871 | 4,432 | 53.5 | 61.3 |
| Central East | 3,008 | 1,035 | 2,054 | 4,043 | 5,062 | 59.4 | 74.4 |
| South East | 1,879 | 313 | 348 | 2,192 | 2,227 | 84.4 | 85.7 |
| Champlain | 3,412 | 172 | 286 | 3,584 | 3,698 | 92.3 | 95.2 |
| North Simcoe Muskoka | 1,076 | 169 | 813 | 1,245 | 1,889 | 57.0 | 86.4 |
| North East | 1,601 | 13 | 859 | 1,614 | 2,460 | 65.1 | 99.2 |
| North West | 924 | 16 | 63 | 940 | 987 | 93.6 | 98.3 |
| ONTARIO | 31,024 | 12,223 | 12,223 | 43,247 | 43,247 | 71.7 | 71.7 |

Data Sources: DAD, NACRS, SDS

Table A26. Number of day surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| LHIN | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 3,431 | 95 | 504 | 3,526 | 3,935 | 87.2 | 97.3 |
| South West | 4,298 | 864 | 882 | 5,162 | 5,180 | 83.0 | 83.3 |
| Waterloo Wellington | 2,563 | 653 | 486 | 3,216 | 3,049 | 84.1 | 79.7 |
| Hamilton Niagara Haldimand Brant | 7,106 | 437 | 735 | 7,543 | 7,841 | 90.6 | 94.2 |
| Central West | 1,025 | 585 | 1,474 | 1,610 | 2,499 | 41.0 | 63.7 |
| Mississauga Halton | 3,110 | 1,521 | 1,059 | 4,631 | 4,169 | 74.6 | 67.2 |
| Toronto Central | 2,078 | 2,970 | 1,172 | 5,048 | 3,250 | 63.9 | 41.2 |
| Central | 3,462 | 2,029 | 1,877 | 5,491 | 5,339 | 64.8 | 63.0 |
| Central East | 5,143 | 1,306 | 1,481 | 6,449 | 6,624 | 77.6 | 79.7 |
| South East | 3,105 | 520 | 260 | 3,625 | 3,365 | 92.3 | 85.7 |
| Champlain | 5,197 | 178 | 482 | 5,375 | 5,679 | 91.5 | 96.7 |
| North Simcoe Muskoka | 2,009 | 308 | 600 | 2,317 | 2,609 | 77.0 | 86.7 |
| North East | 2,901 | 29 | 446 | 2,930 | 3,347 | 86.7 | 99.0 |
| North West | 1,501 | 8 | 45 | 1,509 | 1,546 | 97.1 | 99.5 |
| ONTARIO | 46,929 | 11,503 | 11,503 | 58,432 | 58,432 | 80.3 | 80.3 |

Data Sources: DAD, NACRS, SDS

Table A27. Number of inpatient non-elective surgeries performed within LHIN and to LHIN residents, by Local Health Integration Networks, Ontario, 2005/06

| LHIN | Number performed to residents within residential LHIN | Number performed on residents from other LHINs | Number performed on residents traveling outside of LHIN | Total number of surgeries provided within LHIN | Total number of surgeries provided to LHIN residents | Retention rate (%) | Local Service Rate (%) |
|----------------------------------|---|--|---|--|--|--------------------|------------------------|
| | (A) | (B) | (C) | (A+B) | (A+C) | A/(A+C) | A/(A+B) |
| Erie St. Clair | 1,548 | 30 | 364 | 1,578 | 1,912 | 81.0 | 98.1 |
| South West | 3,045 | 673 | 278 | 3,718 | 3,323 | 91.6 | 81.9 |
| Waterloo Wellington | 1,584 | 177 | 432 | 1,761 | 2,016 | 78.6 | 89.9 |
| Hamilton Niagara Haldimand Brant | 4,828 | 414 | 386 | 5,242 | 5,214 | 92.6 | 92.1 |
| Central West | 897 | 366 | 707 | 1,263 | 1,604 | 55.9 | 71.0 |
| Mississauga Halton | 1,306 | 389 | 795 | 1,695 | 2,101 | 62.2 | 77.1 |
| Toronto Central | 2,403 | 3,313 | 552 | 5,716 | 2,955 | 81.3 | 42.0 |
| Central | 2,173 | 810 | 1,387 | 2,983 | 3,560 | 61.0 | 72.8 |
| Central East | 2,696 | 495 | 1,246 | 3,191 | 3,942 | 68.4 | 84.5 |
| South East | 1,875 | 201 | 157 | 2,076 | 2,032 | 92.3 | 90.3 |
| Champlain | 3,729 | 209 | 159 | 3,938 | 3,888 | 95.9 | 94.7 |
| North Simcoe Muskoka | 946 | 163 | 402 | 1,109 | 1,348 | 70.2 | 85.3 |
| North East | 1,775 | 59 | 404 | 1,834 | 2,179 | 81.5 | 96.8 |
| North West | 947 | 15 | 45 | 962 | 992 | 95.5 | 98.4 |
| ONTARIO | 29,752 | 7,314 | 7,314 | 37,066 | 37,066 | 80.3 | 80.3 |

Data Sources: DAD, NACRS, SDS