Association of unmet need with self-rated health in a community dwelling cohort of disabled seniors 75 years of age and over

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Abstract Self-rated health (SRH) is a measure of perceived health that has been shown to predict use of community services, functional decline, pain, and mortality. Many factors associated with SRH have been identified, but unmet need for physical assistance with activities of daily living (ADL) has not yet been examined. The objective of this paper is to examine the association between unmet need and SRH while accounting for the effects of other, previously identified, correlates of SRH. We conducted a secondary analysis of a population-

based study of 839 residents of Montréal, Québec who were 75 years of age or older, not cognitively impaired, and living in the community. Multivariable logistic regression was used to evaluate the association between met and unmet personal ADL (PADL) and instrumental ADL (IADL) need for physical assistance with SRH. Among 508 disabled community-dwelling elderly, for each additional unmet IADL need, subjects were 1.70 (95% CI: 1.11–2.61) times more likely to report poorer SRH. For each additional unmet PADL need, subjects were 2.26 (95% CI: 1.31–3.91) times more likely to report poorer SRH. Subjects at increased risk of malnutrition, with greater comorbidity and whose income was insufficient to meet their needs were also more likely to report poorer SRH. After adjustment for important correlates, unmet PADL and IADL needs retain a statistically significant association with poorer SRH, with nutritional status, comorbid conditions, and income satisfaction being important confounders of the relationship.

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Introduction

Self-rated health (SRH) is a notion that has garnered much attention in the medical literature. This simple measure is a marker of overall health that is influenced not only by physical health, but also by psychological health, personal attitudes, and social functioning (Benyamini et al. 2000; Fylkesnes and Forde 1992). As a result, much effort has been spent determining the predictive ability of SRH for a variety of outcomes. SRH has been shown to be a strong predictor of future morbidity (van den Brink et al. 2005; Ferraro et al. 1997; Moller et al. 1996), functional decline (Lee 2000; Idler

and Kasl 1995; Mor et al. 1994), pain (Reyes-Gibby et al. 2002), mortality (Jylha et al. 2006; Heistaro et al. 2001), and increased utilization of health services (Denning et al. 1998; Wolinsky et al. 1995).

Self-rated health is associated with many factors including comorbidity, disability (Bardage et al. 2005; Ferraro et al. 1997), sex (Lee and Shinkai 2003; Han et al. 1999), marital status (Bardage et al. 2005), age, education, and socioeconomic status (Lorraine et al. 2005; Ferrer and Palmer 2004), nutrition and body mass index (Goldman et al. 2004), social support (Zunzunegui et al. 2004), and psychological factors including mastery and depression (Han 2002; Leibson et al. 1999; Mulsant et al. 1997). Of all these factors, disability has one of the strongest and most consistent relationships with poor SRH in older adults. A study of French-speaking Canadians found that community-dwelling seniors aged 65 and older with disability in at least one instrumental activity of daily living (IADL) were 3.00 (95% CI: 2.24–4.03) times more likely to report poor SRH than seniors without disability (Zunzunegui et al. 2004). The relationship between disability and self-rated health is consistent across cultures; a study of community-dwelling seniors aged 60 and older living in Singapore who were disabled in at least one personal activity of daily living (PADL) were 3.9 (95% CI: 2.1–7.3) times more likely to report poor or fair self-rated health than those with no disability (Ng et al. 2006). Furthermore, disability and self-rated health appear to interact to negatively influence health outcomes such as mortality. Among severely disabled men aged 70–89 living in Finland, Italy, or the Netherlands, those who rated their health poorly were 1.45 (95% CI: 1.02–2.04) times more likely to die within the subsequent 10 years than men who identified themselves as healthy even after adjustment for age, comorbidity, and country (van den Brink et al. 2005).

Although the relationship between disability and SRH among older adults is well established, the effect of how well an individual is able to manage living with their disability upon SRH has not been investigated adequately. Individuals may use assistive devices or modify their environment or tasks to allow them to remain independent, but when these adaptations are unsuccessful, some disabled elders who live in the community may require personal assistance to complete their daily activities. Whether this need for personal assistance is met or unmet may have an impact on self-rated health. Unmet need for personal assistance to complete an ADL is associated with a variety of negative consequences including being unable to eat or drink when hungry or thirsty, falling, incontinence, or being bothered because housework is not done (Desai et al. 2001; Allen and Mor 1997). Unmet need is also associated with increased phy-

sician visits, emergency department visits, and hospitalizations. Allen and Mor (1997) found an increased number of physician visits, emergency department visits, and hospitalizations in the year prior to the study interview among subjects with unmet versus met PADL need (Allen and Mor 1997). Sands et al. (2006) found that among community dwelling seniors aged 75 and older who were disabled in personal ADL, those with unmet need were more likely to be hospitalized compared to those with met need (OR = 1.26 [95% CI: 1.01–1.57]).

