The relative impact of 13 chronic conditions across three different outcomes

Anthony V Perruccio, J Denise Power, Elizabeth M Badley

J Epidemiol Community Health 2007;**61**:1056–1061. doi: 10.1136/jech.2006.047308

See end of article for authors' affiliations

Correspondence to: Anthony V Perruccio, Toronto Western Research Institute, 399 Bathurst St., MP10-316, Toronto, ON, Canada, M5T 2S8; perrucci@uhnres.utoronto.ca

Accepted 26 January 2007

Study objective: Previous estimates of individual and population attributable risks for adverse outcomes due to chronic conditions have considered only a limited number of conditions and outcomes, with some studies using inappropriate formulae or methods of estimation. This study re-examines the magnitude of individual and population attributable risks for a wide range of conditions and various health outcomes.
Design: Log-Poisson regression was used to calculate prevalence ratios as an indicator of individual risk and population-associated fractions of 13 chronic conditions, examining activity limitations, self-rated health and physician visits. The effect of multimorbidity on prevalence ratios was examined.
Setting: Canada, 2000–01.
Participants: Nationally representative sample of Canadians aged 12+ years (n = 130 880).
Main results: At the individual level, fibromyalgia/chronic fatigue syndrome and cancer, and to a lesser extent stroke and heart disease, were associated with an increased risk of both activity limitations and a self-rated health status of fair or poor; high blood pressure was associated with four or more physician visits in the previous 12 months. In contrast, population attributable fractions were substantial for arthritis/rheumatism, heart disease, back problems and high blood pressure across all outcomes. Adjustment for multimorbidity resulted in a marked decreases in prevalence ratios.
Conclusions: Differences in the ranking of individual risks and population attributable fractions for different diseases and outcomes are substantial. This needs to be taken into account when setting priorities, as interventions may need to be targeted to different conditions depending on which aspects of health are being considered, and whether the focus is on individuals, such as in clinical care, or improving the health of the population.

Estimates of the impact of health conditions are important for driving clinical priorities and population-based health service planning and prevention strategies. However, the focus of these endeavours is somewhat different. At the individual and clinical level, the impact of a condition is related to its severity, including frequency and intensity of symptoms, and related outcomes. In contrast, at the population level, the impact of a condition is governed by the frequency of its occurrence in the population and the strength of association between the condition and adverse outcome. A truism of preventative medicine is that ''a large number of individuals exposed to small risk may generate more individuals with a particular outcome than a small group exposed to higher risk.''[1] Thus, what individuals and their physicians may legitimately view as important health conditions to be addressed and given priority may conflict with public policy focused on conditions that have the greatest negative health impacts for the population as a whole.

For the most part, comparative studies evaluating the differential impacts of health conditions either focus exclusively on mortality or evaluate population impacts by estimating *summary* measures of population health which take into account both mortality and morbidity, for example health expectancy[2] or disability-adjusted life years.[3] Often, however, there is considerable interest in better describing and evaluating the burden of conditions by examining their impacts, at an individual and population level, on specific and selected health outcomes.

Measures of disability or limitation in the ability to perform certain activities are important indicators of the impact of chronic conditions. A particular need to focus on these limitations was raised by Cassel *et al*.[4] in their discussion of the ''ageing society''. They argue that insufficient progress has been made in preventing, postponing and treating non-fatal diseases and that a greater emphasis on controlling disability and chronic disease is needed. In this respect, research has examined the impact of chronic conditions by assessing their burden on the ability of individuals to perform daily activities.[5–9] These activities are generally related to independent living, including preparing meals, shopping for groceries or personal items and performing light or heavy housework.

