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Title:

Virtual Care in Ontario Community Health Centres: A Cross-Sectional Study to Understand Changes in Care Delivery

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Abstract

Background: Virtual delivery of primary care has seen a massive adoption as a result of the COVID-19 pandemic.

Aim: In this descriptive study, we use an equity lens to explore the impact of transitioning to greater use of virtual care in community health centres (CHCs) across Ontario, Canada.

Design and Setting: We administered a cross-sectional survey and extracted electronic medical record (EMR) data from thirty-six CHCs.

Methods: The survey captured CHC's experience with the increased adoption of virtual care. A longitudinal analysis of the EMR data was conducted to evaluate changes in health service delivery. EMR data was extracted monthly for a period of time prior to the pandemic (April 2019 - February 2020) and during (April 2020 – February 2021).

Results: In comparison to the pre-pandemic period, CHCs experienced a moderate decline in visits made (11%), patients seen (9%), issues addressed (9%), and services provided (15%). During the pandemic period, an average of 54% of visits were conducted virtually with phone as the leading virtual modality (96%). Drops in service types ranged from 82% to 28%. The distribution of virtual modalities varied according to the provider type. Access to in-person and virtual care did not vary across patient characteristics.

Conclusion: Our results demonstrate a large shift towards virtual delivery while maintaining in-person care. We found no meaningful differences in virtual versus in-person care related to patient characteristics or rurality of centres. Future studies are needed to explore how to best select the appropriate modality for patients and service types.

Keywords: primary health care, virtual care, COVID-19

How this fits: The COVID-19 pandemic resulted in a massive shift towards virtual delivery of primary health care. Published studies have reported changes in healthcare visits and services however, this study reports changes in visit modality (i.e. in-person, phone, video, text/email) along with changes in the number of health care visits, services provided, and issues addressed. Our study also uses an equity lens to examine the distribution of visit modalities across sociodemographic factors (e.g. gender, income, education, etc.) of patients. This paper adds to the existing literature on the impact of the COVID-19 pandemic to healthcare service delivery and will be helpful for primary care organizations working towards providing more equitable care.

Introduction

Virtual delivery of primary care is not an innovation. In fact an article in an 1879 medical journal mentions the use of phone visits as a means to reducing office visits.¹ However, only recently has there been widespread adoption of virtual care due to the COVID-19 pandemic. Prior to the pandemic, many barriers prevented greater implementation and use. For example, according to the Canadian Medical Association, the most notable challenge preventing greater uptake has been the absence of billing codes relevant to virtual care and reimbursement issues.² Other commonly cited challenges include provider and patient readiness, worsening inequitable access to technology and resources, low digital literacy, concerns regarding the security and privacy of information, and quality of care concerns (e.g. uncertainty on how to triage patients for certain modalities of care).³⁻⁸

These concerns, especially those related to exacerbating inequitable access, were shared by the Ontario Community Health Centres (CHCs) during the rapid adoption of virtual care. CHCs, are comprehensive, interprofessional, salary-based primary health care organizations with a long history of serving marginalized communities and addressing social determinants of health. CHC priority populations include people living in poverty, those in rural and remote areas as well as those facing other barriers to access such as newcomers and people experiencing homelessness.⁹⁻¹¹ With the advent of the COVID-19 pandemic and government-mandated physical distancing, primary care practices, including CHCs were required to rapidly shift and offer virtual delivery of care.¹² A number of studies have demonstrated that this accelerated transition to virtual care led to changes in healthcare visits and visit modalities using electronic medical record and billing data.¹³⁻¹⁶ Yet, currently there is limited literature on the distribution of specific virtual modalities of care for issues addressed, services provided, provider types and patient sociodemographic characteristics. In this descriptive study, we use an equity lens to explore the impact of transitioning to greater use of virtual delivery of primary care in CHCs.

Methods

Study design and setting

We conducted a cross-sectional survey of CHCs to capture their experience with the increased use of virtual delivery of care during the COVID-19 pandemic, and a longitudinal analysis of electronic medical record data to evaluate changes in health service delivery over time.

Study population

All 73 CHCs operating in Ontario were eligible for the study. An invitation to participate in the study was sent to all CHCs in May 2020. Only patients who had at least one CHC visit during the 22 months study span were analysed.