It is plausible that unmet need may influence SRH, over and above the effects of disability, through physical, psychological, and social pathways. Individuals with unmet need for physical assistance may be unable to care for themselves adequately due to difficulty completing essential daily tasks such as eating regular meals, taking medications, or mobilizing within the home and this may exacerbate physical health problems. They may also be more likely to experience psychological distress or a reduced sense of personal mastery as a result of the daily struggle of attempting to perform essential tasks that are difficult for them, or not being able to perform the tasks at all. Conversely, individuals whose needs are met may be more likely to experience psychological benefit, not only from the amelioration of their daily struggle to complete necessary ADL, but also from knowing that people care about them and are concerned about how they are managing at home. Disability is associated with reduced social contact (Simonsick et al. 1998), although whether needs are met or unmet is likely to further influence socialization. Unmet need is likely to exacerbate social isolation, as most individuals with unmet need live alone (Desai et al. 2001). Additionally, individuals with unmet need will be more likely to have difficulty leaving the home if they have problems with mobility or transportation, and may be reluctant to receive visitors if they are unable to keep their home tidy and clean. On the other hand, individuals who receive personal assistance (i.e. having needs met) will experience increased social contact while interacting with their caregiver.

Previous studies of unmet need that have included self-rated health as a covariate have inconsistent findings. Otero et al. (2003) examined unmet needs for physical assistance with daily, weekly, and monthly functional activities among community-dwelling seniors age 65 and older living in Leganés, Spain and found SRH did not have a statistically significant association after adjustment for age, income, education, depression, cognitive impairment, and living arrangements. Conversely, two other studies found that poor SRH was significantly associated with an increased likelihood of unmet need (Newcomer et al. 2005; Kennedy 2001).

Both studies used data from the same national health survey of disabled adults aged 18+ in the United States, although their objectives were different. Newcomer et al. (2005) evaluated the association between the physical environment and unmet need and reported that disabled adults who rated their health as ‘fair’ or ‘poor’ were 1.5 ($P < 0.01$) times more likely to have unmet need in at least one personal ADL. Kennedy (2001) described the type and magnitude of unmet need in this population and found that subjects who rated their health as ‘fair’ or ‘poor’ were 1.7 (95% CI: 1.3–2.3) times more likely to have unmet or undermet PADL need than subjects who rated their health as ‘good’ or ‘excellent’. However, a limitation of all these studies is that the association between SRH and unmet need was not the primary association of interest and, as a result, not all potentially important correlates were included in statistical modelling. Furthermore, Newcomer et al. (2005) and Kennedy (2001) used a study population that included disabled adults age 18 and older, and results are not specific to an elderly population.

Investigating the association between unmet need and SRH in older adults will be useful to improve understanding of the relationship between both of these factors and their impact upon health outcomes, with implications for future research and the care of our elders. It is possible that unmet need may confound or modify the relationship between SRH and health outcomes, and the potential association should be investigated to determine if unmet need should be accounted for in future studies. Furthermore, while disability can rarely be changed, unmet need can and may offer a way to improve an individual’s SRH with implications for future physical health, delayed institutionalization, and mortality. With the burgeoning elderly population and more seniors living in the community with disability, this is an increasingly important issue to investigate. The objective of this paper is to determine the association between SRH and unmet need for assistance in a community-dwelling population of older adults who are disabled. We hypothesize that the presence of unmet need will be associated with an increased likelihood of rating one’s health poorly.

