Youth health care utilization in Nova Scotia: What is the role of age, sex and socio-economic status?

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ABSTRACT

OBJECTIVE: Youth have distinct health care needs that are not always met within a framework designed for children or adults. In Canada, little attention has been given to how youth utilize health care services and limited data are available. The aim of this study was to identify whether age, sex, socio-economic status (SES) and geographic location were significant mediators of youth health care utilization in Nova Scotia.

METHODS: The NSYOUTHS database comprises health care utilization information for all youth aged 12 to 24 years, resident in Nova Scotia between 1997 and 2007. We calculated health care utilization rates by provider, stratified by sex, age, SES, urban/rural residence and year. Negative binomial regression was used to model the variation in health care utilization by sex, SES and urban/rural location.

RESULTS: Health care utilization declined over time and varied by age. Females were more frequent users of services. Youth from lower SES areas had fewer family physician contacts but more outpatient, emergency and inpatient contacts compared to those from higher SES areas. Rural residents had fewer family physician and emergency contacts but more outpatient contacts than youth from urban areas. Ten percent of the youth were responsible for 32% of all health care contacts, whereas 11% had no health care contacts.

CONCLUSION: Specific subgroups, including youth from rural areas and of lower SES, utilize health care services differently than other youth. The challenge is to provide health care that is responsive to the needs of this heterogeneous population. Meeting this challenge requires accurate information on youth health care utilization.

KEY WORDS: Youth; health service utilization; socio-economic status; geography

La traduction du résumé se trouve à la fin de l'article.

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Youth, who experience major changes in physical, mental and social development,^{1,2} have distinct and unique health care needs related to this critical transition period in their development.^{3,4} These needs are often not well met within a framework that is designed either for children or adults.⁵ Changes in health, including an increased burden of mental disorders, increasing autonomy and an emerging capacity for self-initiated health-seeking behaviour, are all features of the transition period from child to adult.³ However, despite the challenges involved in delivering appropriate services to youth, little attention has been devoted to how health services are best delivered to this age group.⁶

Data on youth health care utilization are published annually in the United States (US)⁷⁻¹⁰ and elsewhere.¹¹ However, in Canada there is no systematic provision of such information, and published data are limited to specific subgroups¹² or chronic diseases,¹³ or focused on gender-related factors.¹⁴ Comprehensive information on patterns of health care use by youth in Canada is therefore warranted. Vingilis et al.¹ examined health care utilization rates in a longitudinal cohort of Canadian adolescents aged 12-19 years ($n=1,493$) from the Canadian National Population Health Survey (1994/1996). Rates of physician utilization were higher for females and for older adolescents.¹ Conversely, studies from the US suggest that family physician utilization declines with age during adolescence, although this is largely attributable to a decline in non-emergency use among males.¹⁵ Youth tend to over-utilize emergency settings,

particularly socio-economically disadvantaged youth.^{16,17} In general, US youth are under-represented in their use of family physicians, with respect to their population size, compared to children and adults.¹⁵ Utilization of health services in the US has been shown to be lower among low income youth,^{4,17} although data on socio-economic disparities in youth health care utilization are limited in Canada. There is no specific age when youth enter the adult health care system, and the transition age range is usually patient-/provider-specific. In general, many paediatric services use age 18 or 21 years as the upper limit.^{18,19} Many services in Nova Scotia use age 16 as the transition age, although this varies by condition.

How to provide health care that is efficient, effective and appropriate to meet patients' needs across all age groups is a critical issue for health care systems in Canada. The challenge is to optimize delivery of resources without increasing costs, while meeting patient needs. To help address this challenge, this study describes health care utilization by youth in Nova Scotia. Our objective was to identify whether age, sex, socio-economic status

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Table 1. Rate of health care contacts per person-year by service provider type

