Age equity in different models of primary care practice in Ontario

Simone Dahrouge MSc PhD William Hogg MSc MCISc MD FCFP Meltem Tuna MSc PhD Grant Russell MB BS FRACGP MFM PhD
Rose Ann Devlin MA PhD Peter Tugwell MSc FRCPC MD Elizabeth Kristjansson MA PhD

Abstract

Objective To assess whether the model of service delivery affects the equity of the care provided across age groups.

Design Cross-sectional study.

Setting Ontario.

Participants One hundred thirty-seven practices, including traditional fee-for-service practices, salaried community health centres (CHCs), and capitation-based family health networks and health service organizations.

Main outcome measures To compare the quality of care across age groups using multilevel linear or logistic regressions. Health service delivery measures and health promotion were assessed through patient surveys (N=5 111), which were based on the Primary Care Assessment Tool, and prevention and chronic disease management were assessed, based on Canadian recommendations for care, through chart abstraction (N=4 108).

Results Older individuals reported better health service delivery in all models. This age effect ranged from 1.9% to 5.7%, and was larger in the 2 capitation-based models. Individuals aged younger than 30 years attending CHCs had more features of disadvantage (ie, living below the poverty line and without high school education) and were more likely than older individuals to report discussing at least 1 health promotion subject at the index visit. These differences were deemed an appropriate response to greater needs in these younger individuals. The prevention score showed an age-sex interaction in all models, with adherence to recommended care dropping with age for women. These results are largely attributable to the fact that maneuvers recommended for younger women are considerably more likely to be performed than other maneuvers. Chronic disease management scores showed an inverted U relationship with age in fee-for-service practices, family health networks, and health service organizations but not in CHCs.

Conclusion The salaried model might have an organizational structure that is more conducive to providing appropriate care across age groups. The thrust toward adopting capitation-based payment is unlikely to have an effect on age disparities.

EDITOR'S KEY POINTS

- Canada has restructured its primary care models of service delivery, shifting from traditional fee-for-service models to salaried community health centres, and to models in which remuneration is largely based on capitation (ie, health service organizations and family health networks). This is the first study to assess disparities among age groups across several dimensions of primary care performance in primary care models.
- Older individuals reported substantially better health service delivery in all models and this was not explained by their poorer health status or greater needs.
- Age was a significant determinant ($P<.05$) of the likelihood of receiving chronic disease management according to recommended guidelines in all models of care except community health centres.

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Les différents groupes d'âge reçoivent-ils des soins équivalents dans différents types d'établissements de soins primaires en Ontario?

Simone Dahrouge MSc PhD **William Hogg** MSc MCISc MD FCFP **Meltem Tuna** MSc PhD **Grant Russell** MB BS FRACGP MFM PhD
Rose Ann Devlin MA PhD **Peter Tugwell** MSc FRCPC MD **Elizabeth Kristjansson** MA PhD

Résumé

Objectif Déterminer si le type de prestation des services a une influence sur l'équité des soins dispensés dans tous les groupes d'âge.

Type d'étude Étude transversale.

Contexte L'Ontario.

Participants Cent trente-sept établissements de pratique, comprenant des cliniques traditionnelles rémunérées à l'acte, des centres de santé communautaires (CSC) rémunérés à salaire et des réseaux de santé familiale et des organisations de services de santé rémunérés à la capitation.

Principaux paramètres à l'étude Comparaison de la qualité des soins dans les différents groupes d'âge à l'aide de régressions logistiques ou linéaires multiples. Divers paramètres de la prestation des services de santé et de la promotion de la santé ont été évalués grâce à des enquêtes effectuées conformément au Primary Care Assessment Tool auprès de 5111 patients, et la prévention et le traitement des maladies chroniques ont été évalués à partir des recommandations canadiennes concernant les soins, grâce à une revue de 4108 dossiers.

Résultats Les patients plus âgés ont rapporté une meilleure prestation des services de santé dans tous les types de pratique. Cet effet de l'âge variait entre 1,9 et 5,7% et était plus important dans les 2 modèles utilisant la capitation. Les sujets de moins de 30 ans qui visitaient les CSC présentaient plus de caractéristiques défavorables (p. ex. vivant sous le seuil de la pauvreté et ayant un faible niveau de scolarité) et étaient plus susceptibles que les sujets âgés d'avoir discuté d'au moins un sujet lié à la promotion de la santé lors de leur visite d'évaluation. On a jugé que ces différences représentaient une réponse appropriée aux besoins plus grands de ces jeunes sujets. On observait une interaction âge-sexe dans tous les modèles pour le score lié à la prévention, l'observance des recommandations diminuant avec l'âge chez les femmes. Ces derniers résultats sont en bonne partie attribuables au fait que les recommandations faites aux femmes jeunes ont beaucoup plus de chances d'être suivies que d'autres recommandations. Les scores pour le traitement des maladies chroniques montraient une relation en U inversé en fonction de l'âge dans les modèles à rémunération à l'acte, les réseaux de santé familiale et les organisations de services de santé, mais non dans les CSC.

Conclusion Le modèle de rétribution à salaire pourrait représenter une structure organisationnelle plus susceptible d'assurer des soins appropriés pour tous les groupes d'âge. Le passage à une rémunération basée sur la capitation a peu de chances d'avoir un effet sur les disparités dues à l'âge.

