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The social cost of physical inactivity in Switzerland in 2011

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Funding

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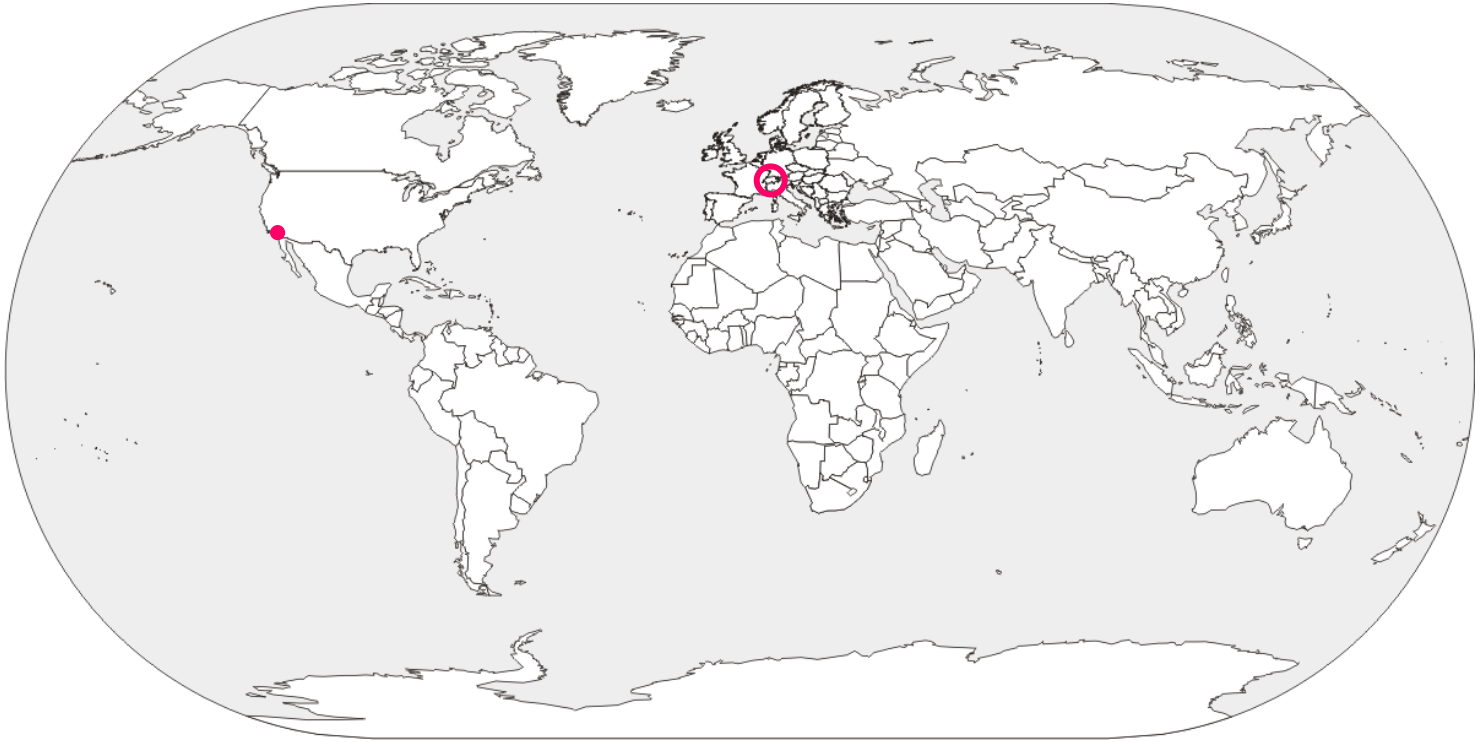
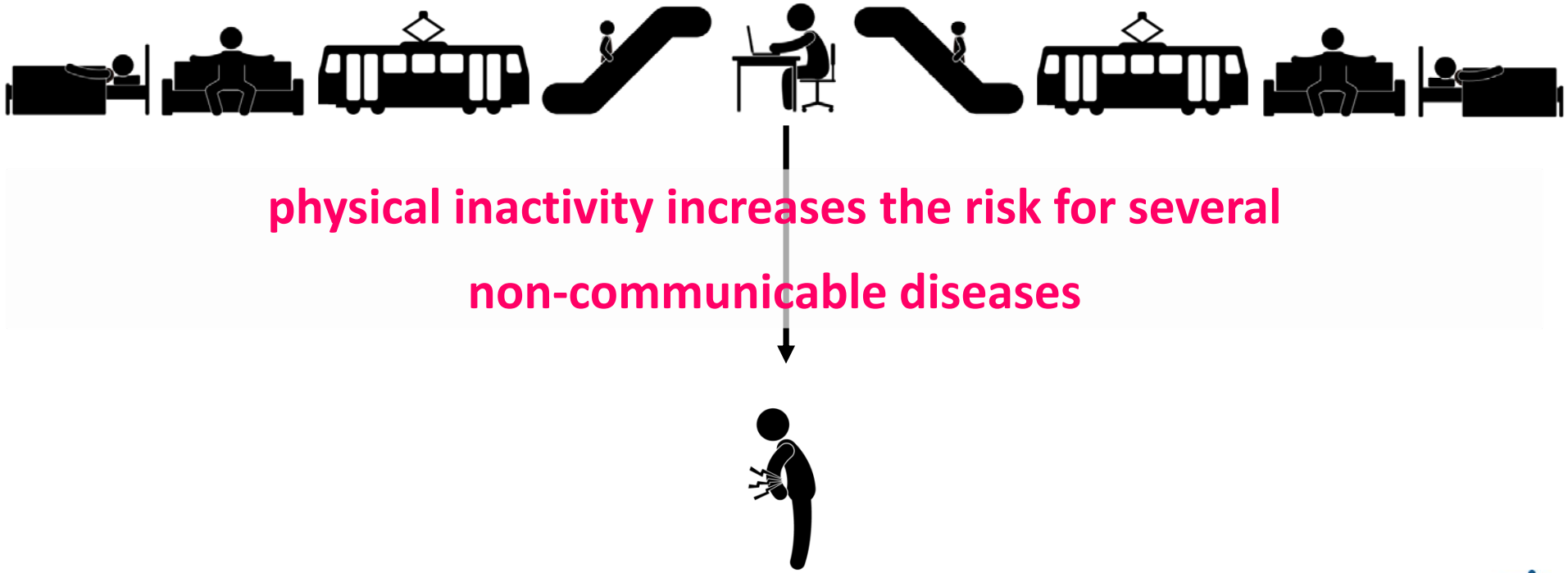
Switzerland