	Rate of health care contacts per person-year				
	All providers	Family physician	Inpatient	Emergency	Outpatient specialist
Overall	3.5	3.0	0.09	0.29	0.29
Sex					
Female	4.7	4.1	0.12	0.32	0.34
Reproductive health	0.9	0.8	0.05	0.01	0.03
Non-reproductive health	4.1	3.4	0.07	0.31	0.31
Male	2.2	1.9	0.06	0.26	0.24
Socio-economic status					
1 Lower	3.6	2.9	0.10	0.33	0.43
2	3.4	2.9	0.09	0.28	0.39
3	3.4	3.0	0.08	0.30	0.25
4 Higher	3.4	3.1	0.07	0.25	0.13
Urbanicity					
Rural	3.4	2.9	0.09	0.28	0.35
Urban	3.5	3.1	0.09	0.30	0.26
Age (years)					
12	2.4	2.1	0.04	0.24	0.25
13	2.6	2.2	0.05	0.25	0.26
14	2.9	2.5	0.06	0.27	0.29
15	3.1	2.7	0.07	0.28	0.30
16	3.4	2.9	0.08	0.30	0.33
17	3.6	3.1	0.09	0.32	0.33
18	3.6	3.1	0.09	0.33	0.31
19	3.8	3.2	0.10	0.34	0.31
20	3.8	3.3	0.11	0.33	0.30
21	3.8	3.3	0.11	0.30	0.28
22	3.8	3.3	0.11	0.29	0.28
23	3.9	3.4	0.12	0.28	0.29
24	4.0	3.5	0.12	0.28	0.29
Year					
1997	3.7	3.1	0.10	0.33	0.36
1998	3.6	3.1	0.10	0.32	0.36
1999	3.5	3.0	0.10	0.33	0.33
2000	3.4	2.9	0.10	0.31	0.31
2001	3.4	2.9	0.09	0.32	0.29
2002	3.4	3.0	0.09	0.33	0.28
2003	3.4	3.0	0.09	0.30	0.28
2004	3.3	2.9	0.08	0.24	0.25
2005	3.5	3.1	0.07	0.24	0.27
2006	3.4	3.0	0.07	0.26	0.25
2007	3.4	3.0	0.07	0.24	0.26

(SES) and geographic location were significant mediators of youth health care utilization.

METHODS

The data for this study were derived from the NSYOUTHS database. NSYOUTHS is a comprehensive longitudinal dataset built from administrative health records, including physician billings records and the Canadian Institute for Health Information (CIHI) Discharge Abstract Database (DAD). NSYOUTHS details health care utilization information for all youth aged 12 to 24 years, resident in Nova Scotia between 1997 and 2007, and eligible for insured health care services paid for by Nova Scotia Medical Services Insurance (MSI). The process for linking datasets has been described in detail elsewhere.²⁰ In summary, all eligible youth were derived from the Nova Scotia MSI Registry and linked to health care utilization data by health card number. The database contains all family physician, emergency department, outpatient specialist and inpatient contacts. Additional information includes: sex, age at health care contact, urban/rural residence (derived from home postal code) and community SES, derived from the median household income of the census dissemination area of residence.

We calculated health care contact rates per person-year by service type (family physician, inpatient, outpatient specialist, emergency), stratified by sex, age, SES and year. Female rates were

calculated overall and stratified into reproductive* and non-reproductive health. Health care utilization rates – by year, age, sex, urban/rural residence and SES – were calculated per person-year for each service type. In addition, health care contact rates, by service type, were classified by service utilization into percentile groups (95th, 90th, median, 10th and non-users) to allow comparison between the contact rates for those with the highest and those with lower utilization. There was significant overdispersion in the data and therefore negative binomial regression²² was used to model the variation in health care utilization. In this model, the response variable was the count of unique health care contacts and the total person-years in each strata was used as an offset to account for population. Hence, the rate of contacts per person-year was defined as the incidence rate. In the model, the independent variables were: sex, SES, urban/rural (categorical variables), age and year (continuous variables). Incidence rate ratios (IRR) and 95% confidence intervals (CIs) are reported. The estimated IRRs for year and age were used to derive the percentage change in health care utilization by year and age. The significance of each variable was assessed from the *p*-value derived from the likelihood ratio test statistic.²² Statistical analysis was undertaken using SAS 9.1.²³ The study received ethical approval from the IWK Health Centre Research Ethics Board.