Methods

Source of data

We conducted a secondary analysis of the Montréal unmet needs study, a population-based cohort study of residents of Montréal, Québec. Subjects were recruited by *Léger Marketing*, a marketing research firm that uses

random digit dialing to conduct regular weekly telephone surveys of the general Québec population to elicit their opinion on a variety of issues (Léger Marketing 2006). The age of survey participants is recorded in categories including ‘age 65 and older.’ From this survey list, *Léger Marketing* recruiters phoned 4,775 households containing a person age 65 or older and were able to contact 4,420. Once contact was established, *Léger Marketing* recruiters determined which respondents met the eligibility criteria for the Montréal unmet needs study. Subjects had to be 75 years of age or older, living in the community, English or French speaking, with no more than mild cognitive impairment as determined by a score of 14 or more on the telephone administered cognitive screening *Mini-Mental State Examination* as part of the *Adult Lifestyles and Function Interview (ALFI-MMSE)* (Roccaforte et al. 1992). The ALFI-MMSE assigns point values based upon completion of various tasks that measure orientation to time and place, attention, and ability to register and recall information. Scores range from 0 to 22, where a score of 17 or higher indicates no cognitive impairment, a score of 14–16 indicates mild cognitive impairment, and lower scores indicate progressively worse cognitive impairment. Within these households, 1,300 seniors met the eligibility criteria and, of these, 946 agreed to participate. *Léger Marketing* forwarded a list of the eligible and orally consenting participants to the Montréal unmet needs study coordinator who then telephoned them to arrange a time for the in-person interview and to complete informed consent. One hundred and seven potential participants changed their mind or could not be contacted, resulting in 839 (64.5%) who were interviewed face-to-face by trained study interviewers between February 2001 and March 2002. During the in-person interview, participants were queried about their demographic and socioeconomic information, physical health, nutrition, psychological characteristics, social support, health services utilization, and attitudes towards community services. Study participants were also asked their permission for the researchers to access information on drugs prescribed to them and their use of health services contained in the government-managed *Régie de l’Assurance Maladie du Québec (RAMQ)* prescription drug and medical services databases, and the *Maintenance et Exploitation des Données pour l’Étude de la Clientèle Hospitalière (MEDECHO)* hospitalization database and 783 consented. Of these 783, 508 subjects who were disabled in at least one ADL were identified. These 508 subjects formed the sample for the analysis in this paper. The study received approval from the *Ethics Committee of the Jewish General Hospital*, *l’Institut universitaire de gériatrie de Montréal*, and the *McGill University Institutional Review Board*.

Measurement

Self-rated health (SRH)

The dependent variable SRH was assessed by asking participants, “How would you rate your current state of health?” The six possible responses were “excellent,” “very good,” “good,” “fair,” “poor,” and “very poor.” Due to the small number of respondents who reported either “very poor” or “poor” health, SRH was dichotomized; a value of 0 was assigned for “very poor,” “poor,” or “fair” SRH and a value of 1 for “good,” “very good,” or “excellent” SRH.

Disability and need for assistance

Subjects who reported that they needed physical assistance to complete any of three instrumental ADL (meal preparation, housekeeping, and transportation to places outside of walking distance from the home) or six personal ADL (dressing, bathing, eating, toileting, transfers, and moving around inside the house) were identified as being disabled and having need. For each ADL, need was further categorized into met and unmet using a modified version of an algorithm created by Allen and Mor (1997). Whereas Allen and Mor’s algorithm categorizes an individual who reports having no need but experiences difficulty when performing an ADL as having met need, our modified algorithm categorizes the individual as having no need (Fig. 1). A different definition was used because it is not possible to have met need when no assistance is received. Met and unmet instrumental ADL (IADL) needs are represented as counts of the needs in two separate variables; IADL unmet need (0, 1, 2, 3) and IADL met need (0, 1, 2, 3). The small number of subjects with multiple personal ADL (PADL) needs necessitated collapsing the highest categories; the count of PADL unmet need is categorized as (0, 1, 2+) and PADL met need is categorized as (0, 1+). By accounting for unmet and met IADL and PADL needs simultaneously, it is possible to adjust for the severity of disability in statistical modelling. For example, a subject who is disabled in 6 ADL may have his/her information modelled as follows: 2 IADL met needs, 1 IADL unmet need, 1 PADL met need and 2 PADL unmet needs. In this way, the overall disability ($2 + 1 + 1 + 2 = 6$ ADL needs) is accounted for, but it is possible to separate the individual effects of IADL and PADL met and unmet needs.