Another particularly useful measure for studies investigating differential impacts is self-rated health (SRH). Negative or poor self-assessments of health have been found to be significant predictors of reduced social–psychological well-being[10–12] and increased morbidity[13–15] and health care utilisation.[14 16 17] Finally, of considerable interest in comparative studies, and especially for policy planners, is the use of health care services. Often, the frequency of visits to primary care physicians is examined.[6–8 18]

For the most part, the statistic most often used as a measure of population impact has been the population attributable fraction/risk.[6 8 19–21] When using this measure, care must be taken to ensure that the appropriate formulae are being used, depending on whether confounding of exposure–disease association exists and the number of levels of exposure. Rockhill *et al*.[22] present some examples from the literature where errors have been made. Of particular concern is the use of odds ratios derived from the fitting of logistic regression models when the odds ratio is not a good approximation of the risk or prevalence ratio (PR), which is the desired estimate. This is particularly the case when the outcome of interest is not infrequent in the population, as is the case for a number of health outcomes for common chronic conditions, the prevalence of which can exceed 15%.

While there is a reliance on the rare event rate assumption when using an odds ratio to estimate the risk or PR under certain scenarios, techniques for determining these estimates for common outcomes using population-based cross-sectional data have been described; these are based on fitted models that do not rely on the rarity assumption.[23] These include the log-binomial model[24] and log-Poisson model with robust variance.[25 26] With log-binomial modelling, convergence problems in the estimation process are likely to occur with very large datasets or when the outcome prevalence is high.[24 27–30]

Using estimates derived from log-Poisson modelling of representative population-based data, this study examines the consequences of several conditions on selected individual health outcomes (activity limitations, SRH and physician visits) and, in addition, estimates the population-level impacts of these same conditions on the health outcomes.

METHODS

Data were obtained from the 2000–01 Canadian Community Health Survey. This cross-sectional survey is conducted by Statistics Canada and collects self-reported information related to the health status, service use and health determinants of Canadians. The target population comprised individuals aged 12+ years living in private dwellings in each of the provinces and territories. Individuals living on Indian reserves or in certain remote regions, institutional residents and members of the armed forces were excluded. The survey employed a stratified two-stage cluster design. In the first stage, separate strata were formed based on provincial economic characteristics and then independent clusters were drawn from each stratum. In the second, dwelling lists were prepared for each cluster and dwellings selected from those lists. Generally, one person was randomly selected from each household. Approximately 98% of the targeted population was covered. The questionnaire was administered using computer-assisted personal interviewing (83% of the sample) and telephone interviewing. Household and person response rates among the 130 880 participants were 91.4% and 91.9%, respectively. Further details have been documented.[31]

Health outcome-dependent variables

Activity limitation

Respondents were asked whether they had any difficulty with activities, including walking, climbing stairs, bending or similar activities, or had reduced their activities at home, work or school or other activities, such as leisure or transportation, due to disease or illness. Respondents were categorised as having an activity limitation if any of the above elicited a positive response.

Self-rated health

Respondents were asked, ''In general, would you say your health is excellent, very good, good, fair or poor?'' Although SRH is measured as an ordinal response, it is often collapsed into a dichotomous variable of good versus less than good health when it is used as an outcome.[20 32–34] In a study of the relationship between socioeconomic conditions and SRH, Manor *et al.*[35] found that the results of analyses were similar regardless of whether SRH was dichotomised or considered in ordinal, ordered categories. For the current study, responses were dichotomised into excellent/very good/good and fair/poor SRH.

Physician consultations

Based on the self-reported number of consultations with a family or general practitioner (F/GP) in the previous 12 months, responses were dichotomised into < 4 and 4+ consultations. This cut-off was chosen based on our preliminary analyses, which showed the discrepancy in the percentage of consultations between individuals with and without any chronic conditions to be largest at the four consultations level, a discrepancy of 29 percentage points.

Independent variables

The presence of chronic conditions was ascertained 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.'' The list included allergies (food and non-food allergies), back problems, arthritis/rheumatism, high blood pressure, migraines, asthma, heart disease, suffering from the effects of stroke, thyroid disease, diabetes; gastrointestinal conditions (including Crohn's disease, colitis and stomach or intestinal ulcers) cancer and fibromyalgia and/or chronic fatigue syndrome.