Cet article a fait l'objet d'une révision par des pairs.
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POINTS DE REPÈRE DU RÉDACTEUR

- Les modèles de prestation des services de soins primaires ont été restructurés au Canada, passant de modèles de rémunération à l'acte à des centres de santé communautaires salariés et à ceux dans lesquels la rémunération repose en grande partie sur la capitation (p ex. organisations de services de santé et réseaux de santé familiale). Cette étude est la première qui cherche à évaluer des disparités éventuelles entre les différents groupes d'âge, et ce, pour divers aspects de la dispensation des soins primaires dans différents modèles de soins primaires.
- Les sujets plus âgés ont rapporté une prestation de services de santé considérablement meilleure dans tous les modèles, ce qui ne s'expliquait pas par leur moins bonne santé ou leurs besoins plus importants.
- L'âge était un déterminant significatif ($P<,05$) de la probabilité de recevoir un traitement pour maladie chronique qui soit conforme aux directives de pratique, et ce, dans tous les modèles de soins, à l'exception des centres de santé communautaires.

Equity in health care concerns "fair arrangements that allow equal geographic, economical, and cultural access to available health care for all in equal need of care."[1] According to Culyer and Wagstaff, the main focus of equity in health care should, insofar as possible, be achieving equal health for all.[2] Two main forms of health care equity exist: vertical equity, in which preferential treatment is given to those with greater health needs, and horizontal equity, in which equal treatment is provided for equivalent needs.[3] Equity in access to health care is a key goal of health care systems in many countries.[4]

In the 1960s, Canada introduced a publicly financed health care system, which included free access to medical services provided by hospitals and physicians. More than half of all physician visits are made to family doctors[5]; and investments in primary care have been advocated as a means to strengthen health care systems and mitigate health inequities.[4,6-10]

For many years, primary care delivery in Ontario, Canada's most populous province, has relied on fee-for-service (FFS) practice, in which compensation is directly related to the types and number of services rendered. Beginning in the 1970s, the province introduced community health centres (CHCs)—a community-oriented, multidisciplinary primary care model that focused on social justice and equity and had salaried providers. Today, CHCs serve approximately 3% of the Ontario population.[11-13] In the same decade, the province introduced a capitation-based model for delivering primary care services, health service organizations (HSOs), in which family physician compensation was based on the number and age-sex profiles of patients registered to them.[14] It was believed that the dissociation between patient visit and physician payment would result in a more equitable delivery of care, in which there was a greater focus on patient need rather than output. In the past decade, Ontario has continued its investments in models of care in which providers derive the largest proportion of their compensation from capitation payments. Family health networks (FHNs) are an example of this. Today, FHNs and other capitation models serve approximately 40% of the Ontario population. As a result of these reform initiatives, Ontario now has various primary care payment models, providing a unique opportunity to evaluate the impact of these structures, unconfounded by time or contextual factors. Some studies have focused on evaluating the effect of these different models on the quality of care,[15-17] but only one has sought to assess whether these models have had an effect on the equity of the care delivered to men and women across a broad spectrum of needs.[18]

This study is part of a larger evaluation exploring the effect of these 4 primary care models (FFS, CHC, HSO, and FHN) on equity.[18] This study aimed to describe the profile of patients across age groups in order to understand their health care needs; determine the extent to which disparities in the quality of care delivered across age groups in family practices exist; and assess whether the extent of these disparities varies between primary care models.

METHODS

Design

This analysis used a data set collected for a study conducted in 2005 to 2006: the Comparison of Models of Primary Care.[19] The study was approved by the Ottawa Hospital Research Ethics Board.

Sample

The Comparison of Models of Primary Care was a cross-sectional study evaluating care in FFS (including family health groups), CHC, HSO, and FHN practices. The study approached all known and eligible FHN (N = 94), CHC (N = 51), and HSO (N = 65) practices. We also approached a random sample of 155 FFS practices from a list of 1884 practices. Recruitment efforts were discontinued when 35 practices of each primary care model of service delivery agreed to participate or when time constraints required us to cease recruiting. We recruited 35 CHC, FFS, and FHN practices, as well as 32 HSO practices. Details of the study methodology and key features of the model are reported elsewhere.[19]

Data collection

In each practice we surveyed patients (30 to 50 per practice) and conducted chart reviews (30 per practice). Surveyed patients were required to be under the care of one of the participating providers; aged 18 years or older; not severely ill or cognitively impaired; able to communicate in English or French either directly or through a translator; and attending the practice on the day of survey administration. Charts reviewed were limited to patients aged 17 years and older who had been with the practice for at least 2 years.

Instruments

Patient surveys were adapted from the Primary Care Assessment Tool–Adult edition[20,21] and supplemented with 2 scales.[22,23] The largest portion of the survey was completed before the encounter with the provider and measured the quality of health service delivery and elicited patient sociodemographic and economic information. The second portion, a single page, was completed after the visit and captured information relating to that "index visit," including a measure of health promotion activity. The survey tool was available in English and French.[24]

We measured preventive care and chronic disease management by comparing documented activities (intent, recommendations, or actions relating to a maneuver) in the chart against indicators from recommended guidelines.

Performance measures

We assessed performance across 7 dimensions of health service delivery and 3 dimensions of technical quality of care (**Table 1**).[20,21,23,25-33] In each case, the score was normalized to be represented as a percentage.

Analysis

Description of patient profile. To understand the health needs of the various age groups, we compared the profile of patients in each group using Pearson χ^2 statistics and ANOVA (analysis of variance), as appropriate.

Age disparities in measures of performance. Because this is an exploratory study, age was grouped into categories based on its relationship with the outcome of interest. To demonstrate the effect of age on performance, we compared the scores of older individuals to those of individuals in the youngest category. For all analyses, except chronic disease management, we performed multilevel linear or logistic regressions using the Glimmix procedure in SAS (Statistical Analysis System, version 9.1), as appropriate, to account for the clustering effect of patients within practices. Because of the small number of eligible charts per practice, chronic disease management was evaluated using standard linear regression.