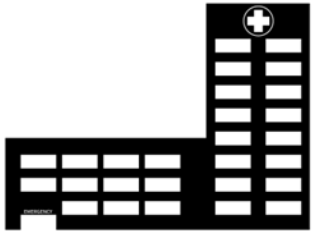


Physical inactivity



physical inactivity increases the risk for several non-communicable diseases

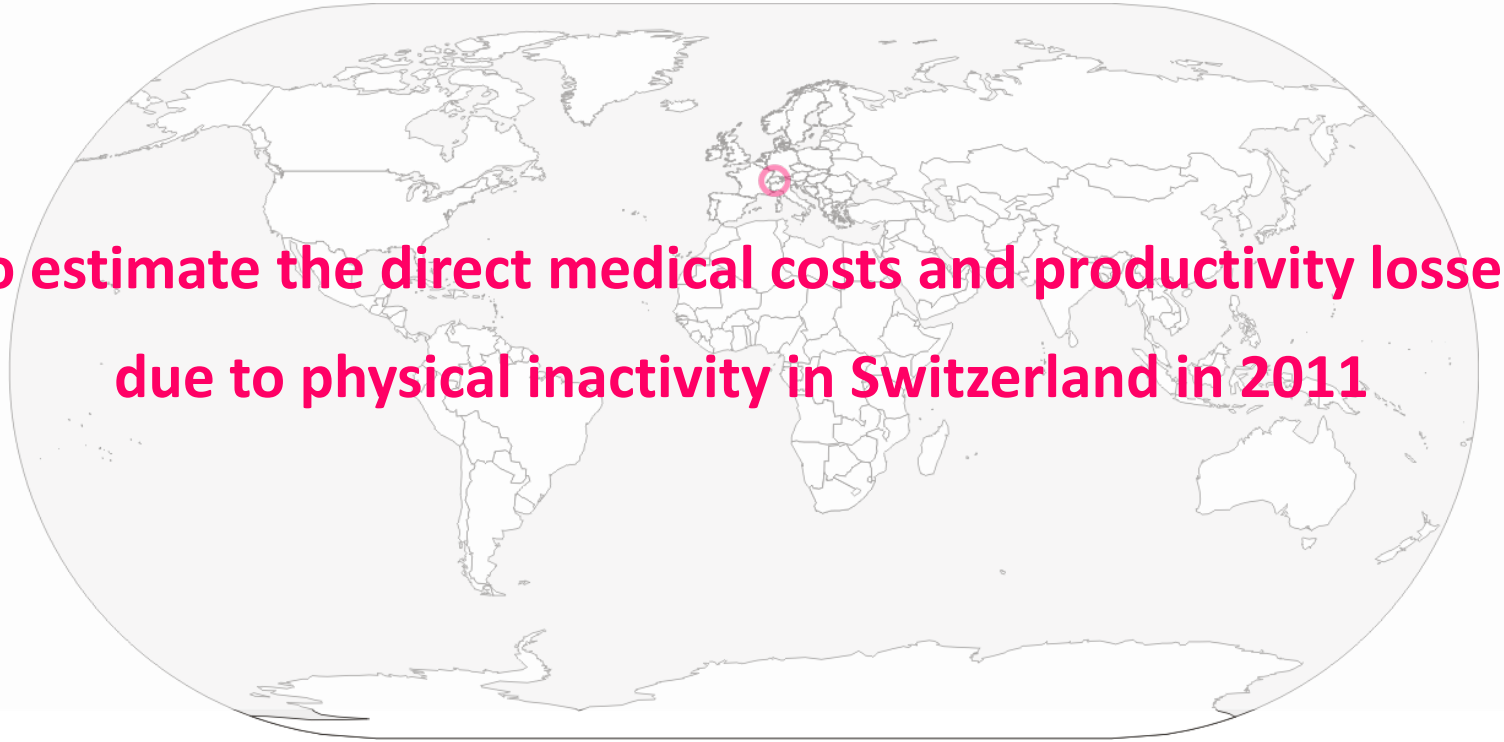
Cost types



productivity losses

direct medical costs

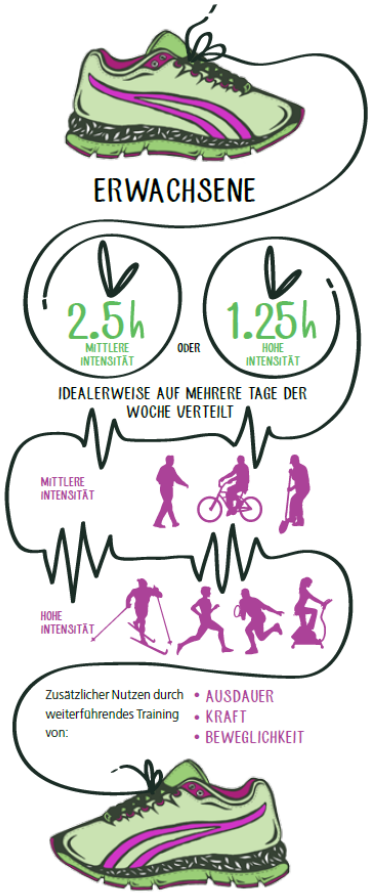
Study aim



To estimate the direct medical costs and productivity losses due to physical inactivity in Switzerland in 2011