Covariates

Potential correlates of SRH identified from the literature include age, sex, marital status (married, not

married), education ($\leq$ high school, $>$ high school), social support, income sufficiency, nutrition, body mass index, comorbidity, and psychological mastery and distress. Adequate social support was defined as being satisfied with social support versus not satisfied. Income sufficiency was determined by self-report that one’s income was sufficient to meet one’s needs (yes, no). Nutrition was assessed using the *Elderly Nutrition Scale (ENS)*, created by Payette et al. (1999), which identifies a person as being at low, moderate, or high risk for malnutrition. The ENS has a sensitivity of 78 and 77% to identify a person at moderate and high risk of malnutrition respectively, and an overall specificity of 77% (Payette et al. 1999b). The scale also has adequate test–retest reliability when self-administered over a 1 week interval ($r = 0.87$), and adequate intra-tester reliability when administered by various field clinicians such as nurses, social workers, or occupational therapists ($r = 0.84$) (Payette 1999). Dummy variables were created with low risk of malnutrition as the reference category. Self-reported height and weight were used to compute body mass index (BMI) which was categorized into underweight ($<18.5 \text{ kg/m}^2$), normal weight (18.5 to $<25.0 \text{ kg/m}^2$), overweight (25.0 to $<30.0 \text{ kg/m}^2$), and obese ($30.0+ \text{ kg/m}^2$). Three dummy variables were created with normal weight as the reference category. Comorbidity was represented using the chronic disease score (CDS), a weighted index of the burden of comorbid conditions based upon pharmaceutical data from administrative databases (von Korff et al. 1992). Using information on the type and number of medications that a subject is prescribed, the CDS calculates a value ranging from 0 to 36, with a higher score indicating more severe comorbidity. The CDS successfully predicts both hospitalization and mortality and is correlated with physician ratings of disease severity ($r = 0.57$) (von Korff et al. 1992). Mastery was assessed using Pearlman’s personal mastery scale (Pearlman and Schooler 1978), a widely used scale with good construct validity (Pearlman et al. 1981) and reasonable internal reliability (Cronbach’s $\alpha = 0.79$) (Kaplan and Boss 1999). Scores range from 7 to 28 with a higher score indicating higher personal mastery. Psychological distress was assessed using the *l’Indice de détresse psychologique de Santé Québec-14* (IDPESQ-14) (Préville et al. 1992). The IDPESQ-14 is based upon the Psychiatric Symptoms Index for which the internal consistency, reliability, and validity have been well established (Ilfeld 1976). The IDPESQ-14 has good reliability (Cronbach’s $\alpha = 0.89$) and has been validated in both French and English (Préville et al. 1992). This scale ranges from 0 to 100 with a higher score indicating greater psychological distress.

Fig. 1 Modified algorithm to determine need for assistance (adapted from Allen and Mor 1997)

Description of sample

The mean age of the study population is 80.36 ± 4.20 and ranges from 75 to 96. The study population is predominantly composed of women (66.9%), married persons (62.8%), and people who have attained an educational level no higher than high school (57.9%).

Statistical analysis

The analysis was limited to subjects that had at least one IADL or PADL need and for whom prescription drug information from the RAMQ database was available ($n = 508$). Bivariate analysis of the association with SRH was conducted using student *t*-tests for continuous variables, chi-square tests for 2-level categorical variables and Wilcoxon rank sum tests for ordinal variables. In all analyses, a *P*-value of <0.05 was used for statistical significance. Multivariable logistic regression was conducted with responses of 'excellent,' 'very good,' or 'good' SRH as the reference group. Since we

are interested in an association between unmet need and SRH after accounting for other previously identified correlates of SRH, all variables were entered and retained in the model. The statistical package SAS V9.1 was used to conduct the analysis (SAS Institute Inc. 2005). The model was assessed for interaction between variables that were hypothesized to modify the relationship between unmet needs and SRH.

Results

Characteristics of study subjects stratified by SRH are presented in Table 1. Female sex, increased risk for malnutrition, increased comorbidity, increased levels of psychological distress, the presence of unmet IADL need and met or unmet PADL need are associated with SRH of no better than 'fair.' Conversely, higher education, satisfaction with social support, sufficient income, and a higher personal mastery score were associated with SRH of 'good' or better. Age, marital

Table 1 Characteristics of disabled study subjects stratified by self-rated health ($n = 508$)