* Reproductive health was defined as diagnoses classified with the following International Classification of Disease Ninth Revision, Clinical Modifications (ICD-9-CM)21 codes: V22-V28 (persons encountering health services in circumstances related to reproduction and development) or 630-679 (complications of pregnancy, childbirth, and the puerperium) or V76.2 (routine cervical Papanicolaou smear) or V72.31 (gynecological examination) or V72.4 (pregnancy examination or test) or 795.0-795.1 (abnormal Papanicolaou smear).

Figure 1. Observed and estimated health care utilization rates over time by service provider type
Note: Estimated rate and 95% CI curve obtained from polynomial fitting on the rate and corresponding estimated 95% CIs.

Table 2. Incidence rate ratios (IRRs) for youth use of health care services by sex, socio-economic status and urbanicity

	All providers		Family physician		Inpatient		Emergency		Outpatient	
	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Sex										
Female	1.96	1.93-2.00	2.15	2.11-2.19	1.95	1.9-2.0	1.18	1.16-1.20	1.40	1.37-1.43
Male	1	—	1	—	1	—	1	—	1	—
Urbanicity										
Urban	0.98	0.96-0.99	0.96	0.94-0.97	1	0.97-1.03	0.90	0.88-0.91	1.31	1.28-1.34
Rural	1	—	1	—	1	—	1	—	1	—
Socio-economic status										
1 Lower	0.99	0.97-1.02	0.87	0.85-0.89	1.22	1.17-1.26	1.19	1.16-1.22	3.38	3.28-3.49
2	0.99	0.96-1.01	0.89	0.87-0.91	1.13	1.09-1.17	1.10	1.08-1.13	2.90	2.81-2.99
3	0.99	0.97-1.02	0.94	0.91-0.96	1.10	1.05-1.14	1.18	1.15-1.21	1.81	1.75-1.86
4 Higher	1	—	1	—	1	—	1	—	1	—
Age	1.020	1.018-1.023	1.021	1.019-1.024	1.075	1.071-1.079	1.011	1.008-1.013	1.002	0.999-1.005
Year	0.989	0.989-0.991	0.996	0.993-0.998	0.951	0.947-0.955	0.958	0.956-0.961	0.952	0.949-0.955

IRR adjusted for age and sex.

RESULTS

Over the 11-year period, 326,555 individuals aged 12-24 years were recorded in the NSYOUTHS database, with a total of 1,846,027 person-years. Among these individuals, 289,244 (89%) had at least one health care contact. The total number of health care contacts by provider type was: family physician, 5,507,774; hospital-inpatient, 162,434; outpatient specialist, 541,562; emergency department, 541,023. The rate of family physician contacts per person-year was 3, whereas for the other services the rate was much less than 1 (Table 1).

There was a general decline in health service utilization over the study period (Figure 1); this was most marked for inpatient, outpatient specialist and emergency contacts, which fell by around 5% annually, whereas family physician contacts declined by less than 0.5% annually (Table 2). Health care contacts became more frequent with older ages (Figure 2). Family physician contacts

steadily increased from an average of 2.1 visits per year at age 12 to 3.5 visits per year at age 24. Inpatient contacts tripled between ages 12 to 24. Emergency department contact rates peaked at age 19 and then gradually decreased, but still remained higher at age 24 than at age 12. Outpatient specialist contacts peaked at ages 16-17 and then declined, but also remained higher for the 24 year olds compared to the 12 year olds.

We looked at the distribution of health care contacts for individuals to determine if the annual contact rates were driven by a small number of very-high-frequency users (Table 3). Ten percent of youth were responsible for 32% of health care contacts (Table 3). For inpatient contacts, just 5% of the youth were responsible for 27% of the admissions. Nearly 20% of other contacts (overall and by service type) were attributable to just 5% of the youth (Table 3). Eighty-four percent of the high-frequency users were female but the age distribution of this group was not

Figure 2. Health care utilization rates by year of age for males and females by service provider type

significantly different from the overall population (t -test, $p=0.998$). Maternal diagnoses, mental health, diabetes and cancer were the conditions most commonly associated with the frequent users group (data not shown). In contrast, 11% of the cohort had no formal contact with the health care system at all. Youth with no contact during the study period were on average in the study for a shorter amount of time (3 years) compared to those with health care contacts (6 years). The non-users group was also, on average, older on entry into the study compared to those with health care contacts.