Analyses in which we adjusted for health assessed horizontal equity (For health needs made equal, is care similar?), while those analyses in which we did not adjust for health assessed vertical equity (If greater health needs could be demonstrated for a group, is care greater?). Based on the different health profiles of patients from various age groups, we determined that older individuals would require more health services. For that reason, our primary analysis for health service delivery included adjustments for patient socioeconomic characteristics but not for health to assess vertical equity (more services for more need). In a second analysis, we added measures of health to assess whether the observed differences were in fact due to the differing health status. Because health lifestyle advice is believed to be equally important across all age groups, our primary analysis for health promotion included adjustments for socioeconomic characteristics and health status and assessed horizontal equity (same care for same need). In a secondary analysis, we excluded health variables to determine the effect of health on differences observed. Prevention and chronic disease management analyses were based on chart abstraction data and could be adjusted for sex, rurality, and insurance status only. In all analyses, age-sex interactions were evaluated and used where appropriate. All analyses were stratified by model.

Model comparison. To determine whether the age disparities within each model were different across the primary care models, we compared the effect size

Table 1. Scales for the measurement of performance; range of overall PCAT* scores was 86% to 88% (N = 5073): *A) Dimensions of quality of health care service delivery; B) Technical quality of clinical care delivery.*

A) QUALITY OF HEALTH CARE SERVICE DELIVERY†‡ (ITEMS ON THE SCALE, CATEGORIES ON THE LIKERT SCALE OF EACH ITEM)	N§	SCORE RANGE,‖ %
Access		
• First-contact accessibility (4, 4)	5033	74 to 83
• First-contact utilization (3, 4)	5323	96 to 98
Patient-provider relationship		
• Cultural competency (3, 4)	4755	83 to 85
• Family-centredness (3, 4)	5146	89 to 90
• Humanism (8, 7)	5292	90 to 91
• Trust (10, 5)	5031	87 to 88
Continuity		
• Ongoing care (4, 4)	5252	85 to 90
B) TECHNICAL QUALITY OF CLINICAL CARE DELIVERY—ADHERENCE TO RECOMMENDED GUIDELINES (ITEMS ON THE SCALE)¶	**N§**	**SCORE RANGE,‖ %**
Health promotion*		
Healthy lifestyle counseling (6)	4642	46 to 59
• Exercise	4562	32 to 40
• Healthy foods	4592	17 to 28
• Family conflicts	4528	10 to 17
• Smoking	4574	13 to 18
• Alcohol	4551	8 to 14
• Home safety	4527	3 to 7
Prevention#		
Preventive care (6) (eligibility)	3284	52 to 68
• Colorectal cancer screening (individuals > 50 y)	1753	30 to 46
• Breast cancer screening (women 50 to 69 y)	698	73 to 85
• Cervical cancer screening (women 17 to 69 y)	1954	65 to 84
• Vision impairment screening (individuals > 65 y)	735	27 to 41
• Hearing impairment (individuals > 65 y)	651	14 to 21
• Influenza immunization (individuals at high risk or > 65 y)	1365	59 to 70
Chronic disease management#		
Chronic disease management (9)	514	60 to 72
• Coronary artery disease (3)	263	66 to 79
• Diabetes (4)	313	52 to 69
• Congestive heart failure (2)	57	56 to 76

PCAT—Primary Care Assessment Tool.

*Overall PCAT score was computed as the sum of all 17 PCAT questions divided by the maximum potential score (68 if all questions were answered).

†All health care service delivery scales are based on the PCAT,[20,21] except for the humanism[23] and trust[25] scales. A respondent's scale was included only if at least 50% of its items contained a response. Performance scores for health service delivery scales were derived by summing the individual item scores and normalizing these to a percentage; for example, for first-contact accessibility, the sum of the scores for the 4 questions, each on a likert scale of 1 to 4, is divided by 16.

‡Patient survey.

§The sample size showing represents the number of cases for which age was available and that were included in the age analysis.

‖Indicates the range of each scale's average scores across the 4 models.

¶Health promotion and prevention evaluations were based on the Canadian Task Force on Preventive Health Care clinical practice guidelines.[26] Chronic disease management was assessed against recommended guidelines accepted in Ontario for the management of the conditions.[27-33] For health promotion, patients were asked to indicate which of the 7 subjects were discussed with them on that day's visit. One question relating exclusively to individuals older than 65 years of age (about how to prevent falls) was excluded. We assessed whether at least 1 of the 6 subjects was discussed on that visit, and we analyzed each subject individually.

#Chart audit. Preventive care was determined by assessing whether 6 indicator maneuvers were documented in the chart as performed or recommended in the previous 24 months. The prevention score was the proportion of preventive maneuvers for which the individual was eligible that were documented as performed or recommended. Chronic disease management was also evaluated by chart audit using 2 to 4 indicators in each of the 3 conditions. For each condition, the score was derived as for prevention, and the overall chronic disease management score was the average of the individual disease scores.

(absolute β values) of the age variable derived from the regression models described above across models using *t* statistics. Where meaningful differences (larger than 5%) in the age disparities for the overall score of a dimension were observed between models, we used regression analysis to provide an estimate of the performance level for the "typical" patient in each age group by model. This allowed the performance level of the age reference group to be represented along the disparity measures.