Data sources and collection

We sent an e-survey link to the organizational survey to clinical directors at each participating centre on July 6th 2020, and requested it be completed within three weeks. The 8-page survey was created based on existing literature on virtual care at the time of the study. The electronic survey captured information regarding rurality, staffing structure, which primary care services were performed virtually (i.e. phone, video, text/email), how centres transitioned services for virtual delivery as well as implementation challenges incurred (Supplementary Appendix 1.).

All Ontario CHCs use a common Electronic medical record (EMR) and the same reporting data standards. Each centre's EMR is extracted nightly to a centralized data warehouse where it is validated. From this data warehouse, we extracted patient sociodemographic information, encounter information including visit modality (i.e. in-person, phone, video, text/email), services provided, issues addressed, and provider type, all of which were inputted directly into the EMR by providers. Issues addressed refers to the specific health concerns including those related to the determinants of health that were addressed during the visit. Provider types included physicians, nurse practitioners, nurses, chiropodists, counselors, dietitians and diabetes educators. EMR data was extracted monthly for a period of time prior to the pandemic period (April 1st 2019 - February 28th 2020) and during (April 1st 2020 – February 28th 2021).

Statistical analysis

We analyzed EMR data at the practice level, and report the monthly mean and standard deviation as well as median and interquartile range for the total number of visits, virtual visits, unique patients seen, issues addressed and services provided. We grouped the issues addressed into 12 broad clinically meaningful categories, which were validated by a CHC clinician and the research team (see Supplementary Table 1.). The distribution of each visit modality type for all 12 categories was calculated for the COVID-19 time period only. We calculated the percent change for each service type across the two time periods. Distribution of modalities was calculated for each provider type and sociodemographic variable (e.g. age, gender, education, preferred language of service, household income, and household composition). We also analysed the data stratified by rurality to observe differences between urban and rural contexts.

Results

CHC characteristics

Thirty-six (49%) CHCs consented to the study, which were generally comparable to CHCs in Ontario with respect to geography, populations served and size. Participating organizations had on average 28 full time equivalent staff and 4,820 registered patients, and most (61%) were located in urban areas (see table 1). Patients were primarily female (58%), older than 61 years of age, and over a quarter had completed high school education or less.

Most practices reported they felt reasonably prepared to offer virtual delivery for primary care (27, 75%) and health promotion (22, 61%) services. Common challenges reported related to availability of resources required to deliver and receive virtual services (17, 47%), and the patients' digital literacy (14, 47%). Centres reported concerns specifically for those living in poverty, seniors, newcomers, those experiencing homelessness, and mental health and addictions.

Transition to virtual care

In comparison to the pre-pandemic time period, the number of activities taken place monthly over the study 11 months period declined (Table 2). The average monthly number of visits, unique patients seen, issues addressed, and services provided dropped between 9% and 15%.

Prior to the pandemic, on average 88% of care was provided in-person (figure 1). Over the course of the pandemic period however, virtual visits made up, on average, 54% of visits. Phone was the leading virtual modality used (96%), while video (2%) and text/email (2%) based visits were rare. The latter two were most commonly used for issues related to mental health, determinants of health, and pain (Figure 2). Video platforms used included Ontario Telehealth Network, TELUS Practical Solutions Suite, Zoom, and Social media (for health promotion programs). Table 3 summarizes the top 20 service types in which the greatest decreases and increases in service provision were observed. Drops in services ranged from 82% to 28%, with the greatest declines seen in written patient care instructions (82%) and periodic health examinations (73%). The greatest increase in service provision was seen in services related to palliative care (212%) and individual counselling (85%).

Physicians, nurse practitioners, and nurses had a similar distribution of in-person to virtual visits, with a mean of 52% ($SD=0.05$) of visits conducted virtually. Of virtual modalities, an average of 96% ($SD=0.01$) of visits were conducted over phone, with only 2% ($SD=0.005$) through video and 1% ($SD=0.004$) conducted using text/email. In contrast, diabetes educators, dietitians, and counselors conducted on average 77% ($SD=0.07$) of their visits through virtual delivery. Chiropodists, however had on average 74% of visits conducted in-person.

When evaluating the distribution of all modalities across patient's socioeconomic status during the pandemic time period, an almost even distribution of in-person and virtual visits was seen (see table 4). There were no noticeable differences in access to the three virtual modalities across patient factors. In addition, urban and rural sites had very similar ruse of virtual and in-person care (data not shown).