Respondents provided their age and gender. Age data were provided in grouped format in the dataset. For this study, age groupings commence at 12–19 years, followed by 10-year increments and ending with 80+ years (data for the 80+ group were available in grouped format only and could not be further decomposed).

Statistical analyses

Data weights provided by Statistics Canada, accounting for sample design, adjustments for non-response and post-stratification, and which were representative of the household population aged 12+ years, were used. Variances were calculated using rescaled weights and incorporating design factors provided by Statistics Canada.

Prevalence estimates of conditions and study outcomes were examined, as were the proportions with specified outcomes among chronic condition groups and vice versa.

For cross-sectional studies, a common measure of association is the PR, whose mathematical computation is identical to that for the relative risk.[28] Adjusted PRs for the outcomes were estimated through multivariate log-Poisson regression analyses with robust variance estimation.[25 26] SAS 9.1 was used for analyses using code provided by Spiegelman and Hertzmark.[36]

For each outcome, models were initially estimated with only age (categorical by deciles of age), gender and each chronic condition (yes/no) as predictors. This was followed by adjustment for multimorbidity, carried out by including an indicator variable for each of the conditions in the model.

With an adequate measure of relative risk available from the modelling technique previously described for the available data, the relative impact of a condition on an outcome at the population level was determined by calculating a population-associated fraction (PAF): $\text{PAF} = pd \times [(\text{adj-PR} - 1)/\text{adj-PR}]$, where pd is the proportion of those with the outcome who report the chronic condition and adj-PR is the adjusted PR from the multimorbidity-adjusted analyses. Bruzzi *et al.*[37] show how, once estimates of relative risk are available, the PAF can be obtained from the distribution of exposure among the cases only. The PAF can be defined as the proportion of cases that would be prevented following elimination of the exposure(s) provided the distributions of other risk factors remain unchanged. The expression of the PAF above produces valid estimates when confounding exists and adjusted PRs are required.[22 38]

RESULTS

The population prevalence of chronic conditions and study outcomes are presented in table 1. The four most common conditions were allergies (28.5%), back problems (17.5%), arthritis/rheumatism (15.2%) and high blood pressure (12.6%).

Four or more consultations with a F/GP was the most often reported health outcome – by almost one-third of individuals. Twelve per cent of individuals reported their health status as fair/poor and a similar proportion reported having some activity limitation.

Table 1 also presents the proportion of individuals within each condition group who reported the outcomes. Although no regular relationships are evident, generally it is the less frequent conditions that tend to be more ''severe'' in that a higher proportion of the population reports an adverse outcome. The pattern of association of conditions is different for different outcomes.

Tables 2, 3 and 4 present the prevalence of chronic conditions among the outcome groups activity limitations, fair/poor SRH and 4+ F/GP consultations, respectively, and the association between the conditions and outcomes, presented as PRs both unadjusted (unadj-PR) and adjusted (adj-PR) for multimorbidity. All estimates are adjusted for age and gender. The importance of taking multimorbidity into account is illustrated by the difference between unadj-PRs and adj-PRs.

Having adjusted for multimorbidity, there was a marked decrease in PRs, indicative of high levels of multimorbidity in this population, although the relative ranking of coefficients between conditions was similar. Adjusted PAFs, estimated using adj-PRs, indicated that, in the case of activity limitations and fair/poor SRH, arthritis/rheumatism overwhelmingly had the greatest population-level impact, at 17% and 16% respectively. The conditions with the second greatest impact on activity limitations were asthma and heart disease, at 8% each. In the case of fair/poor SRH, arthritis/rheumatism was followed by back problems (12%) and high blood pressure (11%). For 4+ F/GP consultations, PAFs were greatest for high blood pressure (9%), followed by back problems (7%) and arthritis/rheumatism (6%).

DISCUSSION

To our knowledge, this is the first study to provide estimates of the impact of a wide range of chronic conditions on diverse outcomes at both the individual and population level and over the full adult age range.