RESULTS

Characteristics of the study population

Patient surveys were completed by 5361 individuals (response rate of 79%), 5111 of whom indicated their age. Age was known for all 4108 charts reviewed. We observed significant differences in the sociodemographic and health profile of patients across age groups ($P<.05$) (**Table 2**).[34]

There were more women overall, less so in the older age groups. Older individuals were more likely to have chronic conditions and less likely to state that their health was "good" to "excellent" ($P<.001$). However, older individuals reported significantly fewer days with poor mental health than younger people did ($P<.001$). There were some differences in the sociodemographic profiles of patients across models (results not shown in tables): Individuals younger than 30 years of age were considerably more likely to be living below the poverty line than older individuals in CHCs only (40%, 34%, and 21% for ages <30, 30 to 64, and ≥65, respectively). Community health centres also had the highest proportion of individuals younger than 30 years without a high school education (19% vs 7% to 10%).

Age disparities

The duration of the index visit (overall average of 17 minutes) did not differ among age groups in any model. Individuals 30 years of age or older reported more yearly visits than younger individuals did in FFS practices only (1.3 visits, 95% confidence interval [CI] 0.3 to 2.6, adjusted for socioeconomic factors). In other models, the difference was smaller than 1 visit yearly.

Table 2. Profile of patients by age groups: *A) Survey patient profile; B) Chart audit patient profile.*

A)	AGE GROUP		
SURVEY PATIENT PROFILE	<30 Y (N = 714)	30-64 Y (N = 3297)	≥65 Y (N = 1100)
Sociodemographic and economic profile*			
• Sex,† % women	76.0	66.0	61.0
• Household income,† % below LICO‡	21.0	16.0	14.0
• Low education,† % with less than high school diploma	14.0	13.0	33.0
• Do not speak English or French at home,† %	2.6	1.6	1.5
• Aboriginal,§ %	1.1	1.6	0.6
• Uninsured (in Canada),† %	4.6	1.5	0.6
• Do not work outside the home,† %	33.0	34.0	89.0
• Recent immigrant (<5 y),† %	3.3	2.6	0.5
• Rurality index,† mean	11.0	13.0	15.0
• Distance from home to practice >10 km,† %	23.0	25.0	19.0
Health status*			
• Average no. of d with poor mental health in past 30 d†	5.1	4.7	2.4
• Average no. of d with poor physical health in past 30 d	5.1	5.4	5.4
• Average no. of d limited by poor mental or physical health in past 30 d	3.8	4.2	3.7
• Physical, mental, or emotional problem lasting >1 y,† %	32.0	45.0	41.0
• Self-perceived health as very good to excellent,† %	53.0	56.0	39.0
• Presence of at least 1 chronic disease, %/no. of chronic diseases†‖	56/1.2	70/1.7	90/2.7
Relationship with the practice			
• Provider is a nurse practitioner,† %	10.0	5.0	2.0
• Seeing his or her own provider at that visit,† %	91.0	94.0	96.0
• Attending the practice for more than 2 y,† %	75.0	82.0	88.0
• No. of visits to the office in previous year, mean¶/median§	5.7/4	6.5/4	6.2/5
• Main reason for visit, %, checkup/chronic problem/recent problem†	43/19/38	33/29/38	36/34/30
B)	**AGE GROUP**		
CHART AUDIT PATIENT PROFILE	**<30 Y (N = 741)**	**30-64 Y (N = 2631)**	**≥65 Y (N = 736)**
Uninsured in Ontario (OHIP),§ %	98	99	100
Sex, % women	70	59	55

LICO—low income cutoffs, OHIP—Ontario Health Insurance Plan.
*Socioeconomic factors and health status were used for adjustment in the analyses.
†$P<.001$ compared by Pearson χ^2 or independent *t* test.
‡Low income cutoff is a measure of household deprivation used by Statistics Canada.[34]
§$P<.05$ compared by Pearson χ^2 or independent *t* test.
‖Thirteen chronic diseases assessed (self reported).
¶$P<.01$ compared by Pearson χ^2 or independent *t* test.

Health service delivery scales

Older individuals reported better health service delivery across many dimensions in all models (**Table 3**), with the largest differences observed in patients attending FHNs and HSOs (adjusting for socioeconomic factors). Adjusting for health status (**Table 3** legend) attenuates the age effect only slightly. Including the duration of the relationship with the practice in the analysis had no additional effect. The age effect on the overall Primary Care Assessment Tool score for patients aged 65 and older compared with those younger than 30 was larger in FHNs (5.6, 95% CI 3.7 to 7.6) and in HSOs (5.7, 95% CI 3.8 to 7.6) than in CHCs (1.9, 95% CI -0.4 to 4.2) or FFS practices (2.6, 95% CI 0.5 to 4.7).

Technical quality-of-care scales

Health promotion. **Table 4** shows the odds ratio (OR) of having discussed at least 1 (and each) healthy lifestyle subject assessed at the index visit in each age group across models. Patients 30 to 64 years of age were significantly less likely than younger patients were to have discussed at least 1 lifestyle subject in the CHC model only (OR 0.65, 95% CI 0.45 to 0.94, $P<.05$). The size of the age effect was larger for CHC than FFS and FHN practices. To represent age effect on actual quality of care delivered, the estimated likelihood of discussing at least 1 subject is provided. Analyses in which the health variables are excluded from the equation show no statistically significant effect of age.

Preventive care. The overall preventive score showed a significant age-sex relationship (**Table 5**). There was no significant difference in the preventive score across age groups in men. However, women 50 years of age and older were less likely to have been up to date on their preventive care in all models. The age effect for those 50 to 64 years of age was significantly larger ($P<.05$) in HSOs (-22%, 95% CI -15% to -30%) than FHNs (-12%, 95% CI -6% to -18%). To represent age effect on actual quality of care delivered, the estimated prevention score is provided for men and women of different age groups.