Females were consistently higher users of health care services compared to males – for family physicians and inpatient contacts, females used services twice as much as males (Figure 2, Table 2). Females drove the increase in family physician utilization by age; in fact, family physician contacts for males declined from age 12 onwards (Figure 2). Females also largely drove the increase in inpatient use by age; the utilization rate for males remained similar across all ages after age 15. Outpatient specialist usage peaked around ages 16 to 17 for both females and males, although after age 17, utilization rates remained very similar for females but declined steadily for males until age 21. Emergency department use peaked at age 19 for both males and females and then declined steadily (although overall was still higher for 24 year olds than for 12 year olds).

Youth from lower SES areas had significantly fewer visits to family physicians and a higher number of inpatient, emergency

department and outpatient specialist visits than youth from higher SES areas (Tables 2 and 3). This was most significant for outpatient specialists where youth in the lowest SES quartile had more than triple the number of contacts of those in the highest SES quartile. Inpatient contacts were similar in all SES quartiles up to age 15, after which the lower SES groups had significantly more inpatient admissions compared to the higher SES groups. Emergency department contact rates remained fairly constant among age groups for the highest SES quartile. In contrast, emergency visits for the lowest SES quartile steadily increased with age and were largely responsible for the peak at age 19. Youth in urban and rural areas had a similar number of health care contacts overall, but the distribution by provider differed considerably (Table 2). Youth living in urban areas had higher rates of family physician and emergency department visits and lower rates of specialist contacts than youth living in rural areas. Inpatient contacts were similar in both groups.

DISCUSSION

This study demonstrates widespread heterogeneity, by age, sex, SES and geography, in the utilization of health services by youth in Nova Scotia. Inpatient and family physician use was higher for older youth, although this was largely due to increased health care utilization by females. Youth in their later teenage years were the most frequent users of emergency services and outpatient specialists. Frequent users of the health care system were

Table 3. Count and rate per person-year of health care contacts by service provider type, classified by youth use of services

Frequency of service use [†]	All providers			Family physician			Emergency			Outpatient specialist			Inpatient		
	Number of youth	Rate	% [‡]	Number of contacts	Rate	% [‡]	Number of contacts	Rate	% [‡]	Number of contacts	Rate	% [‡]	Number of contacts	Rate	% [‡]
Very high	16,281	14.5	18.8	1,033,451	11.8	18.8	92,655	1.06	17.1	102,009	1.2	18.8	43,830	0.5	27.0
High	16,319	9.0	13.1	733,058	7.5	13.3	60,068	0.61	11.1	63,936	0.7	11.8	25,046	0.3	15.4
Average	130,517	4.4	53.8	3,000,119	3.7	54.5	277,844	0.34	51.4	277,635	0.3	51.3	78,207	0.1	48.1
Low	126,127	1.3	14.3	741,146	1.0	13.5	110,456	0.15	20.4	97,982	0.1	18.1	14,351	0	9.5
Non-user	37,311	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All youth	326,555	3.5	100	550,774	3.0	100	541,023	0.29	100	541,562	0.3	100	162,434	0.1	100
Summary Statistics															
Maximum		167.0			159.0			61.0			146.0			16.0	
95 th Percentile		10.4			8.8			1.1			1.3			0.5	
90 th Percentile		7.9			6.6			0.8			0.8			0.3	
3 rd Quartile		4.7			4.0			0.3			0.3			0.1	
Median		2.4			2.0			0			0			0	
1 st Quartile		1.0			0.7			0			0			0	
10 th Percentile		0			0			0			0			0	
Minimum		0			0			0			0			0	
Quartile range		3.7			3.3			0.3			0.3			0.1	

[†] Service use groupings defined by percentiles: Very High (95th percentile), High (90th percentile); Average (Median), Low (10th percentile) and non-users.
[‡] Percentage of all contacts.

significantly more likely to be female than male. Youth from lower SES areas utilized health services differently than those from higher SES areas; in particular, they had fewer family physician contacts but more emergency, inpatient and outpatient specialist contacts.

