The mobility gap between older men and women: The embodiment of gender


ABSTRACT

Objectives: To present the study design and baseline results of the longitudinal International Mobility in Aging Study (IMIAS) on gender differences in physical performance and mobility disability prevalence in five diverse societies.

Methods: Data are from surveys on random samples of people aged 65–74 years at Canadian (Kingston, Ontario; Saint-Hyacinthe, Quebec), Mediterranean (Tirana, Albania) and Latin American sites (Natal, Brazil; Manizales, Colombia) (N = 1995). Mobility disability was defined as reporting difficulty in walking 400 m or climbing stairs. Activities of daily living (ADL) disability was based on any self-reported difficulty in five mobility-related ADLs. The short physical performance battery (SPPB) was used to assess physical performance. Poisson regression models were fitted to estimate prevalence ratios.

Results: Age-adjusted prevalence of low SPPB, mobility disability and ADL disability were higher in women than in men at all sites except Kingston. After adjustment for education and income, gender differences in SPPB and ADL disability attenuated or disappeared in Saint-Hyacinthe and Manizales but remained large in Tirana and Natal and mobility disability remained more frequent in women than in men at all sites except Kingston. After further adjustment by chronic conditions and depressive symptoms, gender differences in mobility remained large at all sites except Kingston but only in Tirana did women have significantly poorer physical performance than men.

Discussion: Results provide evidence for gender as a risk factor to explain poorer physical function in women and suggest that moving toward gender equality could attenuate the gender gap in physical function in old age.

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1. Introduction

Mobility, the ability to move in one’s environment, is an essential feature of human functioning (Guralnik & Ferrucci, 2003). Population studies have consistently shown a gender gap in mobility disability. Limited available evidence suggests that this gap is small and is decreasing with time in countries where there is little gender segregation (Ahacic, Parker, & Thorslund, 2000; Raina, Dukeshire, Lindsay, & Chambers, 1998) and it is large in countries where women have different social roles and opportunities in life (Alvarado, Guerra, & Zunzunegui, 2007; Guerra, Alvarado, & Zunzunegui, 2008; Khadr & Yount, 2012; Miszkurka et al., 2012; Onadja et al., 2013; Rahman & Liu, 2000; Yount & Agree, 2005; Zeki Al Hazzouri et al., 2011) Few studies on gender differences in
physical function have integrated performance and self-reported measures, and those that have used both types of measures utilized single populations (Khadr & Yount, 2012; Rahman & Liu, 2000). International research is needed to better understand the gender gap in physical performance and in mobility across diverse populations.

In this article “sex” refers to the biological and physiological characteristics that define men and women and “gender” refers to the socially constructed roles, behaviors, activities, and attributes that a given society considers appropriate for men and women (WHO, 2013). We will use the term gender for customary dichotomous comparisons of men and women, absorbing both gender and sex-linked differences. Explanations of the mobility gap between men and women should go beyond understanding what part of the difference can be best explained by biological differences and what part could be explained by gender differences in exposure to risk factors and vulnerabilities (Kaneda, Zimmer, Fang, & Tang, 2009; Rahman & Liu, 2000; Roy & Chaudhuri, 2008).

To illustrate this point, the differences between men and women in mobility disability in old age can be related to: (1) higher prevalence of arthritis in women (Whitson et al., 2010). Obesity is a risk factor for arthritis (Blay, Fillenbaum, Andreoli, & Gastal, 2012; Loeser, 2010), and tends to be more prevalent in women (El Ati et al., 2012; Radiger & Clara, 2011; Whitson et al., 2010; Yount et al., 2010). The higher obesity risk of women could be linked to their lower physical activity compared with men (Souza, Fillenbaum, & Blay, 2015), particularly in societies with norms which discourage physical activity in women through the entire life-course (gender) (Van Tuyckom, Van de Velde, & Bracke, 2013; Yount et al., 2010). Obesity in women could be also linked to the daily responsibility to domestic housework (gender) (Appelhans et al., 2015; Stamatakis et al., 2007); (2) higher exposure to domestic violence (early childhood abuse and intimate partner violence) in women. People exposed to domestic violence have higher risk of osteoarthritis, heart disease, diabetes, hypertension and obesity (Fuller-Thomson, Stefanyk, & Brennenstuhl, 2009; Fuller-Thomson, Brennenstuhl, & Frank, 2010; Miller, Chen, & Parker, 2011). The higher prevalence of these chronic conditions in old women (Whitson et al., 2010) could be due to sex-linked differences in inflammatory and stress responses to life course violence; (3) Higher prevalence of depression and low self-esteem in old women (Alvarado, Zunzunegui, Beland, Sicotte, & Tellechea, 2007; Djernes, 2006; Sonnenberg et al., 2000) could trigger a third pathway, characterized by impaired stress response (Dube et al., 2009; Fagundes et al., 2013; Power, Thomas, Li, & Hertzman, 2012), inflammation (Kiecolt-Glaser et al., 2011) and poor health behaviors (Miller et al., 2011); (4) Multi-parity is a risk factor for cardiovascular disease in later life (Parikh et al., 2010) and diabetes (Vandenheede, Deboosere, Gadeyne, & De Spiegaelaere, 2012). In societies where women are expected to have many children, women have little control of their fertility and they may be at higher risk of these disabling diseases and, in consequence, at higher risk of mobility disability in old age.