Colorectal cancer screening (for which there is no upper age limit) and cervical cancer screening were less likely to be performed in older individuals in most models. In contrast, influenza immunization, which, at the time, was indicated for individuals of any age considered at high risk of contracting influenza or experiencing complications from it as well as all individuals 65 years of age or older, was most likely to have been performed in the older age groups in all models.

Table 3. Dimensions of health service delivery in the various models of primary care among age groups: *Statistically significant results (P <.05) are boldface.*

DIMENSIONS OF HEALTH SERVICE DELIVERY	AGE GROUP, Y*	AGE EFFECT,† β (95% CI)			
		CHC	FFS	FHN	HSO
Overall PCAT score‡	30 to 64	**2.1 (0.5 to 3.6)**	**2.6 (1.1 to 4.2)**	**3.3 (1.8 to 4.8)**	**3.9 (2.5 to 5.3)**
	≥65	1.9 (-0.4 to 4.2)	**2.6 (0.5 to 4.7)**	**5.6 (3.7 to 7.6)**	**5.7 (3.8 to 7.6)**
First-contact accessibility	30 to 64	0.7 (-2.1 to 3.5)	**3.3 (0.5 to 6.1)**	**3.9 (1.2 to 6.6)**	**4.0 (1.8 to 6.2)**
	≥65	0.6 (-3.5 to 4.6)	**5.2 (1.4 to 9.0)**	**7.3 (3.8 to 10.8)**	**6.9 (3.9 to 9.9)**
First-contact utilization	30 to 64	**3.0 (1.5 to 4.5)**	**3.7 (2.4 to 5.0)**	**4.7 (3.4 to 6.0)**	**3.7 (2.5 to 4.9)**
	≥65	**5.0 (2.8 to 7.2)**	**4.7 (3 to 6.4)**	**5.5 (3.8 to 7.2)**	**4.8 (3.2 to 6.5)**
Cultural competency	30 to 64	**2.7 (0.1 to 5.3)**	**3.5 (0.8 to 6.3)**	**4.3 (1.6 to 7.1)**	**4.7 (1.9 to 7.5)**
	≥65	-1.3 (-5.1 to 2.5)	1.4 (-2.3 to 5.1)	**4.7 (1.1 to 8.3)**	**4.9 (1.1 to 8.8)**
Family-centred care	30 to 64	**2.1 (0.1 to 4.2)**	1.8 (-0.5 to 4.0)	**3.6 (1.5 to 5.6)**	**4.4 (2.2 to 6.6)**
	≥65	0.0 (-3.0 to 3.0)	-1.3 (-4.4 to 1.7)	**4.2 (1.5 to 6.9)**	**5.9 (3.0 to 8.9)**
Relational continuity	30 to 64	**3.3 (1.0 to 5.6)**	**3.1 (1.0 to 5.2)**	**2.2 (0.1 to 4.3)**	**3.6 (1.7 to 5.5)**
	≥65	**3.8 (0.4 to 7.1)**	**4.2 (1.4 to 7.0)**	**6.5 (3.7 to 9.2)**	**6.1 (3.5 to 8.7)**
Humanism	30 to 64	**3.3 (1.3 to 5.3)**	**4.9 (2.8 to 6.9)**	**5.4 (3.3 to 7.5)**	**5.0 (2.9 to 7.1)**
	≥65	**4.4 (1.4 to 7.4)**	**7.2 (4.4 to 10)**	**8.9 (6.2 to 11.7)**	**9.5 (6.7 to 12.4)**
Trust	30 to 64	**2.5 (0.6 to 4.5)**	**4.1 (2.2 to 6.1)**	**3.4 (1.4 to 5.4)**	**4.4 (2.5 to 6.3)**
	≥65	**3.9 (1.1 to 6.7)**	**5.9 (3.2 to 8.5)**	**6.0 (3.4 to 8.7)**	**7.3 (4.6 to 9.9)**

CHC—community health centre, CI—confidence interval, FFS—fee-for-service, FHN—family health network, HSO—health service organization, PCAT—Primary Care Assessment Tool.

*Individuals younger than 30 years of age make up the reference category.

†Age effect (β value for the age group) adjusted for socioeconomic status only (95% CIs) is shown. Results from regressions predicting the overall PCAT score in which health factors are included show a slightly attenuated effect: CHC, FFS, FHN, and HSO for ages 30 to 64, β value is 1.6, 2.4, 3.1, and 3.6, respectively; for ages 65 and older, β value is 0.8, 2.2, 5.1, and 4.9, respectively.

‡The overall PCAT score was derived from all 17 questions contained in the 5 scales.

Table 4. Health promotion across age groups among primary care models: *A) ORs of having discussed lifestyle topics at the index visit; B) Estimated likelihood of discussing at least 1 topic.*