On average, each youth had 3.0 family physician visits per year, which is similar to data reported in other Canadian (2.8 visits)¹ and US (3.3 visits)⁴ studies. However, there was a decrease in health care utilization for youth over the study period, during a time when the population remained relatively stable,²⁴ with the hospitalization rate experiencing the largest decline. Although this change may be due in part to a shift to more outpatient management, outpatient specialist, emergency department and family physician contacts also declined. The pregnancy rate among youth aged 15-19 dropped by 45% in Nova Scotia from 1994 to 2004,²⁵ which likely contributed to the decline in female contacts. It is also possible that some youth access more anonymous health care, which is not recorded in administrative databases. For example, public health initiatives including school-based services increased over the 11-year study period, allowing some youth to have easier access to non-recorded health care.²⁶

Our finding that youth from lower SES areas have lower family physician utilization rates is consistent with data from the US,⁹ despite Canada's publicly funded health care. We also found that Nova Scotia youth living in lower SES areas had higher emergency, outpatient specialist and inpatient utilization rates compared to those from higher SES areas. The biggest difference was in specialist visits; youth from the lowest SES quartile used specialist services over 3 times more than youth from the highest SES quartile. Given that higher SES is linked to better health,²⁷ it is possible that these youth have poorer health in general and more chronic disease, necessitating more specialty visits. Another possible explanation is access and availability of family physician care in lower SES areas; it is possible that some youth in these areas get referred for, and continue with, specialist management because they do not have a regular family physician. Primary care physician supply is associated with higher family physician contact rates and less emergency and specialist service use among children.²⁸ Youth from lower SES areas accounted for the majority of the peak in emergency department contacts at age 19. An assessment of the exact nature of these emergency visits is beyond the scope of this paper, but injury is the leading cause of death and a major source of hospitalization among Canadian youth.²⁹ Variations in the use of primary health care settings and over-reliance on emergency and outpatient specialist care are major concerns given the important role primary care has in health promotion and prevention. Focusing on ways to reach these populations for primary/preventive health care, as well as tackling the broad determinants of health in general, is therefore important.

Our data revealed that youth living in rural areas have fewer visits to family physicians and emergency departments but significantly more specialist visits than their urban counterparts. The differences may reflect the lower density of family physicians in rural areas,³⁰ but there may be other factors, including socio-economic factors or a higher chronic disease burden among rural youth. This evidence suggests there may be an opportunity for health education for both families and physicians in rural areas.

One in ten youth had no formal contact with the health care system. These non-users were more likely to be male, from a lower SES area, or living in an urban area. Non-users were generally older on entry into the study and spent less amount of time in the study, which may account in part for their lack of health care contact. By contrast, we found that 10% of youth were responsible for 32% of health care visits. Previous studies have confirmed that children with medically complex chronic conditions have increased hospital admission rates.³¹⁻³³ Although these medically complex children

make up a relatively small proportion of the population, they account for a substantial proportion of health care costs.³⁴ Further examination of the socio-demographic and health characteristics of this high-frequency-user group is warranted. Understanding the nature of their health care contacts may reveal areas in which quality and efficiency of care can be improved.