These hypotheses could be examined in international population studies that provide a wide range of exposures and outcomes, compare disease rates, and examine the causes of differences in these population disease rates (Rose, 2001; Schwartz & Carpenter, 1999). Our hypothesis is that gender inequality (systematic differences in access to resources and opportunities between women and men) is an important risk factor for mobility disability in populations of women. If this hypothesis is true, we should observe higher rates of mobility disability in female populations in societies with larger gender inequality.

The International Mobility in Aging Study (IMIAS) aims at understanding the mobility differences between men and women by comparing mobility disability in populations that differ widely in gender norms and values. Main IMIAS hypotheses being currently tested are: (1) chronic exposure to violence and poverty during the life course increase the risk of mobility disability in old age (Sousa et al., 2014); (2) social and economic adversity will be embodied by dysregulation in the stress response and increased chronic inflammation with impacts on mobility in old age; (3) the higher the gender gap in social and economic adversity through the life course, the higher the gender disability gap in old age will be.

This article presents the study design and preliminary baseline results of IMIAS on differences between men and women in physical performance and mobility disability in early old age in five diverse societies. We tested the hypothesis that the gender mobility gap would be small or non-existent in societies with little gender inequality, that this gap would be larger in societies with larger gender inequality and that it would be attenuated after statistical adjustment by gender related socioeconomic and health indicators. We expected to find that the direction of the results would be similar for three measures of physical function: physical performance, self-reported mobility and more severe disability in mobility-related activities of daily living (ADL).

2. Methods

2.1. Setting

IMIAS (International Mobility in Aging Study) is a population-based longitudinal study conducted in five sites: Tirana (Albania), Natal (Brazil), Manizales (Colombia), Kingston (Ontario, Canada) and Saint-Hyacinthe (Quebec, Canada).

Tirana is a city of approximately 700,000 inhabitants, situated in the central valley of Albania. Researchers in Tirana are affiliated with the Albanian School of Public Health. Natal is a city of 800,000 inhabitants and the capital of the province of Rio Grande do Norte in northeast Brazil. Researchers in Natal are affiliated with the Universidade Rio Grande do Norte. Manizales is a city of 400,000 inhabitants in the coffee-growing zone in the Colombian Andes Mountains and capital of the Caldas department. Researchers in Manizales are affiliated with the University of Caldas. Kingston is a city with 130,000 inhabitants in Ontario and was the first capital of Canada. Researchers in Kingston are affiliated with Queens University. Saint-Hyacinthe is a city with a population of about 50,000 inhabitants and the economic center of an agricultural region 50 km from Montreal, Quebec. Researchers in Saint-Hyacinthe are affiliated with the Université de Montréal.

These cities represent diverse ways of living in very different societies (Tirana is capital of Albania, an ex-communist country of Muslim tradition in rapid transition to capitalism; Kingston, a University city in Ontario and Saint-Hyacinthe, a center of an agricultural region in Quebec; Manizales in the Andean coffee growing region, a relatively wealthy area of Colombia; and Natal, a coastal city and capital of a relatively poor region of North Eastern Brazil) and they represent societies which vary strongly in gender equality: according to the Gender Inequality Index published in the 2014, Human Development Report of United Nations, Canada ranks 23, Albania 44, Brazil 85 and Colombia 92. These national averages are not applicable to each study city but they can be used as rough current national indicators of gender equality. Since they are based on current indicators of health, economics and participation they do not take into account historical variations or geographical variations within countries. Concerning our study sites, Kingston (Ontario) and Saint-Hyacinthe (Quebec) differ on their historical developments of gender equality (Québec, 2013) and Natal is capital of the province of Rio Grande do Norte, the province with the highest gender inequality of the Brazilian provinces (Cardoso, 2012).
We assume that prolonged exposure to one place will produce more relatively homogeneous distributions of education, occupation, income, living arrangements, health and social services systems and gender social norms in addition to more obvious differences related to physical environmental conditions and nutrition in each research site population. The choice of diverse sites extends the range of values for each possible exposure or risk factor for functional decline.