Discussion

Summary

Over the course of the pandemic period, CHCs experienced a moderate decline in visits made, patients seen, issues addressed, and meaningful changes in the types of services provided. Care delivered virtually was primarily done through phone visits, with very little use of video or text/email based visits. The distribution of virtual modalities across providers varied according to the provider type with interprofessional team members (aside from chiropodists) providing a greater proportion of their care virtually. Chiropodists, due to the nature of their profession, had the greatest proportion of in-person visits. Access to in-person and virtual care did not vary across patient characteristics suggesting equitable access to all modalities of care.

Strengths and limitations

This study's strengths include: extraction of data from EMR; access to data on visit modalities for issues addressed, services provided, and provider types including interprofessional team members; and sociodemographic data from patient populations who often face multiple barriers to accessing care. We

were unable to report on the use of multiple modalities in a single visit; visit type may have been misclassified in some cases as the EMR template defaults to “in person” unless the provider changed it to another type.

Comparison with existing literature

Despite CHCs offering little virtual care prior to the pandemic, over half of centres felt prepared in shifting towards greater use of virtual modalities due to the COVID-19 pandemic. This may in part be due to CHCs employing a salary funded model which, unlike other models, would not have been influenced by the availability of billing codes.^{2, 5-7, 17}

Knowing that various determinants of health can affect access to digital technology and digital literacy,¹⁹⁻²⁰ the CHCs’ emphasis in maintaining in-person care may have prevented a greater decrease in overall visits compared to other primary care settings. For example, according to a systematic review, the median reduction in health care visits was 42%, nearly double the decline observed in CHCs.¹⁴ Furthermore, a Canadian study looking at physician billing data, reported a mean reduction of 28% for total visits, far greater than the 11% seen in our study.¹³ The study also observed a greater decline of in-person visits (i.e. 79% vs 48% in our study) and a higher average of virtual visits (i.e. 71 % in our study vs 54%).¹³

In our study, the limited use of video and text/email based visits was expected, as concerns about patient access to Wi-Fi and digital literacy were reported by almost half of participating CHCs. A survey conducted by Canada Health Infoway, similarly reported phone visits as the main virtual modality.¹⁸ Between April to August 2020, approximately 76% of virtual visits in Ontario, were conducted over phone, 20% over video and 5% through secure messaging. Other provinces also reported similar distributions.¹⁸

Our data demonstrated large increases in palliative care and mental health services. This rise in palliative care supports may have been a result of COVID-19 restrictions further restricting access to an already limited service²² and CHC providers stepping in to address this increased demand. As the pandemic has also exacerbated issues related to mental health²³, it is no surprise that CHCs responded to the needs of their patients by increasing these supports by 85%.

Despite concerns that patients who were poorer or had other barriers to access would be disadvantaged by the shift to virtual care, visit modalities did not vary across any patient characteristics. The even distribution among phone versus in-person visits could be a result of CHC’s recognizing the impact of limiting in-person visits as well as inequitable access to virtual care earlier on, and procuring phones and data plans to patients in order to maintain their access to care.²⁴ We had also anticipated greater use of video visits among those with higher education and household income as internet access and digital literacy is influenced by socioeconomic factors.²⁵ However, since the use of phone was the primary source of virtual visits, this may have resulted in other barriers not being identified.²⁶ Overall, our study results points to a rapid, equitable shift to virtual care while maintaining in-person care when needed. In-person service delivery was on-going and the shift in types of service demonstrated a responsiveness to the emerging needs of the patients.

Relatedly, our data did not demonstrate any considerable differences due to rurality with respect to both changes in primary care services and distribution of visit modalities. The even distribution of video visits was especially unexpected, given how unequal access to high-speed internet is across the country. The Canadian Radio-television and Telecommunication Commission (CRTC) has highlighted a significant digital equity gap in regard to rural households accessing reliable and affordable high-speed internet.²⁷ They report that only 37% of rural households in 2017 had adequate internet speeds, including those required for telehealth services, in comparison to 97% of urban homes.²⁷ Within this context, we had expected to see a greater use of video based visits amongst urban centres.