This study examined the relative impact of a range of conditions by examining adjusted PRs estimated using multivariate log-Poisson regression techniques with robust variance, appropriate for common outcomes and population-based cross-sectional data, and used these estimates to calculate PAFs. The term associated fraction, as opposed to attributable risk, was used in this study as the relationship between the conditions and the outcomes examined could not strictly be defined as causative. The PAFs are therefore interpreted not in absolute or causative terms but in relative and associative terms.

The differences in our study between PRs unadjusted and adjusted for multimorbidity point to the need to take account of the co-occurrence of conditions when estimating PAFs. The prevalence of many chronic conditions increases with age, and a corollary of this is an increasing occurrence of multimorbidity. However, this makes providing estimates of the impact of a wide range of conditions on diverse outcomes over the full adult age range challenging to some extent since impact may very well vary by age. However, our aim was to estimate the overall impact of conditions in the population. From a health policy and health care system funding perspective, where strategies are often conceptualised and implemented globally, the utility of age-specific impacts may be small.

Our findings indicate that the impact of conditions can vary substantially depending on whether an individual- or population-level examination is undertaken. For example, although nearly two-thirds of those suffering from the effects of a stroke, compared with about one-third of people with arthritis/rheumatism, reported fair/poor SRH, each with similar associations with fair/poor SRH, the PAF for this outcome was eightfold higher for arthritis/rheumatism than for the effects of a stroke. Similarly, while the proportion of individuals reporting activity limitations was lowest among those with allergies, and this condition ranked among the lowest in strength of association with activity limitations, allergies ranked fourth out of the 13 conditions in terms of population impact. These differences between individual consequences and population-level impacts demonstrate how the determinants of clinical priorities may conflict with those of population-based health service and prevention priorities.

The relative impact of different conditions also varied by the outcome considered, pointing to the need when assessing population impact to take into account the purpose of the assessment. For example, our findings indicate that at population level a priority for interventions aimed at reducing activity limitation should be arthritis/rheumatism. When looking at health in general, back problems and high blood

Table 1 Prevalence of chronic conditions (overall) and study outcomes (overall and by chronic condition groups), Canada, ages 12+ years, 2000–01

	Population prevalence of conditions (%)	Prevalence (%) of study outcomes, overall and by chronic condition		
		Activity limitations	Fair/poor SRH	Four or more F/GP visits
Population prevalence		11.6	12.0	28.5
Chronic condition (by order of overall prevalence)				
Allergies	28.5	15.5	13.8	34.7
Back problems	17.5	18.9	23.5	43.6
Arthritis/rheumatism	15.2	29.2	31.8	51.5
High blood pressure	12.6	24.3	31.2	56.4
Migraines	9.1	19.7	20.2	45.5
Asthma	8.4	23.8	20.7	43.6
Heart disease	5.0	39.8	49.0	63.3
Thyroid condition	4.8	24.6	23.5	48.7
Crohn's disease/colitis/ulcers	4.7	28.8	34.2	54.7
Diabetes	4.1	31.8	42.6	61.1
Cancer	1.7	41.2	47.3	60.0
Fibromyalgia/chronic fatigue syndrome	1.6	49.3	52.2	67.1
Suffering from effects of stroke	1.0	55.3	63.2	67.7

Table 2 Outcome: activity limitations. Prevalence of chronic conditions in people with activity limitations; prevalence ratios (PRs) (95% CI) from Poisson regression analyses; population-associated fractions (PAFs), Canada, 2000–01

