Author's response to reviews

Title: Musculoskeletal comorbidities in cardiovascular disease, diabetes and respiratory disease: the impact on activity limitations; a representative population-based study

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Version: 2 Date: 21 December 2010

Author's response to reviews: see over
Dear Editor and Reviewers,

Thank you for your thoughtful comments on our manuscript. Based on these comments, we have edited our manuscript and feel it is improved and clearer. Our responses are noted following the specific comments. Changes to the manuscript text are highlighted in red. Thank you for considering our manuscript for publication in BMC Public Health.

Editorial Requests:

1. Please can you ensure that the background section of your abstract contains context information.

Greater context has been provided in the Background. We highlight the fact that while many people have comorbidity, chronic disease management and prevention strategies continue to focus on single diseases.

We added to the Background,

“A frequent focus of attention for chronic disease prevention and management programs has been on cancer, coronary heart disease, diabetes, and chronic respiratory disease with many programs focusing on a single disease.[1] However, many people have comorbidities (i.e. multiply co-occurring diseases) [2]. The occurrence of comorbidity influences decisions in many areas of health including prevention, complexity of treatment and service utilization, as well as influencing outcomes such as limitations in activity, participation restriction and mortality [3:4]. In spite of this, little attention has been paid to comorbidity and the effect that comorbid conditions have on limitations in activity and hence on one’s ability to engage in self management behaviours, in particular physical activity [5:6]” (paragraph 1, p.3).

2. Please can you let us know if the data used in your study was openly available?

The data were publicly available.

We added to the Methods,

“The data used in this study were publicly available” (paragraph 4, p.4).
Reviewer: Arpana Verma
1. How representative is the sample to the study population?
   2. What tests/steps have been used to determine representativeness and to minimise responder bias and non-responder bias?
   3. What are the methods used for the weights?

These are important questions. We agree that further detail concerning survey methodology may be helpful and of interest to readers. Since the questions are somewhat related, our response will address all three together.

For administrative purposes, each province in Canada was divided into health regions (HR) and each territory was designated as a single HR. Data was collected in 122 HRs in the ten provinces, in addition to one HR per territory, totalling 125 HRs. Sample sizes and allocation were calculated to ensure reliable estimates both at the HR and provincial level. The household response rate for the survey was 84.9% and person response rate was 92.9%, with a final sample size of 132,221 individuals.

As a final step, Statistics Canada employed a weighting phase, a step that calculates, for each person, his or her associated sampling weight.

The weighting strategy was developed by treating both the area and telephone frames, the initial sampling frames, independently. The weights accounted for the probability of selection of clusters within the area frames, and selection of households within clusters. The weights of the non-responding households were distributed using response propensity classes to the responding households. Weights were then adjusted to account for the probability of individual selection within the household. An adjustment factor was applied to the weights of respondents to account for individual nonresponse. The adjustment was applied within classes based on characteristics available for both respondents and nonrespondents. Depending on the HR, the following characteristics were used to form the adjustment classes: household size groups, urban/rural indicator, collection period, number of persons 12 years of age or older, living arrangement, sex, marital status, and age.

The final step in the weighting phase was post-stratification. Poststratification was done to ensure that the sum of the final weights corresponded to the population estimates defined at the HR level, for all 10 age-sex groups of interest, that is, the five age groups 12-19, 20-29, 30-44, 45-64, 65+, for both males and females.

As noted in the Methods, the weights provided by Statistics Canada were employed in our analyses. Thus, the combination of sampling methods employed by Statistics Canada and the additional use of sampling weights in our analyses ensured a high level of representativeness of the sample and analytical findings to the population.

Though important, we felt that providing this level of detail in the manuscript could potentially detract from the paper. However, we provide a reference to direct interested readers to a detailed account of the survey’s methodology.

We added to the Methods,

“Data were obtained from the 2005 Canadian Community Health Survey (CCHS, Cycle 3.1), a comprehensive cross-sectional survey of health status and determinants administered by Statistics Canada, Canada’s central statistical agency…The survey
covered approximately 98% of the Canadian population aged 12 and older” (paragraph 3, p. 3).