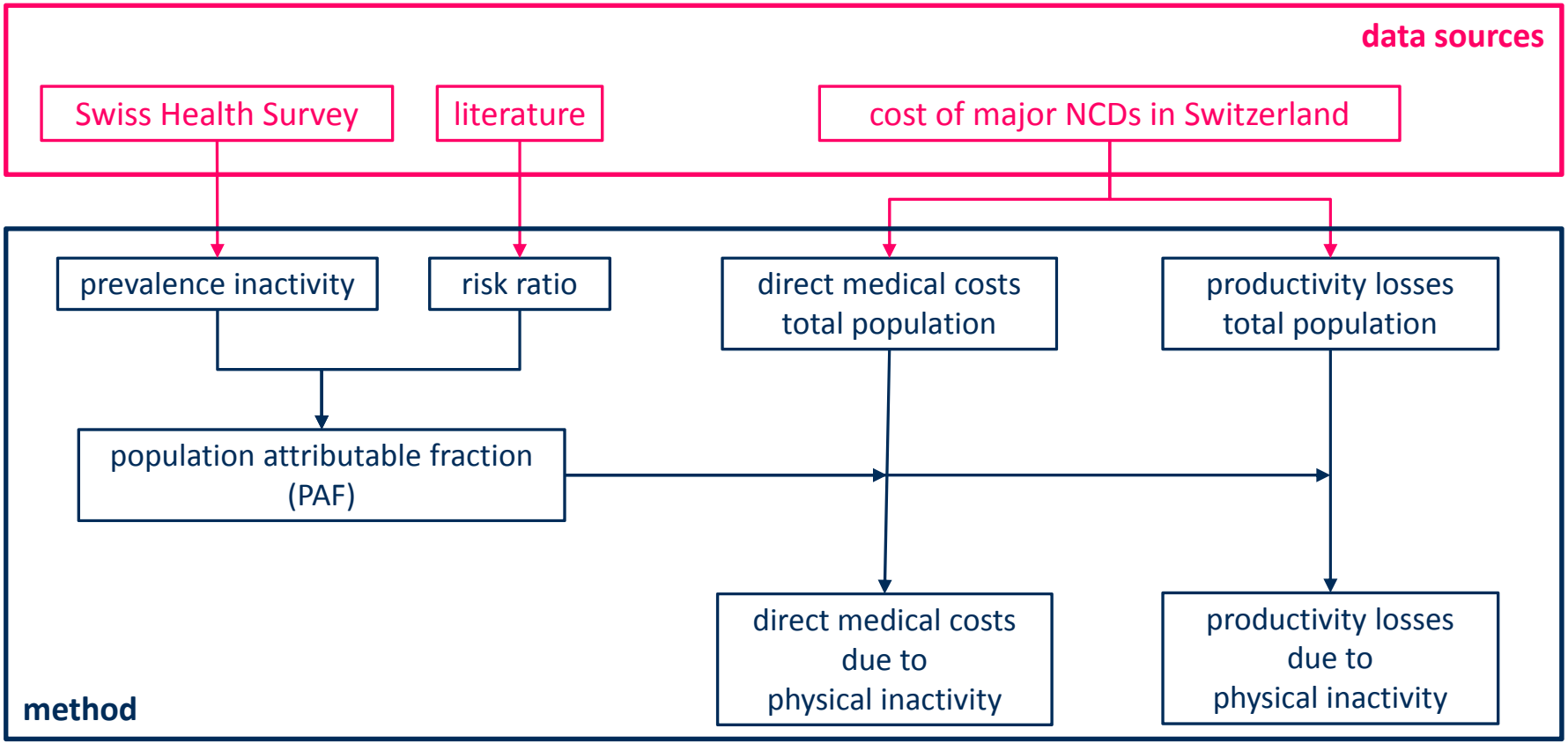
Definition of physical inactivity

hepa.ch



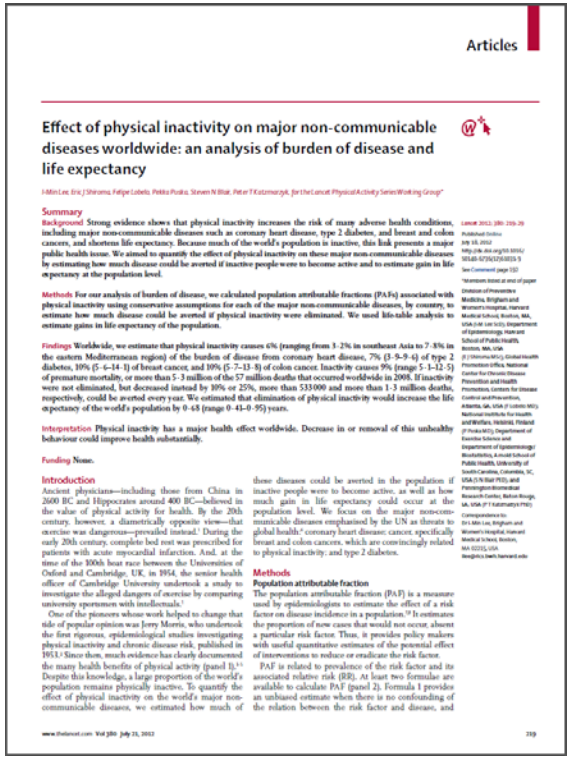
at least 150 min of moderate intensity
or
75 min of high intensity
physical activity per week

Overview on methods and data sources



Population attributable fraction

Key question: How much of the disease that occurs can be attributed to a certain exposure?