2.2. Study design

The study population is composed of community dwelling elderly people between 65 and 74 years of age. The sample was stratified by sex with an aim to recruit 200 men and 200 women at each site. The total attained sample size of the study at the five research sites was 1995. The sample size at each site was calculated to allow for comparison of baseline mobility disability prevalence of men and women assuming a prevalence ratio of 1.8, error type 1 of 0.05 and power of 0.80.

Baseline data were collected in 2012; from January to June in Manizales, Natal, and Saint-Hyacinthe, from January to December in Kingston and from September to December in Tirana.

2.3. Sampling strategy

Participants were recruited through neighborhood primary care center registers at Tirana, Manizales and Natal. At these sites a random sample of elderly people registered at the health centers was drawn and participants were approached directly by our interviewers to invite them to participate in the study. In Kingston and Saint-Hyacinthe, participants received a letter from their primary care doctors inviting them to contact our field coordinator to make an appointment for the home visits. Since Albania, Brazil and Canada have universal health care systems; more than 90% of the population in the 65 to 74 age range are registered at a health center or have a primary care doctor. In Tirana and Natal, two and five neighborhood health centers were covered by our sampling scheme. These neighborhoods are located in middle and low socioeconomic areas in both cities, which composed most of the population in that age group. In choosing the study neighborhoods we purposefully avoided the extremes of the socioeconomic spectrum: the wealthy and the very poor areas. In Manizales, a random sample of all subjects between 65 and 74 years of age registered in the Public Health Insurance of the city was drawn. Most of the population in this age group is covered by this Public Health Insurance.

The use of two different recruitment methods was needed to respond to the different requirements of local Ethics Committees. According to the Ethics committees of Queens University and the Université de Montréal (Canadian sites), researchers are not allowed to directly contact potential participants to invite them to participate and invitations to participate in research projects need to be carried out by third parties (in this case, a primary care doctor). In the Universities of Caldas and Rio Grande do Norte and at the Albanian National Institute of Health, authorized researchers are allowed to invite participants directly by letter, phone or home visits. Consequently, response rates were very different across sites. In Manizales, Natal and Tirana response rates were very high: higher than 90% in Tirana and close to 100% in Natal and Manizales and participants expressed appreciation for receiving medical exams and blood analyses results. In Kingston and Saint-Hyacinthe only 30% of people receiving a letter of invitation from their doctors contacted us. However, out of those who telephoned us to obtain more information about the study, about 95% agreed to participate both in Kingston and Saint-Hyacinthe.

Exclusion criteria. Participants were excluded if they had 4 or more errors in the orientation scale of the Leganes Cognitive Test (LCT) (De Yebenes et al., 2003), which was administered at the beginning of the interview. Low scores in the LCT were considered indicative of inability to complete the study procedures. The number of excluded people ranged from one in Kingston and Saint-Hyacinthe to five in Natal.

2.4. Data collection

At every research site all procedures were carried out at the participant’s home, except that the physical performance and vision tests were done at the local hospital in Manizales. For those agreeing to donate blood and saliva for biomarker determinations, ten saliva samples were collected by the participant at home during two consecutive days and blood was drawn at the local hospital.

Interviewers at each site were trained using the same standard training based on videotapes, protocol instructions and data entry forms at each site. Assessments in Tirana were done by public health professionals and graduate students, in Natal by physiotherapists, in Manizales by local nurses, in Kingston and in Saint-Hyacinthe by teachers and other lay professionals.

The questionnaire and all data collection documentation and manuals of procedures are available in the local languages (Albanian, Spanish, Portuguese, English and French). French, Portuguese and Spanish versions of the main scales were validated in two pilot studies conducted in Brazil, Colombia and Quebec (Curcio et al., 2013; Freire et al., 2012).

The questionnaire included demographic and socioeconomic variables, chronic conditions, depressive symptoms, falls, life-course history of socioeconomic conditions and exposure to violence, physical activity, health behaviors, quality of life, neighborhood social, economic and physical characteristics, social networks and community social integration, gender roles, decision making power and financial autonomy, life space assessment and tests of cognitive function. Blood pressure, grip strength and vision assessments were also carried out.