Study variables	Good/very good/ excellent SRH ($n = 355$)	Very poor/poor/ fair SRH ($n = 153$)	<i>P</i> -value
Self-rated health			
Excellent	36 (10.1%)		
Very good	142 (40.0%)		
Good	177 (49.9%)		
Fair		127 (83.0%)	
Poor		22 (14.4%)	
Very poor		4 (2.6%)	
Age (75–96) mean $\pm$ SD	80.41 $\pm$ 4.32	80.24 $\pm$ 3.91	0.68
Sex			
Female	224 (63.1%)	116 (75.8%)	
Male	131 (36.9%)	37 (24.2%)	0.005
Married			
Yes	215 (60.6%)	104 (68.0%)	
No	140 (39.4%)	49 (32.0%)	0.11
Education			
$\leq$ High school	189 (53.2%)	105 (68.6%)	
>High school	166 (46.8%)	48 (31.4%)	0.001
Satisfied with social support			
Yes	307 (86.5%)	110 (71.9%)	
No	48 (13.5%)	43 (28.1%)	<0.0001
Satisfied with income			
Yes	345 (97.2%)	133 (86.9%)	
No	10 (2.8%)	20 (13.1%)	<0.0001
Risk for malnutrition			
Low risk	145 (40.9%)	26 (17.0%)	
Moderate risk	179 (50.4%)	79 (51.6%)	
High risk	31 (8.7%)	48 (31.4%)	<0.0001
BMI			
Underweight [<18.5 kg/m ²]	16 (4.5%)	15 (9.8%)	
Normal weight [18.5 to <25 kg/m ²]	178 (50.1%)	66 (43.1%)	
Overweight [25 to <30 kg/m ²]	128 (36.1%)	49 (32.0%)	
Obese [30+ kg/m ²]	33 (9.3%)	23 (15.0%)	0.82
Chronic disease score (0–22) mean $\pm$ SD	5.82 $\pm$ 4.78	7.99 $\pm$ 5.34	<0.0001
Psychological mastery score (7–28) mean $\pm$ SD	21.33 $\pm$ 3.61	19.06 $\pm$ 3.68	<0.0001
Psychological distress score (0–100) mean $\pm$ SD	13.45 $\pm$ 10.89	21.02 $\pm$ 15.08	<0.0001
IADL met need			
0	57 (16.1%)	41 (26.8%)	
1	198 (55.8%)	68 (44.4%)	
2	85 (23.9%)	33 (21.6%)	
3	15 (4.2%)	11 (7.2%)	0.21
IADL unmet need			
0	267 (75.2%)	73 (47.7%)	
1	71 (20.0%)	57 (37.3%)	
2	15 (4.2%)	14 (9.2%)	
3	2 (0.6%)	9 (5.9%)	<0.0001
PADL met need			
0	342 (96.3%)	140 (91.5%)	
1+	13 (3.7%)	13 (8.4%)	0.023
PADL unmet need			
0	333 (93.8%)	111 (72.6%)	
1	19 (5.4%)	28 (18.3%)	
2+	3 (0.9%)	14 (9.2%)	<0.0001

status, body mass index, and met IADL need were not found to be statistically significantly associated with SRH. There was no significant difference in self-rated health between subjects who did and did not give consent for the researchers to access the RAMQ prescription drug database (data not shown).

The multivariable analysis (Table 2) found that, after adjustment for other known correlates of SRH, unmet need remained associated with poorer SRH, with the association being stronger for PADL versus IADL need. With each additional unmet IADL need, seniors were 1.70 (95% CI: 1.11–2.61) times more likely to rate their health poorly. With each additional PADL unmet need, seniors were 2.26 (95% CI: 1.31–3.91) times more likely to rate their health poorly. Both IADL and PADL met need had elevated point estimates (1.34 and 1.45, respectively), although they were not statistically significant. Risk for malnutrition had a highly significant association with SRH; compared to seniors at low risk, those at moderate and high risk were 1.83 (95% CI: 1.05–3.19) and 4.77 (95% CI: 2.28–9.94) times more likely to have poorer SRH. Subjects with a higher chronic disease score were more likely to rate their health poorly, with the likelihood increasing by 8% for each additional point on the CDS. Seniors who reported insufficient income were 2.65 (95% CI: 1.05–6.71) times more likely to rate their health poorly.