Implications for research and practice

The results of this study describe the challenges experienced by CHCs during the rapid transition to virtual care as well as impacts on primary care service delivery. Our results demonstrate a large shift towards virtual delivery while maintaining in-person care and increases in specific services presumably as a response to patient's needs. We found no meaningful differences in virtual vs in person care related to patient characteristics or rurality of centres. Future studies are needed to explore the distribution of modalities for different types of care and services in other primary care settings as well as how to best select the most appropriate modality for patients and service types.

Additional Information

Funding: This project was conducted without any funding.

Ethical Approval: The study protocol was approved by the Research Ethics Board at Western University (#116036).

Competing interests: The authors declare no competing interests.

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Table 1 - CHC and patient characteristics	
Community Health Centres (n=36)*	
	<i>Mean (SD)</i>
Average number of registered clients	8,897 (5,035)
Size of practice (average FTE for all staff)	28 (17)
	<i>N (%)</i>
Urban	22 (61%)
Patient characteristics (n=173,503)**	
<i>Age</i>	
0-12	14,616 (8%)
13-26	21,239 (12%)
27-40	29,985 (17%)
41-60	47,606 (27%)
61+	60,057 (35%)
<i>Female</i>	99,990 (58%)
<i>English as preferred language of service</i>	124,547 (72%)
<i>Highest level of education</i>	44,651 (26%)
<i>Household income</i>	
\$0 - 24,999	37,343 (22%)
\$20,000 - 59,999	22,615 (13%)
\$60,000+	16,314 (9%)
Unknown	97,231 (56%)
<i>Living alone</i>	22,316 (13%)
*Data source: Organizational Survey	
**Data source: EMR	

**Table 2 - Median and Mean numbers of visits, patients, issues addressed and services provided
April 2019 - February 2020 (pre-COVID-19) and April 2020 - February 2021 (COVID-19)**

Variable	Pre-COVID-19 (n=396)		COVID-19 (n=396)		Mean % change	Median % change
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)		
Total visits	2901.6 (1447)	2721.5 (1764, 3592)	2572 (1482)	2145 (1510, 3209)	11%	-21%
Total patients seen	480.7 (307)	429.5 (252, 617)	438.8 (257)	396 (259, 552)	9%	-8%
Total issues addressed	6349.3 (3930)	5697 (3940, 7176)	5771 (4729)	4687 (3406, 6553)	9%	-18%
Total services provided	8976.3 (5574)	7662.5 (6417)	7596 (6417)	5799 (3866, 9213)	15%	-24%