	Prevalence (%) in people with activity limitations	PR unadjusted† for multimorbidity	PR adjusted for multimorbidity‡	PAF (%)
Age (years) (ref: 12–19 years)				
20–29			0.90 (0.80 to 1.00)	
30–39			0.99 (0.90 to 1.10)	
40–49			1.27* (1.16 to 1.40)	
50–59			1.48* (1.34 to 1.63)	
60–69			1.66* (1.50 to 1.83)	
70–79			1.67* (1.51 to 1.85)	
80+			1.65* (1.46 to 1.87)	
Gender (ref: male)				
Female			1.20* (1.15 to 1.25)	
Chronic condition				
Allergies	38.1	1.63* (1.56 to 1.70)	1.22* (1.17 to 1.28)	6.9
Back problems	28.6	1.68* (1.61 to 1.76)	1.18* (1.12 to 1.24)	4.3
Arthritis/rheumatism	38.3	2.42* (2.31 to 2.55)	1.78* (1.69 to 1.88)	16.8
High blood pressure	26.4	1.58* (1.51 to 1.67)	1.22* (1.15 to 1.28)	4.7
Migraines	15.5	1.93* (1.82 to 2.04)	1.36* (1.28 to 1.45)	4.1
Asthma	17.3	2.40* (2.28 to 2.53)	1.76* (1.66 to 1.87)	7.5
Heart disease	17.1	2.62* (2.49 to 2.77)	1.78* (1.68 to 1.89)	7.5
Thyroid condition	10.1	1.48* (1.38 to 1.58)	1.18* (1.10 to 1.27)	1.5
Crohn's disease/colitis/ulcers	11.7	2.21* (2.09 to 2.34)	1.35* (1.27 to 1.45)	3.1
Diabetes	11.3	2.00* (1.88 to 2.12)	1.49* (1.40 to 1.60)	3.7
Cancer	6.2	2.40* (2.22 to 2.58)	1.93* (1.78 to 2.11)	3.0
Fibromyalgia/chronic fatigue syndrome	6.9	3.59* (3.34 to 3.85)	2.02* (1.84 to 2.22)	3.5
Stroke	4.8	2.96* (2.72 to 3.21)	1.87* (1.68 to 2.08)	2.3

*p<0.001; †adjusted for age and sex only (e.g. age + gender + allergies; age + gender + asthma; …); ‡age + gender + allergies + back problems +… + stroke.

pressure also make substantial contributions to population burden. PAFs were generally low for 4+ FP/GP consultations, presumably reflecting the fact that the chronic conditions studied account for only a fraction of the reasons for multiple visits. The highest PAF was for blood pressure, presumably related to the need for physician-supervised monitoring.

It is difficult to compare our findings with those of other studies, which tend to be confined to a restricted range of age

Table 3 Outcome: fair/poor SRH. Prevalence of chronic conditions in people with fair/poor SRH; prevalence ratios (PRs) (95% CI) from Poisson regression analyses; population-associated fractions (PAFs), Canada, 2000–01

	Prevalence (%) in people with fair or poor SRH	PR unadjusted† for multimorbidity	PR adjusted for multimorbidity‡	PAF (%)
Age (years) (ref: 12–19 years)				
20–29			0.91 (0.80 to 1.04)	
30–39			1.02 (0.91 to 1.14)	
40–49			1.49* (1.34 to 1.66)	
50–59			1.81* (1.63 to 2.02)	
60–69			2.12* (1.89 to 2.36)	
70–79			2.46* (2.20 to 2.75)	
80+			3.13* (2.78 to 3.53)	
Gender (ref: male)				
Female			0.91* (0.87 to 0.95)	
Chronic conditions				
Allergies	32.8	1.39* (1.33 to 1.45)	1.02 (0.98 to 1.07)	0.8
Back problems	34.4	2.16* (2.07 to 2.25)	1.55* (1.48 to 1.62)	12.2
Arthritis/rheumatism	40.6	2.31* (2.21 to 2.42)	1.62* (1.55 to 1.70)	15.5
High blood pressure	32.9	1.93* (1.84 to 2.02)	1.47* (1.41 to 1.54)	10.6
Migraines	15.4	2.20* (2.08 to 2.32)	1.50* (1.42 to 1.60)	5.2
Asthma	14.6	2.05* (1.95 to 2.17)	1.49* (1.41 to 1.58)	4.8
Heart disease	20.5	2.65* (2.53 to 2.78)	1.74* (1.65 to 1.84)	8.7
Thyroid condition	9.3	1.33* (1.24 to 1.42)	1.06 (0.99 to 1.13)	0.5
Crohn's disease/colitis/ulcers	13.4	2.50* (2.37 to 2.63)	1.52* (1.43 to 1.61)	4.6
Diabetes	14.6	2.36* (2.24 to 2.48)	1.76* (1.66 to 1.86)	6.3
Cancer	6.9	2.30* (2.15 to 2.46)	1.86* (1.72 to 2.01)	3.2
Fibromyalgia/ chronic fatigue syndrome	7.1	3.87* (3.62 to 4.15)	2.12* (1.94 to 2.31)	3.7
Stroke	5.4	2.62* (2.43 to 2.81)	1.57* (1.42 to 1.73)	1.9