Table 2 Results of multivariable logistic regression ($n = 508$)

Covariates	Adjusted OR ^a	95% CI	P-value
Disability			
Count of IADL met needs (0, 1, 2, 3)	1.34	[0.94–1.92]	0.11
Count of IADL unmet need (0, 1, 2, 3)	1.70	[1.11–2.61]	0.016
Any PADL met need (0, 1+)	1.45	[0.51–4.13]	0.49
Count of PADL unmet need (0, 1, 2+)	2.26	[1.31–3.91]	0.0036
Risk for malnutrition			
Low risk	1.00		
Moderate risk	1.83	[1.05–3.19]	0.032
High risk	4.77	[2.28–9.94]	<0.0001
Chronic disease score (0–22)	1.08	[1.03–1.13]	0.002
Satisfied with income			
Yes	1.00		
No	2.65	[1.05–6.71]	0.040
Satisfied with social support			
Yes	1.00		
No	1.73	[0.95–3.15]	0.074

^a Adjusted for age, sex, marital status, education, body mass index, psychological mastery, and psychological distress, in addition to the other variables in the table

Finally, seniors who reported dissatisfaction with social support were more likely to rate their health poorly, although these results failed to reach statistical significance. All other variables had P -values >0.15 and no interactions were identified. The chi-square goodness-of-fit value for the multivariable model was 2.53 ($P = 0.96$), indicating that the fit of model is acceptable.

Discussion

The primary goal of this analysis was to determine the association between unmet need for assistance with ADL and self-rated health in a cohort of community dwelling elders with disability. We found that SRH is associated with unmet need, and the association persists even after adjustment for met needs, comorbidity, and other correlated factors.

Disability is associated with poorer SRH (Ng et al. 2006; Nourhashemi et al. 2001; Ebly et al. 1996), but our results show that, within a disabled population, there are differences in SRH by type of need (IADL versus PADL) and if the need is met or unmet. PADL unmet need has a stronger association with poorer SRH than IADL unmet need. A possible explanation for this finding is that a hierarchy of disability exists in which IADL disability occurs first, followed by disability in PADL (Sonn 1996). PADL disability thus represents more severe disability, which may have a greater negative impact upon daily life than IADL and, as a result, may affect a person's perception of their health more negatively. Presumably, the more fundamental the task a person is disabled in, the more distressed a person may become when they have unmet need. We also found that neither PADL nor IADL met need were associated with SRH, although both have similar point estimates in the multivariable model (OR = 1.45 and 1.34, respectively), indicating that a greater number of needs is associated with poorer SRH, but that having these needs met, regardless of type, influences a person's perception of their health in a positive way relative to having unmet need. Given that poor SRH is associated with the development of comorbidities (Ferraro et al. 1997; Moller et al. 1996), functional decline, (Lee 2000; Idler and Kasl 1995; Mor et al. 1994), pain (Reyes-Gibby et al. 2002), and mortality (Jylha et al. 2006; DeSalvo et al. 2006), and both SRH and unmet need are associated with increased utilization of health services (Sands et al. 2006; Denning et al. 1998; Allen and Mor 1997; Wolinsky et al. 1995), improving SRH by meeting ADL needs through family involvement, community support services, utilization of assistive devices, and modification of the home

environment and activities should be a priority in the care of community-dwelling disabled elders.

Our findings are in agreement with Newcomer et al. (2005) and Kennedy (2001), who reported that, after adjustment for age, disabled adults age 18+ who rate their health as 'fair' or 'poor' are 1.5 and 1.7 times more likely to have unmet need in at least one PADL than those who rate their health as 'good' or 'excellent,' respectively. These results suggest that the association between unmet need and SRH is not limited to the elderly, but spans across all ages. Conversely, Otero et al. (2003) found no association with unmet need and SRH in an elderly population that is similar to the Montréal unmet needs study population. The lack of an association may be explained by the fact that they did not adjust for disability and sex in their analyses, two factors that are likely to be important. In all three studies, the association of SRH with unmet need was not the primary objective and, thus, information on important covariates that we accounted for was not included in the analysis, which may explain some of the discrepancies. Furthermore, the outcome for all three studies was the presence of any unmet PADL need, which limits the results to determining an all-or-none association between SRH and unmet need. By adjusting for both met and unmet need IADL and PADL need as counts, our results demonstrate that the likelihood or rating one's health as poor increases with increasing unmet need.