The NSYOUTHS database contains comprehensive administrative health record data from all major health care providers over a number of years. By their nature, these data were not collected for research purposes, they were collected largely for payment to physicians or for supporting service delivery.^{35,36} Hence, limitations related to data quality, reliability and completeness are acknowledged. Completeness of the population registry may influence the person-years calculation, although because registration for provincial health benefits is required before health care can be accessed, it is likely that only a small number of eligible youth will be unregistered in the MSI population registry and this small number will not materially impact the person-years calculation. The accuracy of the ICD coding from the physician billing is dependent on the completeness of the physician notes and health care provider coding practices. There may be issues related to the recording of the primary diagnosis, and associated co-morbidities, which can vary by provider.³⁶ Validation studies suggest that hospital administrative data accurately record major procedures but are poor for recording routine and minor procedures.³⁵ However, we were less interested in specific diagnoses and disease burden, which we did not explore, because we used the billing information for the purpose of calculating contact rates. Only formal health care contacts were captured and we were unable to include anonymous health care visits, school-based services or other non-standard provision, which may be important sources of health care for youth. Due to the nature of administrative health data, no person-level contextual data, such as ethnicity, sexual orientation or family situation, were available and these may be important influences on health care utilization and health-seeking behaviour. Linked to this lack of contextual data, we have very limited information about the characteristics of the non-users of health care, especially whether these were non-users due to good health status or non-users due to disadvantaged access to services. Our data set was limited to health care contacts up to 2007, and it is possible that the trends reported may since have changed. Furthermore, socio-economic conditions and health care provision may have changed in more recent times and this study has not been able to consider these aspects.

CONCLUSION

Unlike the US, Canada has no routine reporting of youth health care utilization and this study represents the first systematic presentation of Nova Scotia youth health care utilization data over an 11-year period. Our findings suggest that there is significant heterogeneity in health care usage by age and sex, by socio-economic status and by urban and rural residence. The analysis has identified specific populations – including rural and lower SES youth – who are potentially underserved with respect to their health care needs, or utilize the health care system in more expensive ways. Given that 1 in 10 youth in Nova Scotia

did not access the formal health care system during the study period, it is important to know whether this reflects a group who have no health care needs or a group with unmet needs. We suggest there is a need for more individualized health care; the challenge is to design new and innovative ways to target the unique health care needs of youth.

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RÉSUMÉ

OBJECTIF : En matière de soins de santé, les jeunes ont des besoins distincts qui ne sont pas toujours satisfaits dans un cadre conçu pour les enfants ou les adultes. Au Canada, on porte peu d'attention à la question de l'utilisation des services de santé par les jeunes, et les données disponibles à ce sujet sont limitées. Nous avons tenté de déterminer si l'âge, le sexe, le statut socioéconomique (SSE) et l'emplacement géographique sont des médiateurs significatifs de l'utilisation des services de santé par les jeunes en Nouvelle-Écosse.

MÉTHODE : La base de données NSYOUTHS contient de l'information sur l'utilisation des soins de santé par tous les jeunes de 12 à 24 ans qui résidaient en Nouvelle-Écosse entre 1997 et 2007. Nous avons calculé les taux d'utilisation des soins de santé par fournisseur et avons stratifié les résultats selon le sexe, l'âge, le SSE, le lieu de résidence (urbain ou rural) et l'année. Par régression binomiale négative, nous avons modélisé les écarts dans l'utilisation des soins de santé selon le sexe, le SSE et le lieu de résidence (urbain ou rural).

RÉSULTATS : L'utilisation des soins de santé diminuait avec le temps et variait selon l'âge. Les jeunes femmes et les filles y avaient recours plus fréquemment que les jeunes hommes et les garçons. Les jeunes des régions de faible SSE avaient moins de contacts avec leurs médecins de famille, mais plus de contacts avec les soins ambulatoires, les urgences et les soins en établissement comparativement aux jeunes des régions de SSE élevé. Les jeunes en milieu rural avaient moins de contacts avec leurs médecins de famille et les urgences, mais plus de contacts avec les soins ambulatoires que les jeunes des zones urbaines. Dix p. cent des jeunes ont eu 33 % des contacts avec les soins de santé, tandis que 11 % n'ont eu aucun contact avec les soins de santé.

CONCLUSION : Certains sous-groupes, dont les jeunes des milieux ruraux et des régions de faible SSE, utilisent les services de santé différemment des autres jeunes. La difficulté est d'offrir des soins de santé adaptés aux besoins de cette population hétérogène. Il faut pour cela avoir de l'information exacte sur l'utilisation des services de santé par les jeunes.

MOTS CLÉS : jeunes; utilisation des services de santé; statut socioéconomique; géographie