A) LIFESTYLE TOPICS FOR DISCUSSION	AGE GROUP, Y*	OR† OF HAVING DISCUSSED LIFESTYLE SUBJECTS (95% CI)			
		CHC	FFS	FHN	HSO
At least 1 subject	30-64	0.65 (0.45-0.94)‡	1.10 (0.76-1.59)	0.97 (0.67-1.41)	0.88 (0.60-1.29)
	≥ 65	0.60 (0.35-1.04)	1.01 (0.60-1.69)	0.96 (0.58-1.58)	0.92 (0.54-1.57)
Healthy foods	30-64	0.59 (0.41-0.86)‡	0.68 (0.43-1.06)	1.08 (0.69-1.71)	0.89 (0.56-1.42)
	≥ 65	0.44 (0.25-0.77)‡	0.71 (0.36-1.40)	1.10 (0.60-2.02)	0.67 (0.34-1.31)
Home safety	30-64	0.71 (0.37-1.35)	0.67 (0.24-1.91)	0.48 (0.17-1.34)	0.30 (0.11-0.82)‡
	≥ 65	0.64 (0.24-1.72)	1.86 (0.47-7.30)	0.63 (0.14-2.74)	0.97 (0.23-4.03)
Family conflict	30-64	0.75 (0.49-1.14)	1.78 (0.93-3.40)	0.91 (0.52-1.60)	0.59 (0.34-1.04)
	≥ 65	0.26 (0.11-0.60)‡	0.66 (0.23-1.88)	0.57 (0.24-1.34)	0.75 (0.32-1.76)
Exercise	30-64	0.95 (0.66-1.35)	1.14 (0.77-1.71)	1.06 (0.72-1.58)	1.09 (0.72-1.66)
	≥ 65	0.95 (0.56-1.62)	0.88 (0.50-1.55)	1.13 (0.67-1.93)	0.96 (0.54-1.72)
Smoking	30-64	0.66 (0.43-1.00)	0.78 (0.49-1.26)	0.88 (0.56-1.37)	0.80 (0.49-1.30)
	≥ 65	0.11 (0.04-0.29)‡	0.43 (0.20-0.91)‡	0.44 (0.22-0.87)‡	0.64 (0.28-1.42)
Alcohol	30-64	0.45 (0.28-0.71)‡	0.73 (0.41-1.31)	1.10 (0.63-1.93)	0.68 (0.38-1.22)
	≥ 65	0.16 (0.07-0.36)‡	0.48 (0.18-1.27)	0.56 (0.25-1.26)	0.38 (0.15-0.97)‡

B) LIFESTYLE TOPIC FOR DISCUSSION	AGE GROUP, Y	ESTIMATED LIKELIHOOD OF DISCUSSING AT LEAST 1 TOPIC,§ %			
		CHC	FFS	FHN	HSO
At least 1 subject	< 30	56	42	42	41
	30-64	45	45	41	38
	≥ 65	43	43	41	39

CHC—community health centre, FFS—fee-for-service, FHN—family health network, HSO—health service organization, OR—odds ratio.
*Individuals younger than 30 years of age make up the reference category.
†The ORs of having discussed at least 1 healthy lifestyle subject and having discussed each individual lifestyle subject at the index visit among age groups are shown. The estimate is adjusted for socioeconomic information and health status, using multilevel linear regressions. Results of the regression analyses in which health status variables are not included eliminate the statistical significance of the effect in CHCs: ORs for CHC, FFS, FHN, and HSO for ages 30 to 64 years are 0.73, 1.11, 0.97, and 0.89, respectively; for ages ≥ 65 years, 0.72, 0.99, 0.95, and 0.92, respectively.
‡Statistically significant ($P < .05$) results.
§For the "typical" patient, the estimated likelihood of reporting at least 1 healthy lifestyle subject being discussed in each age group of the primary care models is derived from the multivariate logistic regression in which socioeconomic information and health status are included. The typical individual is an individual with the most common features: woman, without features of disadvantage (ie, low education, income below low cutoff, language barrier, aboriginal status, uninsured), travel distance less than 10 km, not rural, no limitations owing to physical or mental health or problems lasting more than 1 year, health good to excellent, and the presence of at least 1 chronic disease.

Chronic disease management. Provider adherence to recommended guidelines for chronic disease management showed an inverted U-shaped relationship with age in FFS, FHN, and HSO practices. The pattern was similar for the individual chronic conditions included in the chronic disease management score (**Table 6**). Scores were significantly higher ($P < .05$) in patients 60 to 69 years of age compared with those younger than age 60, then appeared to drop in individuals 70 years of age and older. The age effect size for those 60 to 69 was significantly larger in HSOs (24.4, 95% CI 11.6 to 37.2) compared with CHCs (5.7, 95% CI -9.1 to 20.5). To represent this age effect on actual quality of care delivered, **Table 6** provides the estimated chronic disease management score.

DISCUSSION

This study is the first to assess disparities among age groups across several dimensions of primary care performance in primary care models. We observed disparities across age groups for health service delivery, preventive care, and chronic disease management, but found that the model of care had little meaningful effect on these disparities. In health promotion, we found the focus on younger individuals attending CHCs justifiable and therefore appropriate.

Individual findings

Health service delivery. Relative to their younger counterparts, older individuals reported significantly better

Table 5. Preventive care* among age groups in the various models of primary care: *A) Age effect for overall prevention score and ORs for screening; B) Estimated overall prevention score by age groups and sex.*

