

Preventable fractions of colon and breast cancers by increasing physical activity in Brazil: perspectives from plausible counterfactual scenarios



Leandro Fórnia Machado de Rezende^{a,*}, Leandro Martin Totaro Garcia^b, Grégore Iven Mielke^{c,d}, Dong Hoon Lee^e, Kana Wu^e, Edward Giovannucci^{e,f,g,1}, José Eluf-Neto^{a,1}

^a Departamento de Medicina Preventiva, Faculdade de Medicina FMUSP, Universidade de Sao Paulo, Sao Paulo, SP, Brazil

^b UKCRC Centre for Diet and Activity Research, MRC Epidemiology Unit, University of Cambridge School of Clinical Medicine, Cambridge, United Kingdom

^c School of Human Movement and Nutrition Sciences, University of Queensland, Brisbane, Australia

^d Postgraduate Program in Epidemiology, Federal University of Pelotas, Brazil

^e Department of Nutrition, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, United States

^f Department of Epidemiology, Harvard T.H. Chan School of Public Health, Boston, Massachusetts, United States

^g Channing Division of Network Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts, United States

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ABSTRACT

Background: Physical activity is associated with lower risk of colon and breast cancers. Herein we estimated preventable fractions of colon and breast cancers in Brazil by increasing population-wide physical activity to different counterfactual scenarios.

Methods: We used data from a representative national survey in Brazil and corresponding relative risks of colon and postmenopausal breast cancers from a meta-analysis. Estimated cancer incidence was retrieved from GLOBOCAN and Brazilian National Cancer Institute. Five counterfactual scenarios for physical activity were considered: (i) theoretical minimum risk exposure level ($\geq 8,000$ metabolic equivalent of tasks-minute/week – MET-min/week); (ii) physical activity recommendation (≥ 600 MET-min/week); (iii) a 10% reduction in prevalence of insufficient physical inactivity (< 600 MET-min/week); (iv) physical activity level in each state equals the most active state in Brazil; (v) closing the gender differences in physical activity.

Results: About 19% (3,630 cases) of colon cancers and 12% (6,712 cases) of postmenopausal breast cancers could be prevented by increasing physical activity to $\geq 8,000$ MET-min/week. Plausible counterfactual scenarios suggested the following impact on cancer prevention: reaching physical activity recommendation: 1.7% (1,113 cases) of breast and 6% (1,137 cases) of colon; 10% reduction in physical inactivity prevalence: 0.2% (111 cases) of breast and 0.6% (114 cases) of colon; most active state scenario: 0.3% (168 cases) of breast and 1% (189 cases) of colon; reducing gender differences in physical activity: 1.1% (384 cases) of breast and 0.6% (122 cases) of colon.

Conclusions: High levels of physical activity are required to achieve a sizable impact on breast and colon cancer prevention in Brazil.

1. Introduction

Convincing evidence supports the association between physical activity and lower risk of colon and breast cancers [1–3]. Potential protective effect of physical activity on other cancer sites has been recently suggested [4–14], yet the evidence is less consistent and dose-response shape unknown [1]. Physical activity may exert major influences on cancer risk mainly through weight management and adiposity level [15,16], and additionally *via* direct effects on hormones and

inflammatory markers [17–19]. To obtain these health benefits the World Health Organization (WHO) recommends at least 600 metabolic equivalents of tasks-minute per week (MET-min/week) of total physical activity, which has been translated as 150 min/week in activities with moderate intensity (3–6 MET) or 75 min/week in vigorous activities (> 6 MET) [20]. However, higher levels of total physical activity (*i.e.*, ≥ 8000 MET-min/week) have been recently suggested to provide optimum risk reduction returns in non-communicable diseases (NCDs), especially for breast and colon cancers [21].

* Corresponding author at: Av Dr Arnaldo 455, 2nd floor. Sao Paulo, SP, 01246-903, Brazil.

E-mail address: lerezende@usp.br (L.F.M.d. Rezende).

¹ These authors contributed equally to this paper.