Increasing risk of nutritional deficiency is associated with an increased likelihood of poorer SRH. Whereas Goldman et al. (2004) defined good nutrition as "eating at least three vegetables and two fruits daily," we improved measurement of nutrition by using Payette et al. (1999) validated scale. Of all the factors related to SRH, nutrition is one of the most amenable to intervention. Simply providing liquid nutrition supplementation and active encouragement to eat can improve nutritional status and reverse weight loss (Payette et al. 2002). Malnutrition and weight loss are associated with increased disability and mortality (Amador et al. 2006; Newman et al. 2001; Zuliani et al. 2001; Payette et al. 1999a), and improving nutrition may help to prevent declines in function and health and reduce mortality (Payette et al. 2002; Sullivan et al. 1990). Disabled community-dwelling elders should be screened for risk of nutritional deficiency and strategies to improve nutrition should be identified. Such strategies may include educating seniors about proper nutrition, involving family members to assist with meal planning and preparation, or utilizing community support services.

Comorbidity and income insufficiency are also significantly associated with concurrent SRH of no better than fair. Our findings are in agreement with other studies that reported increased comorbidity is associated with poorer SRH (Goldman et al. 2004; Lee and Shinkai 2003). Income inequality has also been shown to have an association with poorer self-rated health (Xi et al. 2005). Xi et al. (2005) found that, among people aged 25 and older living in the Canadian province of Ontario, those with the highest level of income inequality were 18% more likely to have poorer SRH compared to those with no income inequality [OR = 1.18, 95% CI (1.01, 1.37)]. It has repeatedly been shown, across all age groups and different cultures, that higher socioeconomic status individuals enjoy better health and a longer life than their lower socioeconomic status counterparts (Eckersley et al. 2001; van Rossum et al. 2000; Hattersley 1999; Mackenbach et al. 1997). A sufficient income is a resource that individuals can draw upon in times of need and may act as a buffer to the stressors encountered in later life as one experiences a decline in physical health. Having insufficient income may reduce not only an individual's options for handling a specific problem, but also their coping skills due to the stress caused by financial concerns.

Other factors that were identified in the literature as having an association with SRH failed to reach statistical significance. Three possible explanations for this relate to the study design, the population studied and confounding. First, analysis of cross-sectional data may yield different results than analysis of longitudinal data. For example, the effect of age on SRH may be attenuated in cross-sectional analyses (Orfila et al. 2000). Second, our study population may differ from that of other studies such that correlation between the factor and SRH is not present. Finally, it is possible that previous findings were confounded by unmet need or nutrition and inclusion of these variables in our model removed the association between the covariate and SRH.

Strengths of this study include the use of a representative community based sample, comprehensive in-person interviews and excellent quality of data. The cohort is population-based and ensures good generalizability of our findings. The age and sex distribution of the Montréal unmet need study population is similar to that of the Québec general population, with the exception that Montréal unmet need participants tended to be slightly younger (Podoba 2004). In-person interviews collected information on variables that have not been evaluated in other studies, allowing us to examine their independent effects and any interaction or confounding. The database was validated by two separate

researchers and study subjects were contacted via telephone to clarify nonsensical or missing information. As a result, less than 0.1% of data are missing for all variables.

Limitations of this study include the possibility of residual confounding by disability, selection bias, misclassification bias, and design issues. It is possible that our results may be confounded by residual disability. The more disabled a person is, (i.e.) the greater number of needs they have, the more likely it is that those needs will be unmet (Mor 1998). We adjusted fully for IADL met and unmet needs, but subjects categorized as having 2+ PADL unmet need may be more disabled than indicated by our categorization. However, only seven subjects had more than two unmet PADL needs and are unlikely to significantly bias our results. There may be selection bias related to the random digit dialing approach employed by *Léger Marketing* and volunteer bias. To mitigate the bias associated with random digit dialing, *Léger Marketing* made in excess of 20 attempts to contact seniors at different times of the day and on different days. Volunteer bias, if present, may limit the generalizability of the findings, but not the validity. Another limitation of this study is that, due to insufficient numbers of subjects who rated their health as poor and very poor, we dichotomized self-rated health into 'good' and 'poor.' We used well-designed and reliable scales to operationalize important covariates such as psychological distress, mastery, and risk for malnutrition, but it is possible that by correlating them with a binary measure they may have reduced reliability, resulting in potential misclassification of data. However, the misclassification should be non-differential between subjects with different SRH, which would bias results towards the null and underestimate the strength of the association. Misclassification bias may also be present as a result of using self-reported measures of need for assistance with ADL. However, in this study, the perception of the individual and their responses to disability and need are of primary interest, and, thus, self-report is the ideal measurement. Finally, as with all cross-sectional studies, temporality cannot be determined.

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