A)		MODELS OF PRIMARY CARE			
VARIABLES	AGE GROUP, Y	CHC	FFS	FHN	HSO
Age effect for overall prevention score,†‡ % (95% CI)					
• Men	50 to 64 vs 17 to 49	-7 (-24 to 9)	7 (-7 to 21)	8 (-8 to 25)	4 (-10 to 18)
	≥65 vs 17 to 49	-5 (-24 to 14)	5 (-10 to 21)	5 (-12 to 22)	9 (-4 to 23)
• Women	50 to 64 vs 17 to 49	-18 (-11 to -24)§	-13 (-7 to -20)§	-12 (-6 to -18)§	-22 (-15 to -30)§
	≥65 vs 17 to 49	-33 (-25 to -41)§	-32 (24 to -40)§	-30 (-22 to -37)§	-34 (-26 to -42)§
ORs (95% CI) for screening or immunization (women and men included)‖					
• Breast cancer	60 to 69 vs 52 to 59	0.95 (0.41 to 2.23)	1.15 (0.55 to 2.41)	0.71 (0.32 to 1.54)	0.79 (0.38 to 1.67)
• Cervical cancer	45 to 69 vs 19 to 44	0.53 (0.33 to 0.86)§	0.90 (0.57 to 1.40)	0.58 (0.36 to 0.94)§	0.41 (0.25 to 0.66)§
• Colorectal cancer	≥75 vs 52 to 74	0.85 (0.46 to 1.56)	0.46 (0.25 to 0.83)§	0.42 (0.25 to 0.71)§	0.56 (0.33 to 0.94)§
• Influenza	≥65 vs 19 to 64	2.76 (1.62 to 4.71)§	3.16 (1.89 to 5.25)§	4.54 (2.58 to 7.98)§	6.59 (3.91 to 11.12)§
• Vision	≥75 vs 67 to 74	1.18 (0.54 to 2.62)	2.13 (0.91 to 5.02)	2.26 (1.03 to 4.96)§	0.99 (0.54 to 1.83)
• Hearing	≥75 vs 67 to 74	0.94 (0.30 to 2.96)	1.28 (1.05 to 1.50)	1.00 (0.35 to 2.90)	1.44 (0.57 to 3.60)
B)		ESTIMATED OVERALL PREVENTION SCORE IN THE MODELS OF PRIMARY CARE,¶ %			
SEX	AGE GROUP, Y	CHC	FFS	FHN	HSO
Men	17 to 49	49	32	42	31
	50 to 64	42	39	50	35
	≥65	44	37	47	40
Women	17 to 49	82	75	78	74
	50 to 64	64	62	66	52
	≥65	49	43	48	40

CHC—community health centre, CI—confidence interval, FFS—fee-for-service, FHN—family health network, HSO—health service organization, OR—odds ratio.
*Cervical cancer screening: women 17-69 years. Breast cancer screening: women 50-69 years. Influenza immunization: 65 years or older or any age with a chronic condition putting patients at higher risk of influenza. Colorectal cancer screening: 50 years or older. Visual impairment screening: 65 years or older. Auditory impairment screening: 65 years or older.
†For each of the 6 maneuvers making up the prevention score, we evaluated the presence of the maneuver being performed in the previous 24 months in those for whom the maneuver was recommended: the age effect for those aged 50-64 was significantly larger in HSOs (-22%, 95% CI 15% to -30%) than FHNs (-12%, 95% CI -6% to -18%).
‡For the overall prevention score, individuals younger than 50 years of age make up the reference category. For individual maneuvers, the younger age group for which the maneuver is indicated make up the reference category.
§Statistically significant ($P<.05$) results.
‖ORs (95% CI) for older individuals compared with younger individuals, adjusted for sex, rurality, and insurance status are shown.
¶The estimated prevention score for the "typical" individual is shown. The typical individual is urban and has public health insurance.

health service delivery ($P<.05$). This relationship persisted after adjusting for health status, indicating that the effect was not related to the lower health status or greater needs of the elderly. These results are consistent with findings from other groups,[35-37] one of which attributed its results to differences in expectations, suggesting that the older generations value the services more.[36] Although the age effect was larger in both capitation-based models compared with CHCs and FFS practices, the small difference in effect size suggests that any effect these models might have is negligible.

Health promotion. The likelihood of discussing a healthy lifestyle subject was considerably higher in individuals younger than age 30 compared with those who were older in CHCs only. Because individuals attending CHCs in the younger-than-30 age group are more likely to be living under the poverty line and less likely to have completed high school than other groups, and because these sociodemographic factors are associated with higher risk of unhealthy behaviour, including smoking[38,39] and drinking,[40] this higher likelihood of receiving healthy lifestyle counseling in younger individuals attending CHCs is likely an appropriate response to greater needs. It is noteworthy that, despite a large effect in CHCs, older individuals attending CHCs do not receive less healthy lifestyle counseling than those receiving care in other models.

Preventive care. Preventive care was more likely to be experienced by younger women. The main reason for this is that the maneuvers for which younger women are eligible are more likely to be performed (breast [70%] and cervical cancer screening [78%]), whereas those for which

older individuals are eligible are the least likely to have been documented as performed (vision [32%] and hearing [16%] screening). The drop in the prevention score from those aged 17 to 49 years to those aged 50 to 64 years was significantly larger in one capitation-based model (HSO) than in the other (FHN), suggesting that this effect is not driven by the remuneration structure ($P<.05$).

There was some indication that an age effect was present within maneuvers. At the time of the study, influenza immunization was recommended for all individuals 65 years of age and older, as well as for younger individuals with chronic conditions.[41] Adherence to the guidelines for the latter group is significantly lower than that for seniors ($P<.05$). Because individuals with the types of chronic conditions for which vaccination is indicated are expected to visit the practice at least as often as those aged 65 and older, this finding is unlikely to represent less-frequent opportunity to offer that care for younger individuals. Instead, this either represents a lack of adoption of this maneuver by the medical community in that population or, because a substantial proportion of influenza vaccination is given in immunization clinics, it might point to the fact that sensitization campaigns aimed at the target public are not as successful at reaching these individuals.

Older individuals were less likely to have had colorectal and cervical cancer screening. This might reflect competing medical priorities leaving less time for this preventive maneuver to be performed or the perception that these interventions are less beneficial for those in the older age groups.