Outcomes Physical performance was assessed by the short physical performance battery (Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995). The short physical performance battery (SPPB) includes three timed tests of lower body function: a hierarchical test of standing balance, a 4-meter walk, and five repeated chair stands. Each SPPB component test (balance, gait and chair stand) is scored from 0 to 4 with a score of 0 representing inability to perform the test and a score of 4 representing the highest level of performance. For the balance task, the participants are first asked to maintain their feet in side by side, followed semitandem (heel of one foot alongside the big toe of the other foot) and tandem (heel of one foot directly in front of the other foot) positions for 10 s each. For gait speed, a 4-meter walk at the subjects’ usual pace was timed. For those who did not have 4-meters available in their homes, a 3-meter course was used and scoring was modified as indicated in the instructions. The test was repeated twice with the faster of the two walks used. For the ability to rise from a chair, participants were asked to stand up and sit down five times as quickly as possible with arms folded across their chests. This was done only after participants first demonstrated the ability to rise once. Further details on the administration of these tests have been published in the original papers (Guralnik et al., 1994, 1995) and can be viewed at the SPPB website (Guralnik, 2011). A summary performance score (range 0–12) was obtained by adding the scores of each individual SPPB component test, with higher scores indicating better lower body function.

Mobility disability was defined as the self-report of having difficulty in walking 400 m or climbing a flight of stairs without
resting (Nagi, 1976). Activities of daily living (ADL) disability related to self-reported lower extremities limitations. We have included here five ADLs: toileting, bathing, dressing, getting out of bed, walking across a small room to define any ADL-mobility related difficulty (Freire et al., 2012).

Education was self-reported and categorized as: less than primary, secondary and post-secondary education. Individual monthly income was categorized in three groups based on self-report: low, middle and high. The cut points for the categories were adapted to each site. In Canada, cutoff points were defined by monthly income of less than $20,000, between $20,000 and $50,000 and more than $50,000 CAD. In Colombia, Brazil and Albania, categories were established in relationship to the minimum salary: low (less than a minimum salary), middle (between one and two minimum salary or equivalently, Old Age Pension, i.e. between $5000CAD and $10,000 CAD/year), high (more than $10,000 CAD/year). Differences between Albania, Brazil and Colombia income distributions are due to the universal pension system that grants a minimum pension to all citizens over 60 (in Brazil), or 65 (in Albania). Universal pension does not exist in Colombia. Sufficiency of income was self-reported as the answer to the question: To what extent is your income sufficient to make ends meet? Possible responses were: very sufficient, sufficient, insufficient.

Chronic conditions were assessed by self-report as having been diagnosed by a medical doctor as having hypertension, heart diseases, diabetes, cancer, chronic respiratory disease and arthritis. Depressive symptoms were assessed by the Center for Epidemiologic Studies Depression Scale (CES-D): Scores range from 0 to 60; scores ≥16 indicating high probability of being depressed.

Additional contextual variables. Living arrangements were categorized as living alone, only with spouse, with spouse and children, with children and extended family and with others (family or unrelated people). The work situation during the last week was categorized as active in the labor force, helping family members, retired and unable to work/cannot find a job.

2.5. Ethical considerations

The Research Ethics Committees at the Universidad de Caldas, Universidade Federal do Rio Grande do Norte, Albanian Institute of Public Health, Queens University and Centre de Recherche du Centre Hospitalier de l’Université de Montréal approved the study, and written informed consent was obtained from all subjects prior to study participation.

2.6. Statistical analyses

Sex-specific bivariate analyses were conducted to illustrate differences in living and health conditions across sites. Differences in prevalence of difficulty in any ADL, in mobility disability and in physical performance (SPPB < 8) were compared by Chi square tests. Poisson regression was used to estimate prevalence ratios of poor outcomes for women compared with men at each site using three models: (a) controlling for age; (b) controlling for age, education and income; (c) controlling for age, education, income,