Articles

Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy

I-Min Lee, Eric J Shiroma, Felipe Lobelo, Pekka Puska, Steven N Blair, Peter T Katzmarzyk, for the Lancet Physical Activity Series Working Group*

Summary

Background Strong evidence shows that physical inactivity increases the risk of many adverse health conditions, including major non-communicable diseases such as coronary heart disease, type 2 diabetes, and breast and colon cancers, and shortens life expectancy. Because much of the world's population is inactive, this link presents a major public health issue. We aimed to quantify the effect of physical inactivity on these major non-communicable diseases by estimating how much disease could be averted if inactive people were to become active and to estimate gain in life expectancy at the population level.

Methods For our analysis of burden of disease, we calculated population attributable fractions (PAFs) associated with physical inactivity using conservative assumptions for each of the major non-communicable diseases, by country, to estimate how much disease could be averted if physical inactivity were eliminated. We used life-table analysis to estimate gains in life expectancy of the population.

Findings Worldwide, we estimate that physical inactivity causes 6% (ranging from 3·2% in southeast Asia to 7·8% in the eastern Mediterranean region) of the burden of disease from coronary heart disease, 7% (3·9–9·6) of type 2 diabetes, 10% (5·6–14·1) of breast cancer, and 10% (5·7–13·8) of colon cancer. Inactivity causes 9% (range 5·1–12·5) of premature mortality, or more than 5·3 million of the 57 million deaths that occurred worldwide in 2008. If inactivity were not eliminated, but decreased instead by 10% or 25%, more than 533 000 and more than 1·3 million deaths, respectively, could be averted every year. We estimated that elimination of physical inactivity would increase the life expectancy of the world's population by 0·68 (range 0·41–0·95) years.

Interpretation Physical inactivity has a major health effect worldwide. Decrease in or removal of this unhealthy behaviour could improve health substantially.

Funding None.

Introduction

Ancient physicians—including those from China in 2600 BC and Hippocrates around 400 BC—believed in the value of physical activity for health. By the 20th century, however, a diametrically opposite view—that exercise was dangerous—prevailed instead.[1] During the early 20th century, complete bed rest was prescribed for patients with acute myocardial infarction. And, at the time of the 100th boat race between the Universities of Oxford and Cambridge, UK, in 1954, the senior health officer of Cambridge University undertook a study to investigate the alleged dangers of exercise by comparing university sportsmen with intellectuals.[1]

One of the pioneers whose work helped to change that tide of popular opinion was Jerry Morris, who undertook the first rigorous, epidemiological studies investigating physical inactivity and chronic disease risk, published in 1953.[1] Since then, much evidence has clearly documented the many health benefits of physical activity (panel 1).[2–5] Despite this knowledge, a large proportion of the world's population remains physically inactive. To quantify the effect of physical inactivity on the world's major non-communicable diseases, we estimated how much of these diseases could be averted in the population if inactive people were to become active, as well as how much gain in life expectancy could occur at the population level. We focus on the major non-communicable diseases emphasised by the UN as threats to global health,[6] coronary heart disease; cancer, specifically breast and colon cancers, which are convincingly related to physical inactivity; and type 2 diabetes.

Methods

Population attributable fraction

The population attributable fraction (PAF) is a measure used by epidemiologists to estimate the effect of a risk factor on disease incidence in a population.[7,8] It estimates the proportion of new cases that would not occur, absent a particular risk factor. Thus, it provides policy makers with useful quantitative estimates of the potential effect of interventions to reduce or eradicate the risk factor.

PAF is related to prevalence of the risk factor and its associated relative risk (RR). At least two formulae are available to calculate PAF (panel 2). Formula 1 provides an unbiased estimate when there is no confounding of the relation between the risk factor and disease, and

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Summary

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Population attributable fraction

1. formula (classic «Levin formula»[1])

$$PAF\ (\%) = \frac{Prevalence_{\text{exposition total population}}\ (RR_{unadj} - 1)}{Prevalence_{\text{exposition total population}}\ (RR_{unadj} - 1) + 1} \times 100 \qquad (1)$$

Assumption: no confounding of the relation between exposition and disease exists! [2, 3]