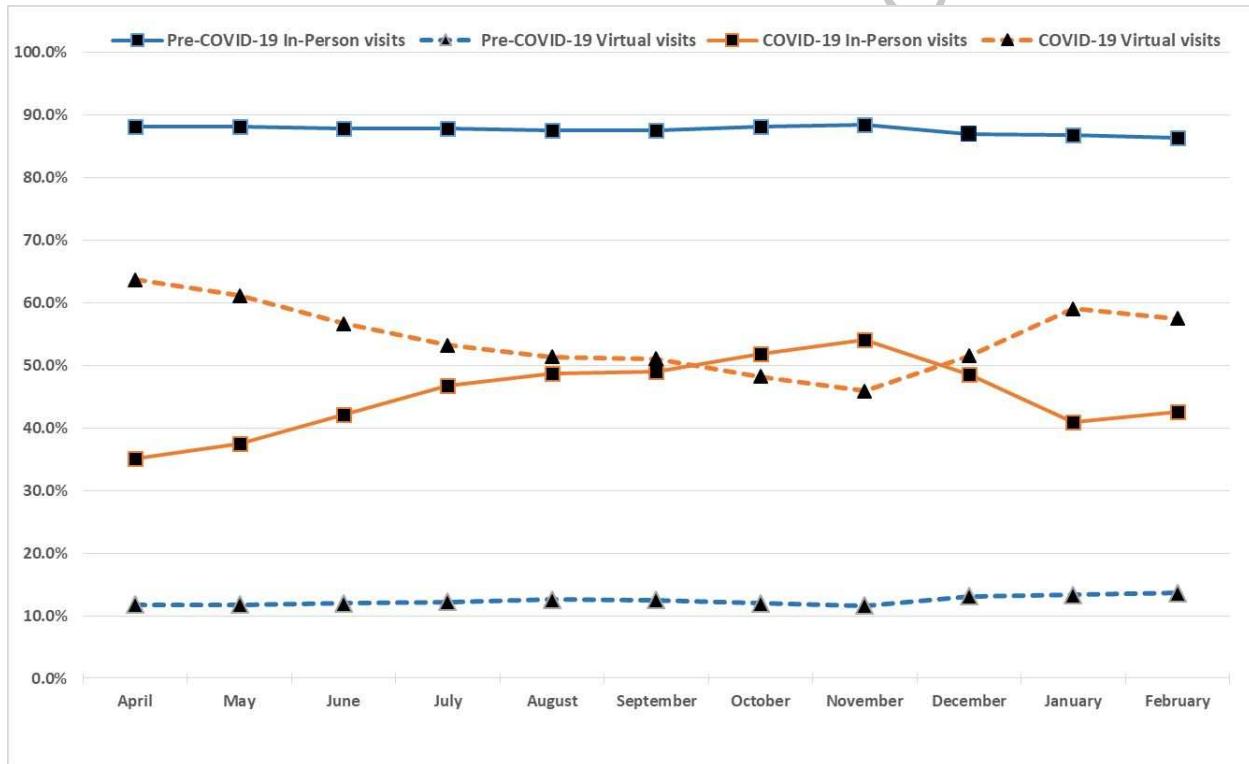


Figure 1. Monthly primary care visits by visit type (in-person, virtual), April 2019 - February 2020 (pre-COVID-19) and April 2020 - February 2021 (COVID-19)

0.2021.0239

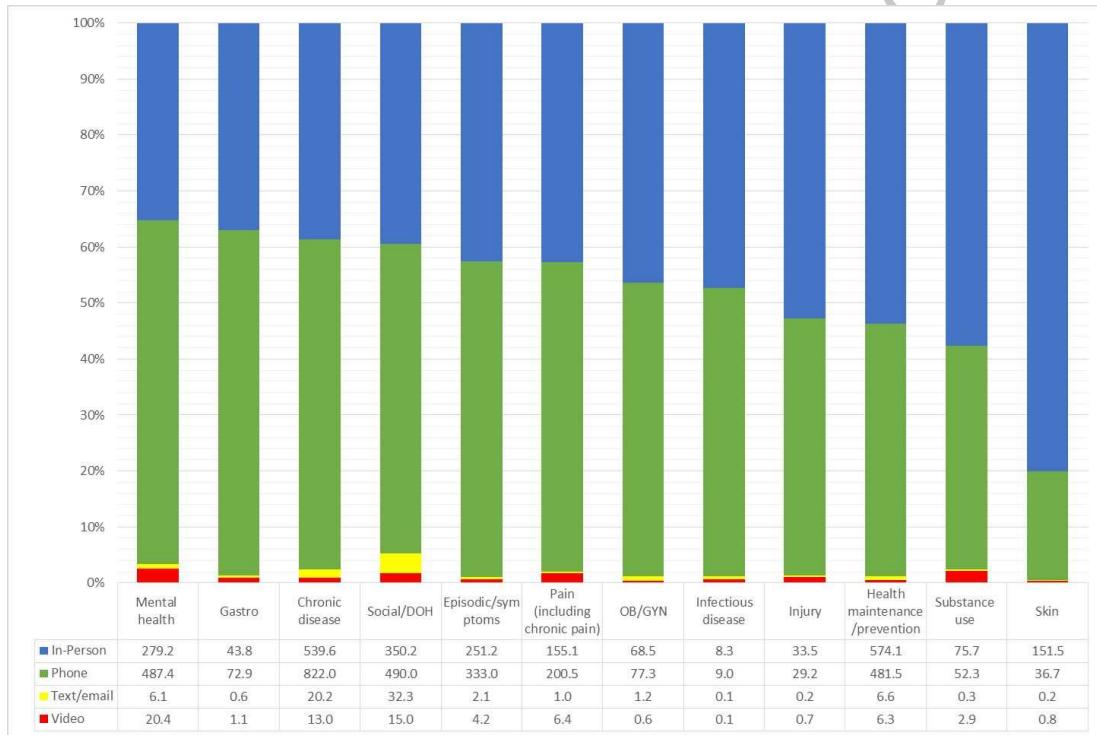


Figure 2. Issues addressed by visit modality during pandemic period, April 2020 - February 2021

O.2021.0239

Table 3 - Total number of services provided, April 2019 - February 2020 (pre-COVID-19) and April 2020 - February 2021 (COVID-19)