<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td>Distribution of study samples according to demographic and socio-economic characteristics.</td>
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<table>
<thead>
<tr>
<th>Variables</th>
<th>Natal (Brazil)</th>
<th>Manizales (Colombia)</th>
<th>Tirana (Albania)</th>
<th>Saint-Hyacinthe (Quebec)</th>
<th>Kingston (Ontario)</th>
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<tr>
<td>Age</td>
<td></td>
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<tr>
<td>65–69</td>
<td>P = 0.591*</td>
<td>P = 0.224</td>
<td>P = 0.223</td>
<td>P = 0.345</td>
<td>P = 0.170</td>
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<tr>
<td>70–74</td>
<td>52.08</td>
<td>54.76</td>
<td>56.57</td>
<td>50.50</td>
<td>46.28</td>
</tr>
<tr>
<td>Education</td>
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<tr>
<td>Less than secondary</td>
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</tr>
<tr>
<td>Secondary</td>
<td>70.31</td>
<td>84.76</td>
<td>69.70</td>
<td>77.72</td>
<td>7.98</td>
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<td>12.86</td>
<td>13.13</td>
<td>17.33</td>
<td>19.68</td>
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<td>Poor/middle</td>
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<td>52.08</td>
<td>17.17</td>
<td>4.95</td>
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<td>Upper middle</td>
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<td>45.24</td>
<td>43.43</td>
<td>49.50</td>
<td>53.72</td>
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<tr>
<td>Higher</td>
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<td>54.76</td>
<td>56.57</td>
<td>50.50</td>
<td>46.28</td>
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<tr>
<td>Income sufficiency</td>
<td></td>
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<tr>
<td>Very sufficient</td>
<td>4.69</td>
<td>3.33</td>
<td>5.56</td>
<td>3.96</td>
<td>42.55</td>
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<td>Sufficient</td>
<td>25.00</td>
<td>19.05</td>
<td>24.75</td>
<td>23.27</td>
<td>42.02</td>
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<td>70.31</td>
<td>77.62</td>
<td>62.87</td>
<td>72.77</td>
<td>15.43</td>
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<td>Alone</td>
<td>5.21</td>
<td>7.62</td>
<td>14.65</td>
<td>13.86</td>
<td>3.19</td>
</tr>
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<td>Only spouse</td>
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<td>7.62</td>
<td>14.65</td>
<td>13.86</td>
<td>3.19</td>
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<tr>
<td>Children with or w/o spouse</td>
<td>69.79</td>
<td>78.57</td>
<td>62.63</td>
<td>72.77</td>
<td>45.74</td>
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<tr>
<td>Longest held occupation</td>
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<td></td>
</tr>
<tr>
<td>No skilled manual</td>
<td>35.94</td>
<td>52.86</td>
<td>28.79</td>
<td>52.48</td>
<td>7.98</td>
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<tr>
<td>Skilled manual</td>
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<td>36.67</td>
<td>52.02</td>
<td>35.64</td>
<td>61.17</td>
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<tr>
<td>Non manual</td>
<td>10.42</td>
<td>10.48</td>
<td>19.19</td>
<td>11.88</td>
<td>30.85</td>
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<tr>
<td>Work situation (last week)</td>
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<tr>
<td>Worked</td>
<td>22.40</td>
<td>44.76</td>
<td>30.81</td>
<td>57.43</td>
<td>5.85</td>
</tr>
<tr>
<td>Did not worked</td>
<td>77.60</td>
<td>55.24</td>
<td>69.19</td>
<td>42.57</td>
<td>94.15</td>
</tr>
</tbody>
</table>

*p-values comparing men and women at each research site.
chronic conditions and depressive symptoms. Analysis was conducted with SPSS version 19.

3. Results

Table 1 shows the distribution of demographic and socioeconomic indicators at each site. The lowest education was observed in Natal and the highest in Kingston. At all sites except in Kingston, women had lower education than men. At all sites except in Tirana, women had lower income than men.

Practically nobody stated that their income was very insufficient in the Canadian sample while this percentage reaches 45% of the population of Natal, 30% of the population of Manizales, and 25% of the population of Tirana. Except for Saint-Hyacinthe, judgments of sufficiency of income were not different between men and women in spite of the lower absolute incomes of women compared with men at all sites.

Living arrangements were very different across sites. In Saint-Hyacinthe, about 90% of people between 65 and 74 lived either alone or with their spouse. In Kingston, this percentage was about 42% and a sizeable minority lived with their children. In Canadian sites, more women than men lived alone: in Kingston, close to 40% of women lived alone compared with 27% of men; in Saint-Hyacinthe, corresponding percentages were 37% vs 14%. In Latin American sites, few participants lived alone and more than 70% lived with their children. In Tirana, few people lived alone and women were more likely to live with children. Living arrangements were statistically different for men and women at each site.

Lastly, work situation during the week preceding the interview was different between men and women in the Latin American sites, where women did more informal work helping the family and men continued actively working or had a pension. In Kingston, Saint-Hyacinthe and Tirana, most elderly persons had a pension, informal work was infrequent, with no gender differences.

Table 2 shows the distributions of co-morbidity and depressive symptoms by site. Women reported higher prevalence of comorbidity than men at all sites except at Kingston. Prevalence of chronic conditions was highest at Tirana. Women had higher prevalence of depression at all sites although in Kingston this difference was less pronounced.