*p<0.001; †adjusted for age and sex only (e.g. age + gender + allergies; age + gender + asthma; …); ‡age + gender + allergies + back problems +… + stroke.

Table 4 Outcome: 4+ F/GP consultations. Prevalence of chronic conditions in people with four or more F/GP consultations; prevalence ratios (PRs) (95% CI) from Poisson regression analyses; population-associated fractions (PAFs), Canada, 2000–01

	Prevalence (%) in people with 4+ F/GP consultations	PR unadjusted† for multimorbidity	PR adjusted for multimorbidity‡	PAF (%)
Age (years) (ref: 12–19 years)				
20–29			1.12* (1.06 to 1.18)	
30–39			1.07*** (1.02 to 1.13)	
40–49			1.02 (0.97 to 1.08)	
50–59			1.09** (1.03 to 1.15)	
60–69			1.22* (1.15 to 1.29)	
70–79			1.35* (1.27 to 1.43)	
80+			1.54* (1.45 to 1.64)	
Gender (ref: male)				
Female			1.31* (1.27 to 1.34)	
Chronic condition				
Allergies	34.6	1.34* (1.31 to 1.38)	1.13* (1.10 to 1.16)	4.0
Back problems	26.8	1.62* (1.58 to 1.66)	1.33* (1.30 to 1.37)	6.7
Arthritis/rheumatism	27.6	1.65* (1.60 to 1.70)	1.29* (1.25 to 1.33)	6.2
High blood pressure	25.0	1.85* (1.80 to 1.91)	1.60* (1.55 to 1.64)	9.3
Migraines	14.6	1.70* (1.65 to 1.76)	1.38* (1.33 to 1.42)	4.0
Asthma	12.9	1.63* (1.57 to 1.68)	1.33* (1.28 to 1.38)	3.2
Heart disease	11.1	1.79* (1.73 to 1.85)	1.33* (1.29 to 1.38)	2.8
Thyroid condition	8.1	1.31* (1.26 to 1.36)	1.13* (1.09 to 1.18)	1.0
Crohn's disease/colitis/ulcers	9.0	1.77* (1.70 to 1.83)	1.30* (1.25 to 1.35)	2.1
Diabetes	8.8	1.79* (1.73 to 1.86)	1.44* (1.38 to 1.49)	2.7
Cancer	3.7	1.61* (1.53 to 1.70)	1.40* (1.32 to 1.47)	1.0
Fibromyalgia/chronic fatigue syndrome	3.8	2.06* (1.97 to 2.16)	1.39* (1.31 to 1.47)	1.1
Stroke	2.4	1.64* (1.55 to 1.74)	1.17* (1.10 to 1.24)	0.3

*p<0.001; **p<0.01; ***p<0.05; †adjusted for age and sex only (e.g. age + gender + allergies; age + gender + asthma; ...); ‡age + gender + allergies + back problems + ... + stroke.

and/or health conditions. In a study of elderly men, Hoeymans *et al.*[19] found the greatest individual-level association, measured by odds ratios, for reporting poor SRH among individuals reporting stroke and respiratory symptoms. Respiratory symptoms, musculoskeletal complaints and coronary heart disease were notable from a population perspective. Heart disease had only a moderate PAF in our study, although we found a high association with arthritis/rheumatism and high blood pressure. Their study included the reporting of back *pain*, which ranked low in impact, in contrast to the current study, which included back *problems* as a long-term condition and for which the impact was very high.