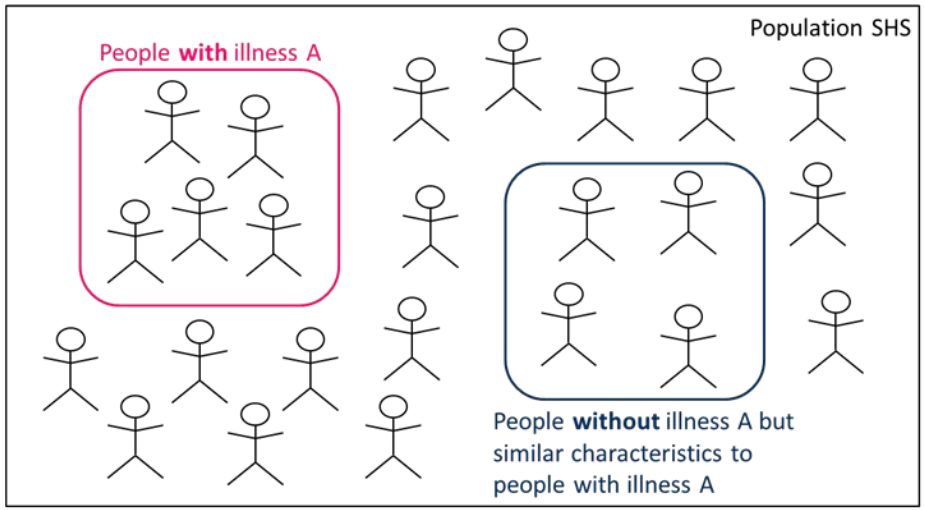
2. formula

$$PAF\ (\%) = \frac{Prevalence_{\text{baseline exposition in group with outcome}}\ (RR_{adj} - 1)}{RR_{adj}} \times 100 \qquad (2)$$

[1] Hanley, J., A heuristic approach to the formulas for population attributable fraction. J Epidemiol Community Health, 2001. 55(7): p. 508-14.
[2] Lee, I.M., et al., Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. Lancet, 2012. 380(9838): p. 219-29
[3] Rockhill, B., B. Newman, and C. Weinberg, Use and misuse of population attributable fractions. Am J Public Health, 1998. 88(1): p. 15-9.

Prevalence inactivity: Propensity Score Matching

– Propensity score matching with Swiss Health Survey data



– Considered characteristics: smoking, alcohol, eating habits, lifestyle, bmi, sex, education, stress at work, language region, urban/rural

– Was done for each disease separately

Risk ratio: literature search

- cohort studies
- disease not present at study start (causality)
- leisure time physical activity
- general population
- high income countries
- longest follow-up period, no restrictions on follow-up rate
- adjustment for confounders

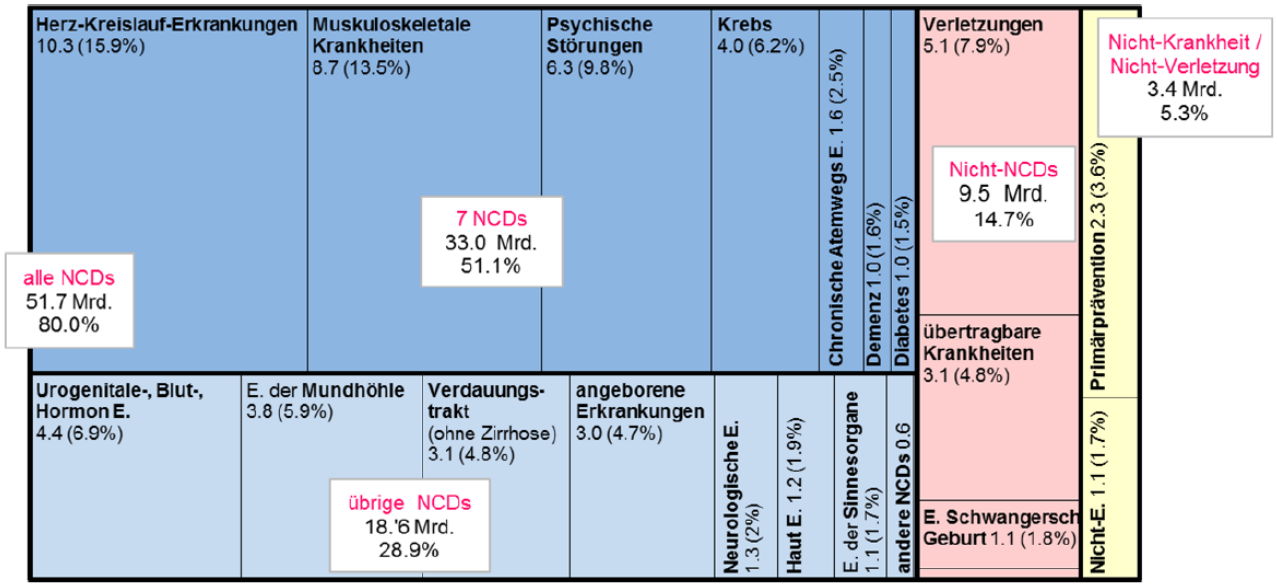
Study on cost of major NCDs in Switzerland