Fig. 1 shows the distribution of SPPB scores by research site and sex (Fig. 1a–e) and comparing across research sites (Fig. 1f). SPPB scores were very similar for men and women in Kingston but difference was less pronounced.

Fig. 2 shows the prevalence of low physical performance (SPPB < 8): No differences between men and women were observed at the Canadian sites. Prevalence in men was lower than in women in Tirana, Natal and Manizales. Overall, Canadian sites had the lowest prevalence of poor physical performance (SPPB < 8).

Fig. 3 shows the prevalence of self-reported difficulty in walking 400 m or climbing 10 stairs by sex across sites. Differences between men and women were significant at all sites except for Kingston. The highest prevalence of mobility difficulties were observed in Tirana, for both men and women, and the lowest at Kingston for women and at Saint-Hyacinthe for men.

Lastly, Fig. 4 shows the prevalence of any difficulty in mobility-related ADL. We observed significant differences between men and women in Natal, Manizales, Tirana and Saint-Hyacinthe and no gender differences in Kingston. Tirana had the overall highest ADL disability prevalence both in men and in women and the lowest prevalence for men was observed in Saint-Hyacinthe.

Adjusted prevalence ratios for women vs men for the three outcomes are shown in Table 3. In the age-adjusted model (Model 1), women had higher prevalence of low physical performance (SPPB < 8) compared with men in Tirana, Natal and Manizales while there were no sex differences in the Canadian sites. Women had higher prevalence of self-reported mobility disability and higher ADL disability compared with men at all sites except for Kingston. In Model 2, after further adjustment by education and income, gender differences in Saint-Hyacinthe and Manizales were attenuated and became non-significant for SPPB and ADL disability while self-reported mobility was worse in women than in men at all sites except at Kingston. In Model 3, after further adjustment by chronic conditions and depression, prevalence of poor physical function was higher in women than in men only in Tirana, self-reported mobility was worse in women than in men at all sites except at Kingston and there were no gender differences in ADL disability at all sites.

4. Discussion

4.1. Main findings

In this work we present the rationale and the design of IMIAS and we examined three hypothesis: (1) that the gender mobility gap would be small or non-existent in societies with little gender inequality, while would be larger in societies with larger gender inequality; (2) that the gender gap would be attenuated after considering gender differences related socioeconomic and health indicators; and (3) that the direction of the results would be similar for objective and self-reported measures of physical function. Our findings support partially the proposed hypotheses. First, the mobility gap between men and women varies across sites from non-significant differences in Kingston (the most egalitarian setting for women and men) to observed significant differences of varying magnitude in Saint-Hyacinthe, Tirana, Manizales and Natal. Second, gender differences in physical performance and ADL

Table 2

<table>
<thead>
<tr>
<th>Variables</th>
<th>Natal (Brazil)</th>
<th>Manizales (Colombia)</th>
<th>Tirana (Albania)</th>
<th>Saint-Hyacinthe (Quebec)</th>
<th>Kingston (Ontario)</th>
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<tbody>
<tr>
<td></td>
<td>Men (n = 192)</td>
<td>Women (n = 210)</td>
<td>Men (n = 198)</td>
<td>Women (n = 202)</td>
<td>Men (n = 191)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic conditions</td>
<td>P &lt; 0.001*</td>
<td>P &lt; 0.001</td>
<td>P &lt; 0.001</td>
<td>P &lt; 0.001</td>
<td>P = 0.011</td>
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<td>Zero or one</td>
<td>55.7</td>
<td>24.3</td>
<td>65.7</td>
<td>45.5</td>
<td>52.4</td>
</tr>
<tr>
<td>Two or three</td>
<td>37.0</td>
<td>56.7</td>
<td>30.8</td>
<td>45.3</td>
<td>41.9</td>
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<tr>
<td>Four and more</td>
<td>7.4</td>
<td>19.0</td>
<td>3.5</td>
<td>8.9</td>
<td>5.8</td>
</tr>
<tr>
<td>Depressive symptoms (CESD ≥ 16)</td>
<td>P &lt; 0.001</td>
<td>P &lt; 0.009</td>
<td>P &lt; 0.001</td>
<td>P = 0.028</td>
<td>P = 0.067</td>
</tr>
<tr>
<td>Less than 16</td>
<td>93.2</td>
<td>63.3</td>
<td>79.8</td>
<td>68.3</td>
<td>93.7</td>
</tr>
<tr>
<td>16 and over</td>
<td>6.8</td>
<td>36.7</td>
<td>20.2</td>
<td>31.7</td>
<td>6.3</td>
</tr>
</tbody>
</table>

*p-values comparing men and women at each research site.
disability were attenuated after adjustment by socioeconomic and health conditions while gender differences in mobility disability remained large in all sites except in Kingston. And finally, gender differences are observed in the three functional outcomes used in the analyses, from the more objective measure of physical performance to the self-reported and less precise measure of gross mobility provided by the questions on walking 400 m and climbing stairs and to the most severe mobility disability implied by the difficulty in ADLs related to lower extremity function.