And,
“A two-stage cluster design was employed to arrive at a representative sample of the household population. In the first stage, homogeneous strata were formed and independent samples of clusters were drawn from each stratum. In the second stage, dwelling lists were prepared for each cluster and dwellings, or households, were selected from the lists.
More specifically, each of the ten province was divided into three types of regions: major urban centres, cities, and rural regions. Geographic or socio-economic strata were created within each major urban centre. Within the strata, dwellings were regrouped to create clusters.
In each stratum, six clusters were chosen by a random sampling method with a probability proportional to size, the size of which corresponded to the number of households. The other cities and rural regions of each province were stratified first on a geographical basis, then according to socio-economic characteristics. Once the new clusters were listed, the sample was obtained using a systematic sampling of dwellings. Further details of survey methodology, including strategies to ensure representativeness of the sample, have been published. [7]” (paragraph 1,2 and 3, p.4).

And finally,
“The methods employed by Statistics Canada to calculate weights have been published. [7]” (last paragraph 3, p. 5).

4. Why is there the discrepancies in PAFs with the published literature?

While we note discrepancies in PAFs with the published literature in the Discussion, we agree that we were not clear in providing a potential explanation for these differences.
The PAFs from the literature cited in our Discussion were calculated for the total population. In contrast, we calculated PAFs in specific sub-groups of the population characterized by specific conditions. We believe these differences suggest that there are differential impacts for individuals with specific medical conditions depending on the presence of particular comorbidities. Additionally, since submitting our manuscript, a study was published that examined the impact of combinations of chronic conditions on functional disability [8]. While they report some of the highest population attributable risks for activities of daily living and instrumental activities of daily living for pairs of conditions including arthritis, and particularly for heart conditions and arthritis, discrepancies in the magnitude of PARs can be attributed to the population under study. In this latter study, the sample was limited to individuals aged 65 and over. Thus, variations in the population, or rather sub-groups of the population, under study will contribute to discrepancies in PAFs. An important advantage of the present study was the consideration of conditions of high prevalence in the population or of considerable public interest, or both, across the full adult age range.
We added to the Discussion,

“The population associated fractions calculated in this study for populations with specific chronic diseases are generally higher that those found in an earlier study for the total population which also used activity limitations as an outcome.[9] (paragraph 5, p.7)

And,

“Griffith et al. [8] reported relatively large population attributable risks for functional disability (examining independently activities of daily living and instrumental activities of daily living) for pairs of chronic conditions which included arthritis. They report some of the highest values for the combination of arthritis and heart problems. Their study was limited to individuals aged 65 and over, however. These differences suggest there are differential impacts for individuals with specific medical conditions depending on the presence of particular comorbidities, and the age structure of the population under study. An important advantage of the present study was the consideration of conditions of high prevalence in the population or of considerable public interest, or both, across the full adult age range.” (paragraph 1, p.8).

5. Are there any unpublished works that may be useful?

The Canadian Public Health Agency and the Canadian Institute for Health Information, and similar national and regional agencies, regularly publish reports (which form part of the ‘grey literature’) that provide essential information for their respective countries’ health systems and health of their populations. Some of these reports have relied on the same or similar health surveys as used in the present study. However, these reports are primarily descriptive in nature and do not examine complex health issues as done in the present study. Therefore, while relevant, we do not feel these reports can aid us in understanding the current study findings.

A search of e-pubs ahead of publication and a Google search did not produce any works that we felt were of sufficient relevance to be included in the manuscript.