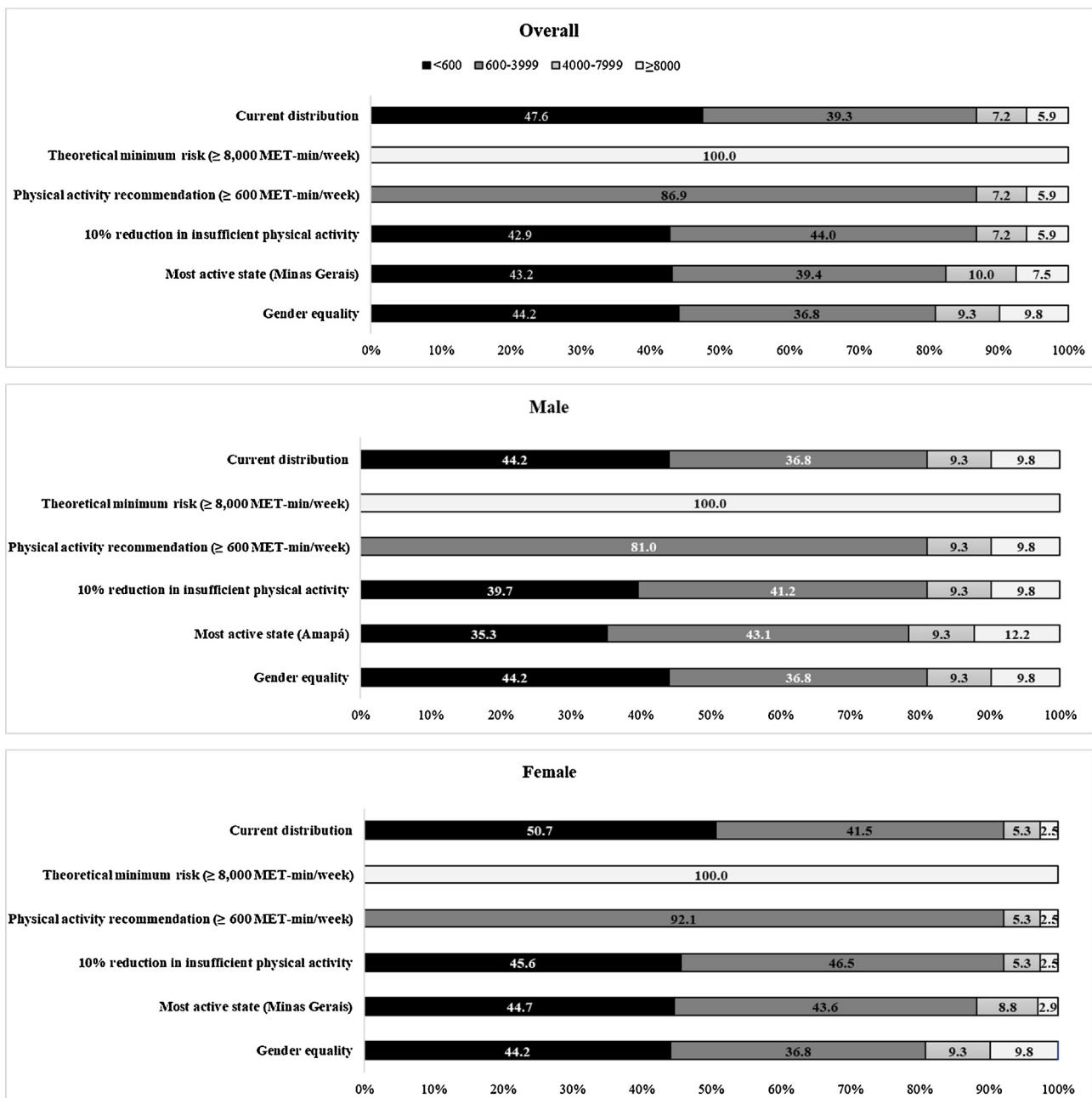


Fig. 1. Current and counterfactual scenarios of physical activity (PA) among Brazilian adults, by sex.

Globally, lack physical activity accounts for, on average, 12% of breast cancer and 18% of colon cancer [22]. To calculate the fraction of cancers due to lack of physical activity, both the distribution of physical activity at the population level (e.g., prevalence of exposure) and the relative risk (RR) of cancer are required [23,24]. Frequently, studies have obtained RR from meta-analyses comparing the most and the least active groups, which is heterogeneously defined across primary studies. Therefore, the definition of lack of physical activity cannot be consistently used to estimate the exposure level at the target population.

Studies on preventable fractions usually report the proportion of cancer that could be potentially avoided if exposure to a certain risk factor were eliminated (i.e., theoretical minimum risk exposure level) [23,24]. Notwithstanding informative, this scenario is unlikely to be reached at the population level. On the other hand, alternative scenarios considering plausible reductions in exposure level are sparse in the literature, despite its importance to inform policy makers and cancer prevention strategies. For instance, the WHO Global Action Plan

for the Prevention and Control of NCDs (WHO 25 × 25) targeted a 10% reduction in the prevalence of insufficient physical activity for 2025 [25]. Reducing gender inequality in physical activity is also important [26,27]. Globally, the prevalence of insufficient physical inactivity is, on average, 20% lower in women than in men [27]. There are also great disparities in insufficient physical activity within countries. For instance, prevalence of insufficient physical activity ranges from 41% to 58% in Brazilian states [28]. Reducing disparities in physical activity between gender and geographic areas may have a positive impact on population levels of physical activity. However, the extent to which these alternative scenarios of physical activity could potentially reduce the burden of cancer is unknown.

Herein we estimated preventable fractions of colon and breast cancer cases in Brazil by increasing population-wide physical activity to five different counterfactual scenarios: (i) reaching the theoretical minimum risk exposure level (≥ 8,000 MET-min/week), (ii) reaching the WHO recommendation for physical activity (≥ 600 MET-min/week)

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