### 4.2. Interpretation of results

We will discuss first the finding of equal disability in Kingston’s men and women. This was unexpected because there is really no other evidence for populations where disability is the same in older men and women. This lack of difference could be due to sample bias but it could be real since it is consistent with the equality in the distributions of education and income among those older men and women in the Kingston sample. In addition, contrary to our expectations that the two Canadian sites would be similar in terms of gender differences in mobility, we observed significant elevated prevalence of self-reported poor physical function and ADL disability, in women compared to men in Saint-Hyacinthe, while the objective indicator of physical performance (SPPB) did not differ. The contrasting results from Saint-Hyacinthe

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**Fig. 1.** Distribution of SPPB scores by research site and gender.

**Fig. 2.** Prevalence of poor physical performance (SPPB < 8) by research site and gender.
gender differences in performance measures of physical function in the Latin American sites and more significantly in Natal than in Manizales. These results provide evidence on ways by which societal gender norms and individual behaviors are embodied, using the term proposed by Krieger to express that human beings literally embody the world in which they live producing population patterns of health and disability (Krieger & Davey Smith, 2004). In addition, gender-related norms and values may be influencing self-reports of both mobility and ADL difficulty at these sites, as argued in previous research conducted at places where differences in the positions of men and women in society prevail (Rahman & Liu, 2000): Masculinity values promote denial of illness and disability (Courtenay, 2000; Oksuzyan et al., 2008; Yount et al., 2010) while feminine roles are associated with reporting of poor health (Rahman & Liu, 2000).

Third, no study of these characteristics has been previously undertaken in Albania. In spite of little or no sex differences in education and income, Albanian women have worse physical function than men, according to both self-reported and performance measures. These results could be interpreted with caution due to the social differences between the research sites but the observed differences are similar to the gender differences in physical disability previously reported in the Mediterranean region, in Italy (Maggi et al., 2004), Spain (Rodriguez-Laso et al., 2014), Lebanon (Zeki Al Hazzouri, Mehio Sibai, Chaaya, Mahfoud, & Yount, 2011), Tunisia (Yount & Agree, 2005) and Egypt (Yount & Agree, 2005).

Consistently with what has been already reported (Raina et al., 1998; Yount et al., 2010; Zunzunegui et al., 2009) further adjustment for socioeconomic position did not change the gender gap in self-reported mobility. However, it attenuated differences in physical performance and ADL disability between men and women in Saint-Hyacinthe and Manizales.

When chronic conditions and depression were taken into account, gender differences in physical performance practically generated one generation later than in Ontario and were fast after 1968 (Québec, 2013).

Second, results of gender differences in Manizales and Natal were in agreement with previous research conducted in Latin America (Alvarado, Guerra et al., 2007; Melzer & Parahyba, 2004) and results from our pilot studies carried out in Brazil and Colombia (Curcio et al., 2013; Freire et al., 2012). Women had worse physical function than men in both self-reported and performance measures of physical function in the Latin American sites and more significantly in Natal than in Manizales. These results provide evidence on ways by which societal gender norms and individual behaviors are embodied, using the term proposed by Krieger to express that human beings literally embody the world in which they live producing population patterns of health and disability (Krieger & Davey Smith, 2004). In addition, gender-related norms and values may be influencing self-reports of both mobility and ADL difficulty at these sites, as argued in previous research conducted at places where differences in the positions of men and women in society prevail (Rahman & Liu, 2000): Masculinity values promote denial of illness and disability (Courtenay, 2000; Oksuzyan et al., 2008; Yount et al., 2010) while feminine roles are associated with reporting of poor health (Rahman & Liu, 2000).

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When chronic conditions and depression were taken into account, gender differences in physical performance practically

Table 3

Gender prevalence ratios (women compared with men) for low physical performance (SPPB < 8), mobility disability and mobility-related ADL disability.

