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Impact of different thresholds of increasing or decreasing body mass index in a non-communicable disease model

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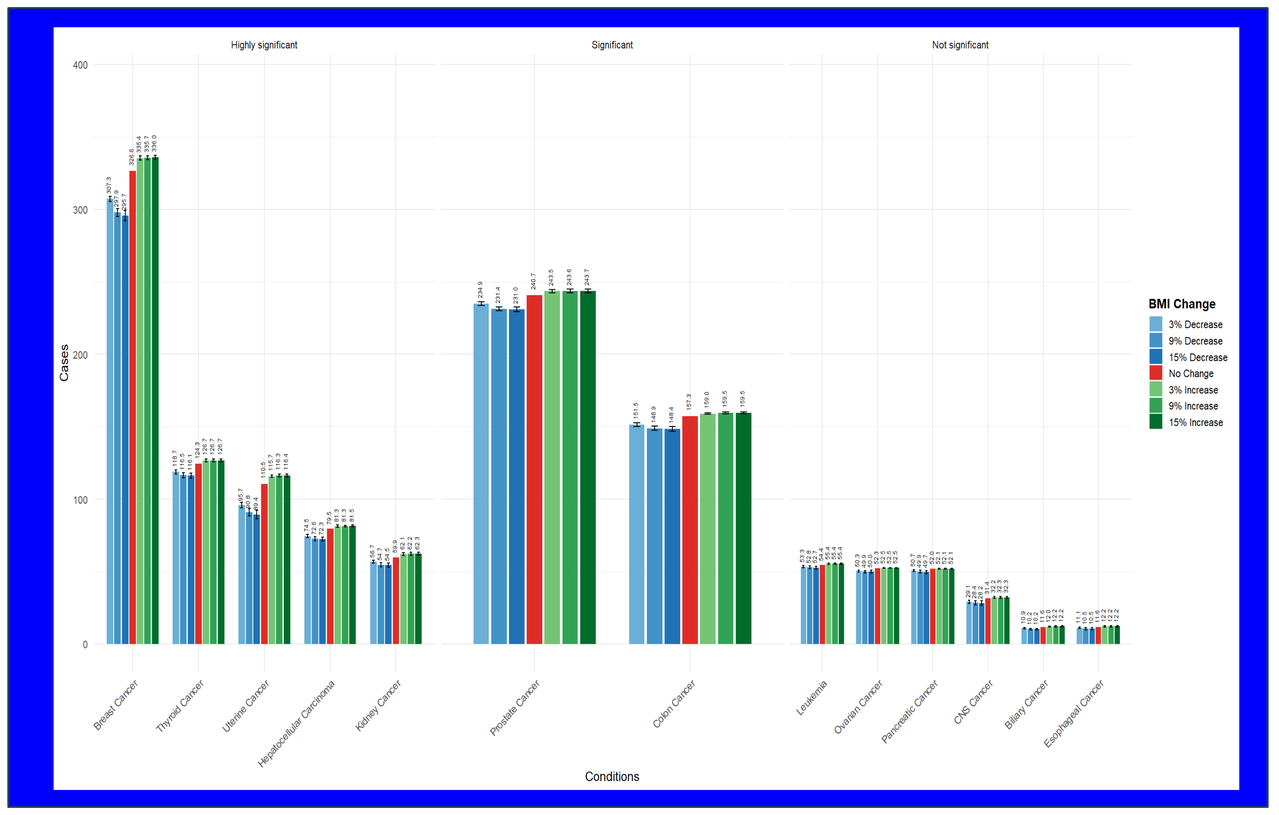
Fig 1. Estimation of the impact on the number of chronic non-communicable disease cases at different body mass index change thresholds per million subjects in Mexico.

Fig 2. Estimation of neoplasia cases in Mexico at different thresholds of change in body mass index per million subjects and classified according to their association with the ANOVA test*.



Note: A value < 0.01 is considered a very significant impact, <0.05 to ≥ 0.01 was considered significant, and ≥ 0.05 was considered non-significant.

OUR LEARNINGS AND CONCLUSIONS

A 3% decrease in population body mass index (BMI-p) yields substantial benefits in cases prevented by major non-communicable disease (NCD) and years of life lost (YLL). However, a 3% decrease would necessitate a 7.5-year to normalize BMI-p. To expedite the benefit, it is imperative to implement multicomponent interventions comprising proper nutrition, exercise, medications, and surgery, with the objective of achieving reductions in the range of 9% to 15%.

The findings of this study enable the identification of distinct thresholds for addressing the problem, contingent on the objectives and resources of health authorities. Furthermore, the study facilitates the modulation of expectations concerning cases averted and YLL over time.

THE CONTEXT

High population body mass index (BMI-p) increases the risk of developing chronic non-communicable diseases (NCDs), premature mortality, health services utilization and healthcare costs.[1]

The prevalence of obesity among Mexican adults showed an annualized growth rate of 2.5%, which is higher than the rates reported in other countries.[2]

Studies using Markov models or microsimulations have estimated the impact of BMI-p on the incidence of type 2 diabetes (DM2) and neoplasms, but not on other non-communicable diseases (NCDs).[3]

PURPOSE

To estimate the impact of modifying population BMI-p on NCDs incidence and years of life lost (YLL) in Mexico using a discrete event simulation (DES) model.

METHODS

A dual-patient approach, with a DES model, was developed to estimate the effect of modifying the BMI-p under different thresholds (±3%, 9%, and 15%) on the incidence of NCDs and YLLs due to hypertension, type 2 diabetes mellitus, cardiovascular disease (CVD), cerebrovascular disease, and malignancies. The temporal requirements for the normalization or augmentation of the BMI-p were meticulously calculated.

RESULTS

The baseline scenario estimated 362,341 NCDs per million subjects. **Decreases in BMI-p** of 3%, 9%, and 15%, **led to a** 13.1% (n=47,390), 18.4%, (n=66,508), and 19.5% (n=70,763**) decrease in the number of incident NCDs**, respectively; **and equivalent increases resulted in** a 9.3% (n=33,839), 9.9% (n=35,967), and 10.0% (n=36,349) **additional NCDs,** respectively. See figure 1. **However, the higher impact was observed in the reduction of BMI-p.** Similar results were found in YLL percentages (data not show).

The lowest thresholds (±3%), got the most extended results with subsequent decreasing increases.

The time required to normalize BMI-p was found to be between 47.0% and 18.8% **longer than the time to increase it.**

Notably, **only seven of thirteen neoplasms had a weight-related impact**. See Figure 2.

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