– total direct medical costs of all NCDs in Switzerland

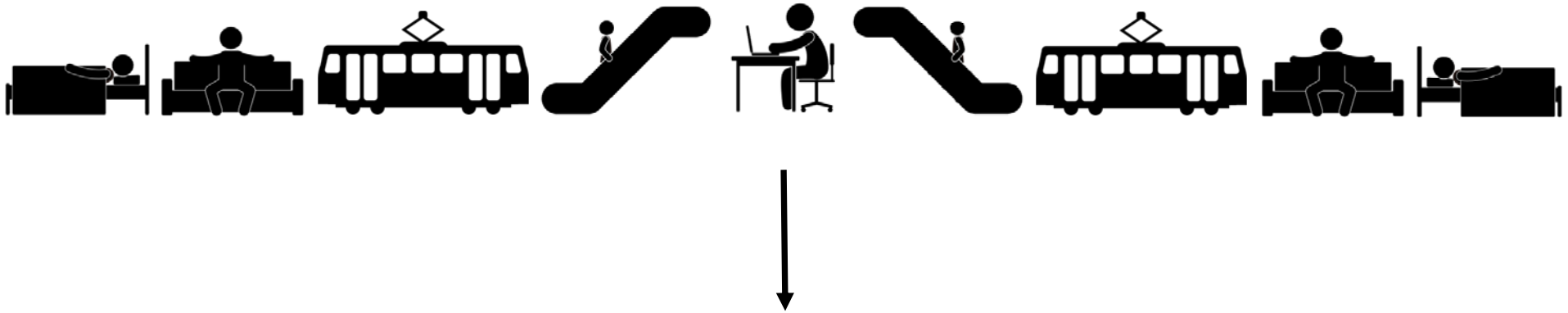
– productivity losses of seven selected groups of NCDs

– data-based and literature-based approach

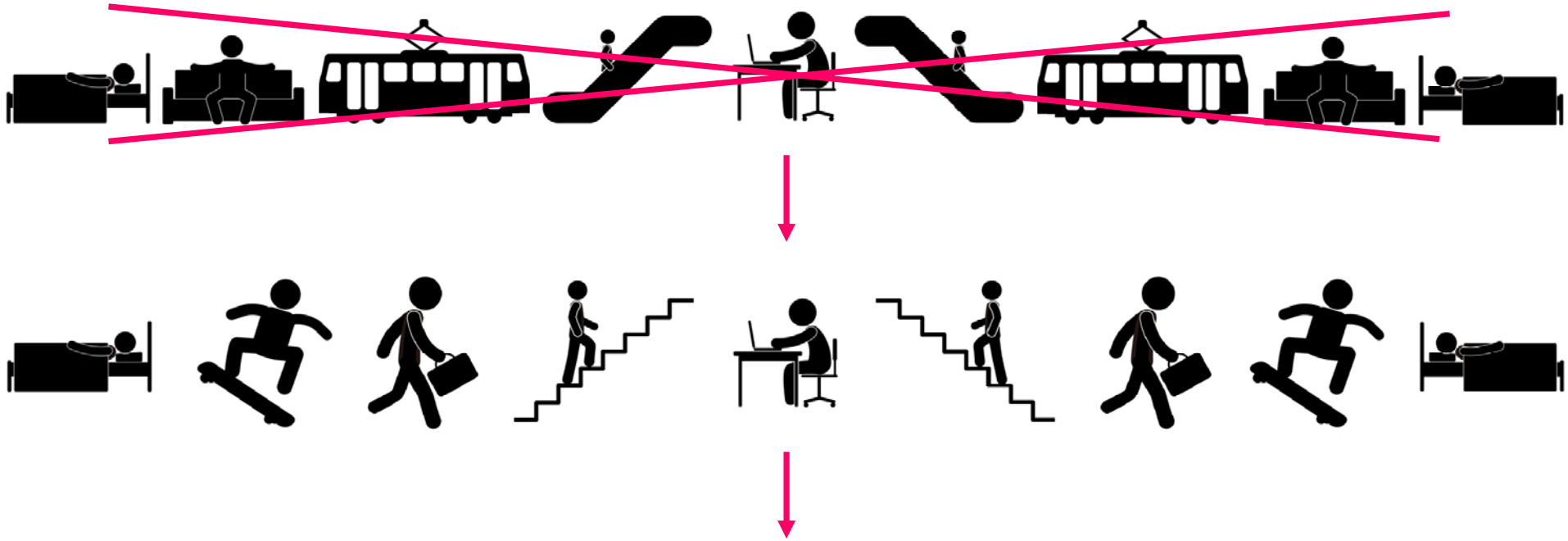
– no cost overestimation due to double counting