<table>
<thead>
<tr>
<th>Region</th>
<th>SPPB 8</th>
<th>Mobility</th>
<th>ADL disability</th>
<th>Mobility</th>
<th>ADL disability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natal (Brazil)</td>
<td>2.24</td>
<td>1.97</td>
<td>2.38</td>
<td>1.57</td>
<td>1.70</td>
</tr>
<tr>
<td>Manizales (Colombia)</td>
<td>2.25</td>
<td>1.51</td>
<td>2.43</td>
<td>1.57</td>
<td>1.70</td>
</tr>
<tr>
<td>Tirana (Albania)</td>
<td>2.38</td>
<td>1.70</td>
<td>2.43</td>
<td>1.57</td>
<td>1.70</td>
</tr>
<tr>
<td>Saint-Hyacinthe (Québec)</td>
<td>2.38</td>
<td>2.07</td>
<td>2.43</td>
<td>2.07</td>
<td>1.70</td>
</tr>
<tr>
<td>Kingston (Ontario)</td>
<td>2.38</td>
<td>2.07</td>
<td>2.43</td>
<td>2.07</td>
<td>1.70</td>
</tr>
</tbody>
</table>

*p < 0.05.
**p < 0.01.
***p < 0.001.
Model 1: adjusted by age.
Model 2: adjusted by age, education and sufficiency of income.
Model 3: adjusted by age, education, sufficiency of income, number of chronic conditions and depression symptoms.

Fig. 3. Difficulties climbing a single flight (10 steps) of stairs without resting or walking 400 m (1/4 mile) by research site and gender.

Fig. 4. Difficulty in at least one of five mobility related activities of daily living by research site and gender.
disappeared at Saint-Hyacinthe, Natal and Manizales suggesting that poor physical performance and severe disability differences between men and women could be explained at least partially by the higher comorbidity and depression of women compared with men of similar age and socioeconomic position. Gender differences in self-reported mobility remained at Saint-Hyacinthe, Manizales and Natal, even after controlling for comorbidity and depression. This is consistent with the report from Bangladesh stating that, for every level of physical performance, women had higher prevalence of self-reported disability which may indicate the existence of socio-cultural barriers of mobility (Rahman & Liu, 2000).

In Tirana, the large gender gap in physical performance persisted even after extensive adjustment both for objective physical performance and self-reported mobility indicating additional barriers to mobility in women that go beyond what has been considered in our models. This is in agreement with previous research on mobility disability conducted in Latin America and Canada (Raina et al., 1998; Zunzunegui et al., 2009) and in one recent report examining gender differences in physical function in Spain, a country with still high gender inequality among this generation of older adults (Rodriguez-Laso et al., 2014).

4.3. Study limitations and strengths

Response rates in Canada were low but these low rates were induced by the recruitment procedure required by the Ethics Review Boards at the Canadian research sites. Comparisons of 2006 census data on education show that participants in Kingston were more highly educated than the general population in that city while participants in Saint-Hyacinthe had levels of education close to the Census data. In particular, while the proportion of participants with more than high school education was 79% in our Kingston’s sample, this proportion was 55% in the 2006 Canadian census for the Kingston area. In Saint-Hyacinthe, these proportions were 48% and 46%, respectively. This may give an over-optimistic view of the mobility status of older adults in Kingston. However, the Kingston sample may be thought to represent the mobility prevalence and the gender gap in physical function if all our populations could have the good living conditions of this highly selected Kingston sample.

In addition, this low response rate could introduce selection bias only if participation in the study was related both to sex and to physical function. Even if people who volunteer to participate in population studies are different from those who do not volunteer in many ways (Pinsky et al., 2007; Thomson et al., 2005), there is no reason to believe that the healthy volunteer effect in the Kingston population will be different in men and women. In spite of the above limitations, IMIAS gives new results on the gender physical function gap by examining aging populations living in diverse societies from high and middle income countries and using uniform study designs and data collection methods, using validated physical and cognitive function measurement tools in the studied populations (Curcio et al., 2013; Freire et al., 2012; Gomez et al., 2012).

5. Conclusion

Physical performance, mobility disability, mobility related ADL disability prevalence vary across research sites with differences consistent with the gender embodiment hypothesis. Our results are preliminary since they are based on prevalence. Longitudinal analyses in IMIAS will be needed to examine if incidence and recovery patterns support the gender inequality origin of the mobility gender gap. If this hypothesis is confirmed and following Rose (Rose, 2001), we could state that shifting the gender distribution of resources and opportunities to more egalitarian patterns may result in disappearance of the gender mobility gap in future generations.

References