6. How has this study added to the literature?

For the most part, chronic disease prevention strategies and practice guidelines have been developed in a siloed fashion, addressing only single chronic conditions, and ignoring the presence of co-existing conditions. Our population-based study points to the importance of taking into account the impact of arthritis and back problems on activity limitations in persons with co-existing cardiovascular disease, diabetes and respiratory disease (diseases of high prevalence in the population or of considerable public importance, or both) when designing intervention and prevention strategies. And, in particular, it needs to be recognized that arthritis and back problems are not contraindications to physical activity.
We have added to and revised the Discussion,

“Although numerous chronic disease prevention strategies and practice guidelines have been developed, they mainly address single chronic conditions and ignore the presence of co-existing conditions. Our findings suggest that the implementation of effective prevention, treatment and management strategies for chronic disease might be affected by musculoskeletal comorbidity. While musculoskeletal conditions are not always considered to be among the top priorities in chronic disease prevention, they are the most prevalent chronic conditions. This population-based study points to the importance of taking into account the impact of arthritis and back problems on activity limitations in persons with co-existing cardiovascular disease, diabetes and respiratory disease when designing intervention and prevention strategies.” (paragraph 2, p. 9).

Additionally, in response to a related comment from the second reviewer, we added to the Discussion,

“There can be potential synergies and antagonisms in populations with comorbid conditions and potential problems in delivering intervention and prevention strategies. However, approaches which consider the presence and impact of comorbid conditions are likely of greater benefit to the population and patient than approaches which overlook them. For example, physical activity is a key prevention strategy particularly for the prevention of cardiovascular diseases and diabetes, and for health in general. When designing intervention strategies, it needs to be recognized that comorbid arthritis and back problems is not a contraindication, although modifications may need to be made [10]. Further, regular physical activity has been shown to be beneficial in managing symptoms associated with arthritis and back problems [11]” (paragraph 3, p.9)
Reviewer: Elaine Harkness

Methods
1. More details should be given about the two-stage cluster design of the survey to describe how the sample was representative of the household population.

   We agree that further detail concerning survey methodology may be helpful and of interest to readers. Further to the additions following reviewer 1’s initial comments,

   We added to the Methods,

   “A two-stage cluster design was employed to arrive at a representative sample of the household population. In the first stage, homogeneous strata were formed and independent samples of clusters were drawn from each stratum. In the second stage, dwelling lists were prepared for each cluster and dwellings, or households, were selected from the lists.

   More specifically, each province was divided into three types of regions: major urban centres, cities, and rural regions. Geographic or socio-economic strata were created within each major urban centre. Within the strata, dwellings were regrouped to create clusters.

   In each stratum, six clusters were chosen by a random sampling method with a probability proportional to size, the size of which corresponded to the number of households. The other cities and rural regions of each province were stratified first on a geographical basis, then according to socio-economic characteristics. Once the new clusters were listed, the sample was obtained using a systematic sampling of dwellings” (paragraph 1,2 and 3, p.4).

2. More details should be given about the specific questions in relation to the musculoskeletal chronic diseases. For example, how are back problems defined?

   We have now included, verbatim, the questions posed to the survey respondents.

   We added to the Methods,

   “The presence of chronic conditions was determined using the lead-in statement: “We are interested in long-term conditions that have lasted or are expected to last six months or longer and that have been diagnosed by a health professional. Do you have…”. Of the 27 specific self-reported chronic conditions that are collected by the CCHS, this study considered the following chronic conditions: cardiovascular conditions (identified as the self-reported presence of “high blood pressure”, “heart disease” or “suffer from the effects of a stroke”), “diabetes”, respiratory conditions (identified as the self-reported presence of “asthma”, “chronic bronchitis”, “chronic obstructive pulmonary disease” or “emphysema”), “arthritis or rheumatism, excluding fibromyalgia” (referred to as arthritis), and “back problems, excluding fibromyalgia and arthritis” (referred to as back problems)” (paragraph 5, p.4).
3. Is the measure in relation to activity limitation a validated measure?

Statistics Canada undergoes a rigorous validation phase for each of the measures included in their surveys. From Statistics Canada’s website, concerning CCHS survey measures and quality evaluation, they report,

“To ensure the survey meet its objectives, a Steering Committee and an Advisory Board comprised of authorities from the provincial and territorial Ministries of Health, Health Canada and the Public Health Agency of Canada determined the concepts and focus. Expert Groups were convened to advise on the measures to obtain the results envisioned by the Steering Committee and Advisory Board, and to recommend proven collection vehicles and indices. The resulting data are recognized as valid measures of contemporary concepts such as: depression, activity limitation, weight problems and chronic pain.