Our findings are also compatible with those of Verbrugge and Patrick,[8] who found arthritis and heart disease to be the most frequent cause of activity limitations among adult men and arthritis and high blood pressure to be the most common cause among adult women. They also found high blood pressure to be the leading reason for visits to office-based physicians, by principal diagnosis, among individuals aged 45+ years. Regarding principal complaint as the leading cause for visits, blood pressure tests and hypertension ranked between 2 and 6.[8] This is consistent with our finding that high blood pressure was associated with 4+ FP/GP consultations more often than other conditions.

A particular strength of this study was the large sample size available for analyses and the possibility of examining activity limitations, SRH and health care utilisation in one large nationally representative dataset, enabling patterns to be explored across outcomes and a large range of conditions; for the most part other studies have examined a more limited number of conditions with a focus on a particular health outcome. Another particular advantage is the full age range examined in this study; many studies have tended to use restricted age ranges.

Health surveys based on self-reports have obvious disadvantages. However reviews, while acknowledging the limitations, have generally considered such surveys satisfactorily reliable and, in particular, economical and practicable for measuring morbidity.[39–41] Also, as people with mild forms of conditions may not seek health care, they potentially would not be counted in the current prevalence estimates as the question specified that the condition had to be ''diagnosed by a health professional.'' The definition of PAF incorporates an assumption of unchanged distributions, in this case of other conditions, upon elimination of the condition of interest to estimate the proportion of cases that would be prevented following elimination of the said condition.[37] However, this assumption may not hold. Depending on the index condition, there is the potential for the co-occurrence of causally related conditions, i.e. causal comorbidity.[42] Therefore, the elimination of one condition may in actuality eliminate/limit other causally related conditions. In this instance, if a comorbid condition(s) has any effect on the outcome of interest, then the effect of this causal co-morbidity would be to moderate the PAF of the index condition. That is, the PAF estimates we present may be conservative and underestimate true impact.

This study demonstrates that there are substantial differences in the ranking of individual risks and PAFs for a wide range of different disease and three diverse outcomes. We found that while musculoskeletal conditions (arthritis/rheumatism and back problems) had PRs for the different outcomes that were generally low to moderate compared with other

What is already known

Previous estimates of the impact of chronic conditions on adverse outcomes have considered only a limited number of conditions and outcomes and restricted age ranges. Some studies used inappropriate formulae or methods of estimation.

What this paper adds

Using data-appropriate techniques, this paper provides estimates of impact for 13 chronic conditions over the full adult age range for three diverse health outcomes (activity limitation, self-rated heath and health care visits), with assessments of both individual and population attributable risks. Discrepancies in the rankings of conditions between the outcomes and for individual and population-level risks were evident. For example, musculoskeletal conditions ranked highly across the three outcomes for population attributable risks, whereas estimates of individual risks were low to moderate.

Policy implications

Health policy and planning may need to be differently targeted depending on which aspects of health are being considered and whether the priority is individual health services or the development of population and public health initiatives. The conditions with the greatest population impact may not be the conditions which are most salient to individuals.

conditions, this was not the case for their population attributable fractions. These variations in magnitude need to be taken into account when setting priorities as interventions may need to be targeted to different conditions depending on which aspects of health are being considered and whether the focus in on the individual, as for example for clinical care or advocacy, or on improving the health the population, for instance in the context of health policy and planning or public health.

Authors' affiliations

Anthony V Perruccio, J Denise Power, Elizabeth M Badley, Department of Public Health Sciences, University of Toronto, and Division of Health Care and Outcomes Research, Toronto Western Research Institute, Toronto, Canada

Competing interests: None.

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