Chronic disease management. In our study, adherence to the recommended guidelines for care of diabetes, coronary artery disease, and congestive heart failure was somewhat greater among patients aged 60 to 69 compared with those aged 70 to 79 in all models of care except CHCs, where evidence-based care was equivalent across age groups. Several studies have documented that the elderly are less likely to receive recommended drug management for chronic disease.[42-45] Our study evaluated the family physician's intent by measuring prescriptions or recommendations. The results therefore cannot reflect patient compliance. The commonly postulated reasons why physicians adhere less closely to guidelines in older patients include the lack of evidence for efficacy in that population because seniors were often excluded from clinical trials; patient medical complexity that would result in inappropriate polypharmacy; and lower life expectancy rendering aggressive treatment undesirable.[46,47] The fact that we did not observe an age effect in CHCs, where visits are longer and nurse practitioners are more available, suggests that competing demands in older patients and limited time might be responsible for lower adherence to recommended guidelines in older patients. This study also demonstrated that younger individuals are less likely to receive care according to recommended guidelines. Few studies have documented lower use of drug therapy in younger individuals with chronic diseases.[42] These results warrant further investigation.

Conclusion

This study evaluated whether disparities across age groups exist within models of primary care, and assessed

Table 6. Chronic disease management among age groups across models of primary care: *A) Percentage of age effect between age groups; B) Estimated chronic disease management score.*

A)		AGE EFFECT,† % (95% CI)			
VARIABLE	AGE GROUP, Y*	CHC	FFS	FHN	HSO
Overall chronic disease management score	60 to 69	5.7 (-9.1 to 20.5)	17.4 (3.4 to 31.3)‡	21.3 (8.3 to 34.2)‡	24.4 (11.6 to 37.2)‡
	≥ 70	5.0 (-7.5 to 17.5)	11.6 (-0.4 to 23.6)	8.0 (-3.0 to 19.0)	8.6 (-2.3 to 19.5)
Diabetes	60 to 69	-0.5 (-18.7 to 17.6)	13.6 (-1.5 to 28.6)	17.0 (1.8 to 32.3)‡	15.8 (-0.2 to 31.9)
	≥ 70	2.3 (-13.8 to 18.4)	9.2 (-6.7 to 25.1)	3.1 (-10.4 to 16.6)	3.4 (-10.0 to 16.8)
Coronary artery disease	60 to 69	-2.3 (-26.7 to 22.2)	21.6 (-1.2 to 44.3)	9.9 (-14.5 to 34.3)	9.4 (-11.7 to 30.5)
	≥ 70	-3.6 (-26.1 to 18.9)	-0.3 (-22.1 to 22.3)	-5.7 (-27.2 to 15.9)	-5.2 (-24.9 to 14.4)
B)		**ESTIMATED CHRONIC DISEASE SCORES,§ %**			
VARIABLE	AGE GROUP, Y	CHC	FFS	FHN	HSO
Overall chronic disease management score	< 60	64	47	50	53
	60 to 69	70	64	71	78
	≥ 70	69	59	58	62

CHC—community health centre, CI—confidence interval, FFS—fee-for-service, FHN—family health network, HSO—health service organization.
*Individuals younger than 60 years of age make up the reference category.
†The age effect (95% CI) adjusted for sex, rurality, and public insurance is shown.
‡Statistically significant ($P<.05$) results.
§The estimated performance for different age groups in each model is shown for the "typical" patient profile, which is an individual with the most common features: an urban woman with public health insurance.

whether the type of primary care model affects the disparity. We observed considerable age effect across a number of dimensions studied. We found 2 differences in the age effect across models. First, the likelihood of discussing a healthy lifestyle subject was higher in younger individuals attending CHCs, a finding determined to likely be an appropriate response to differing patient need. Second, quality of chronic disease management varied considerably with age in FFS and capitation models but not in CHCs. We conclude that the salaried model might have an organizational structure that is more conducive to providing appropriate care across age groups, and that the thrust toward adopting capitation-based payment is unlikely to have an effect on age disparities.

Dr Dahrouge is Director of Research and a scientist at C.T. Lamont Primary Health Care Research Centre of the Élisabeth Bruyère Research Institute in Ottawa, Ont. **Dr Hogg** is Professor and Director of Research in the Department of Family Medicine at the University of Ottawa and Director of the C.T. Lamont Primary Health Care Research Centre. **Dr Tuna** is Research Analyst at the Ottawa Hospital Research Institute. **Dr Russell** is Director of the Southern Academic Primary Care Research Unit, Head of the School of Primary Health Care, and Professor of General Practice Research at Monash University in Melbourne, Australia. **Dr Devlin** is Full Professor in the Department of Economics at the University of Ottawa. **Dr Tugwell** is Director at the Institute of Population Health at the University of Ottawa, Canadian Research Chair in Health Equity at the University of Ottawa, a physician in the Department of Medicine at the Ottawa Hospital, and Scientist at the Ottawa Hospital Research Institute. **Dr Kristjansson** is Associate Professor in the Department of Psychology at the University of Ottawa.

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Contributors

Dr Dahrouge conceptualized the current study, consulted on the statistical analysis, and wrote the initial draft of the manuscript. **Dr Tuna** contributed to methodological and statistical analysis and critically reviewed the manuscript. **Dr Hogg** conceptualized the original study, provided consultation on the analytical approach, and critically reviewed and edited the manuscript. **Drs Russell, Devlin, Tugwell,** and **Kristjansson** contributed to the concept and design of the study and interpretation of the results, and critically reviewed and edited the manuscript. All authors have read and approved the final manuscript.

Competing interests

None declared

Correspondence

Dr Simone Dahrouge, C.T. Lamont Primary Health Care Research Centre, Élisabeth Bruyère Research Institute, 43 Bruyère St, Ottawa, ON K1N 5C8; telephone 613 562 6262, extension 1246; e-mail **sdahrouge@bruyere.org**

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