Throughout the collection process, control and monitoring measures were put in place and corrective action was taken to minimize non-sampling errors. These measures included response rate evaluation, reported and non-reported data evaluation, on site observation of interviews, improved collection tools for interviewers and others.

Once processing steps are completed, three data validation steps are undertaken. First, a validation program is run in order to compare estimates for the health indicators taken from the common content with the previous year. This validation is performed at various geographical levels, as well as by age and sex. Significant differences are examined further to find any anomalies in data. Also, the work of analysts who use the CCHS data to publish analytical articles on specific themes, allows for an in-depth look at many variables of the survey and represents a very effective way to find error.

Last, an external validation step is also part of the validation process. Share files are sent before release to provincial and federal partners for a two-week examination period. They can then scrutinize the data and inform Statistics Canada of any concerns or anomalies related to data quality.” [12]

Unfortunately Statistics Canada does not publish the details of this work. We have substituted the wording of the question used by Statistics Canada to obtain the derived variable we use. This variable has been used extensively in their previous surveys, since 1994.

We added to the Methods,

“Prefaced with “The next few questions deal with any current limitations in your daily activities caused by a long-term health condition or problem,” respondents were asked, “Do you have any difficulty…walking, climbing stairs, bending, learning or doing any similar activities?” and “Does a long-term physical condition or mental condition or health problem, reduce the amount or the kind of activity you can do…at home?...at school?...at work?...in other activities, for example, transportation or leisure?” For each of these, respondents indicated either “sometimes”, “often”, “never.” (paragraph 1, p.5)
Results

1. A table of population characteristics may be of interest to readers.

We have added a new table (Table 1) to the manuscript, reporting on the population characteristics.

Additionally, we added to the Results,

“Table 1 contrasts the demographic and socioeconomic characteristics and BMI levels of the overall population and the groups characterized by the index conditions. The index condition groups generally were comprised of a greater proportion of older individuals; this likely partially explains some of the differences in education and income levels within these groups relative to the overall population. Nearly 51% of the overall population was overweight/obese. This is in contrast to the 74% and 67% within the diabetes and cardiovascular sub-groups, respectively” (paragraph 2, p.6).

Discussion

1. Activity limitations were taken as those that reported limitations sometimes or often – it would be interesting to know whether there were differences between these categories.

We agree that this potentially is of interest. However, we feel that examining limitations with greater granularity may not lend itself easily to informing overall public health direction or policy. With a public health perspective in mind, we intentionally chose to focus on overall limitations.

2. It would be useful if the authors suggested what types of intervention and prevention strategies they feel would be beneficial. This could perhaps include some discussion around the potential synergies and antagonisms in populations with co-morbid conditions and the potential problems of delivering intervention and prevention strategies. For example, exercise may be beneficial for those with cardiovascular disease but may aggravate another condition e.g. arthritis.

These are important considerations, indeed. Using the example provided by the reviewer,

We added to the Discussion,

“There can be potential synergies and antagonisms in populations with comorbid conditions and potential problems in delivering intervention and prevention strategies. However, approaches which consider the presence and impact of comorbid conditions are likely of greater benefit to the population and patient than approaches which overlook them. For example, physical activity is a key prevention strategy particularly for the prevention of cardiovascular diseases and diabetes, and for health in general. When designing intervention strategies, it needs to be recognized that comorbid arthritis and back problems is not a contraindication, although modifications may need to be
made [10]. Further, regular physical activity has been shown to be beneficial in managing symptoms associated with arthritis and back problems [11]” (paragraph 3, p.9)

3. On page 7, one of the limitations the authors discuss is that of self-report data and that this may lead to an underestimate of the prevalence of chronic disease. However, for something like back pain self-report data may also lead to an overestimate of prevalence.

We agree. We have clarified the sentence by referring to inaccuracies, without specifying the direction of inaccuracy.

We added to the Discussion,

“The absence of clinician-assessed chronic conditions may lead to inaccuracies in the prevalence of chronic disease” (last paragraph, p.8).
Reference List


Ref Type: Electronic Citation


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