Service type	Sum of service type provided Pre-COVID-19 (n=36)	Sum of service type provided COVID-19 (n=36)	% Change
Written client care instructions	3977	710	-82%
Periodic health examination	9736	2601	-73%
Well child health examination	3300	1506	-54%
Foot care	53774	25155	-53%
Accompaniment	7351	3768	-49%
Physical therapy	23386	13016	-44%
Forms completion	47509	28507	-40%
Preventive care	127353	86925	-32%
Interpretation services	18783	13541	-28%
Client intake	42629	30879	-28%
Recommendation/assistance	104309	125904	21%
Postnatal care	1201	1464	22%
Health card registration	1593	1958	23%
Case management	65805	81043	23%
Care plan documentation	11334	13979	23%
Mental health care	34160	42207	24%
Breastfeeding counselling	2055	2653	29%
Occupational therapy	1304	1691	30%
Individual counselling	35439	65469	85%
Palliative care	350	1092	212%

Table 4 - Patient characteristics by visit modality

Sociodemographic Variable	In-person	Phone	Text/Email	Video	n (%)
Age					
0-12	18 652 (60.7)	11 271 (36.7)	518 (1.7)	263 (0.9)	
13-26	21 591 (43.9)	25 078 (51.0)	1362 (2.8)	1154 (2.3)	
27-40	36 415 (45.1)	41 230 (51.1)	1610 (2.0)	1465 (1.8)	
41-60	58 937 (43.9)	71 449 (53.2)	2037 (1.5)	1871 (1.3)	
61-75	51 762 (46.6)	57 129 (51.4)	946 (0.9)	1216 (1.1)	
76+	28 708 (50.6)	27 180 (50.6)	347 (0.6)	508 (0.9)	
Gender					
Female	127 216 (45.3)	145 205 (51.8)	4001 (1.4)	4106 (1.5)	
Male	84 591 (49.0)	83 845 (48.6)	2161 (1.3)	2031 (1.2)	
Other	4258 (44.9)	4287 (45.2)	658 (6.9)	280 (3.0)	
Education					
High school or less	74 366 (47.1)	80 263 (50.8)	1620 (1.0)	1598 (1.0)	
Post secondary or equivalent	49 297 (44.0)	59 932 (53.5)	1120 (1.0)	1659 (1.5)	
Other	92 402 (47.9)	93 142 (48.3)	4080 (2.1)	3160 (1.6)	
Income					
\$0 to \$14,999	34 070 (46.3)	37 835 (51.4)	929 (1.3)	817 (1.1)	
\$15,000 to \$19,999	11 606 (46.3)	12 903 (51.5)	271 (1.1)	288 (1.1)	
\$20,000 to \$24,999	8687 (45.7)	9886 (52.0)	225 (1.2)	198 (1.0)	
\$25,000 to \$29,999	5966 (46.4)	6629 (51.6)	99 (0.8)	153 (1.2)	
\$30,000 to \$34,999	6137 (46.4)	6835 (51.7)	120 (0.9)	135 (1.0)	
\$35,000 to \$39,999	4965 (45.4)	5795 (53.0)	70 (0.6)	99 (0.9)	
\$40,000 to \$59,999	12 029 (45.4)	13 817 (52.2)	260 (1.0)	375 (1.4)	
Greater than \$60,000	18 487 (44.6)	21 865 (52.8)	374 (0.9)	699 (1.7)	
Other	114 118 (47.5)	117 772 (49.1)	4472 (1.9)	3653 (1.5)	
Spoken language					
English	157 037 (45.7)	177 566 (51.7)	4705 (1.4)	4461 (1.3)	
French	6837 (47.8)	7094 (49.6)	148 (1.0)	222 (1.6)	

	Other	52 191 (49.9)	48 677 (46.6)	1967 (1.9)	1734 (1.7)
Household Composition					
	Living with others	94 027 (46.0)	106 255 (51.9)	1924 (0.9)	2420 (1.2)
	Living alone	28 243 (48.8)	30 634 (50.9)	630 (1.0)	702 (1.2)
	Other	93 795 (50.9)	96 448 (48.8)	4266 (2.2)	3295 (1.7)
Overall		216 065 (46.7)	233 337 (50.4)	6820 (4.5)	6417 (1.4)