Results

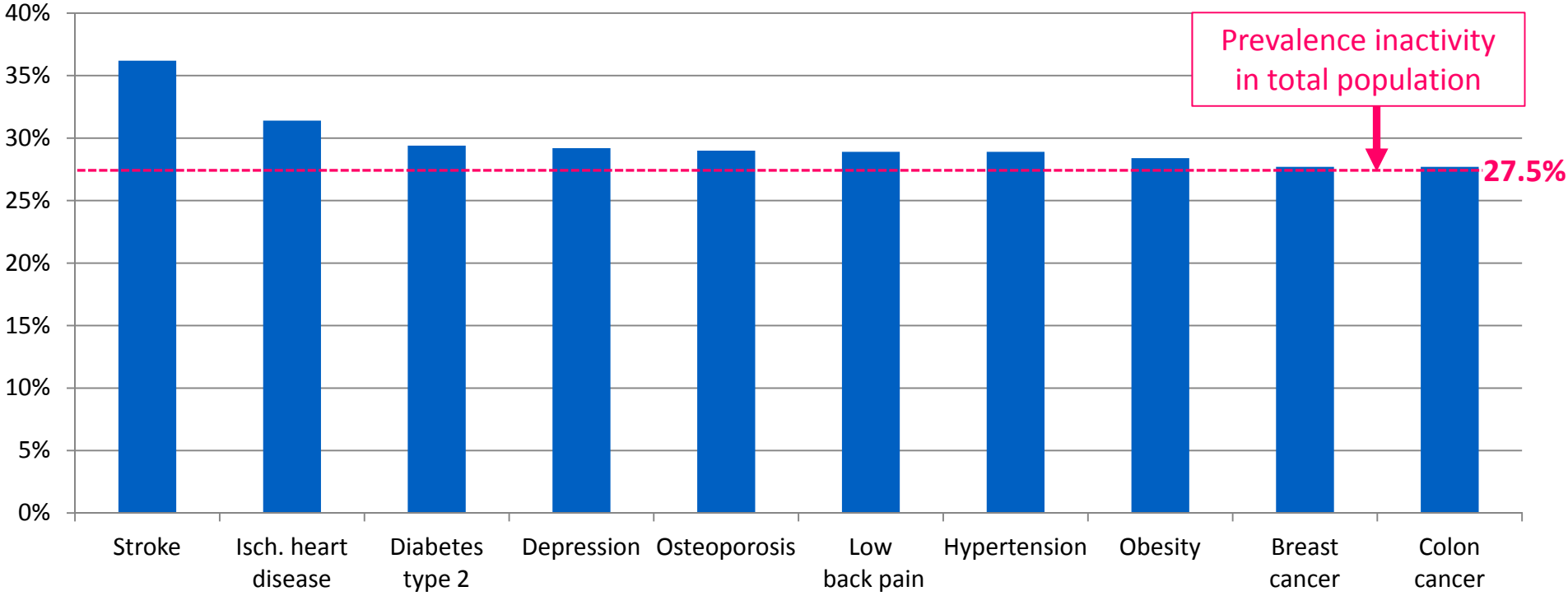


1.8% of total health care expenditures

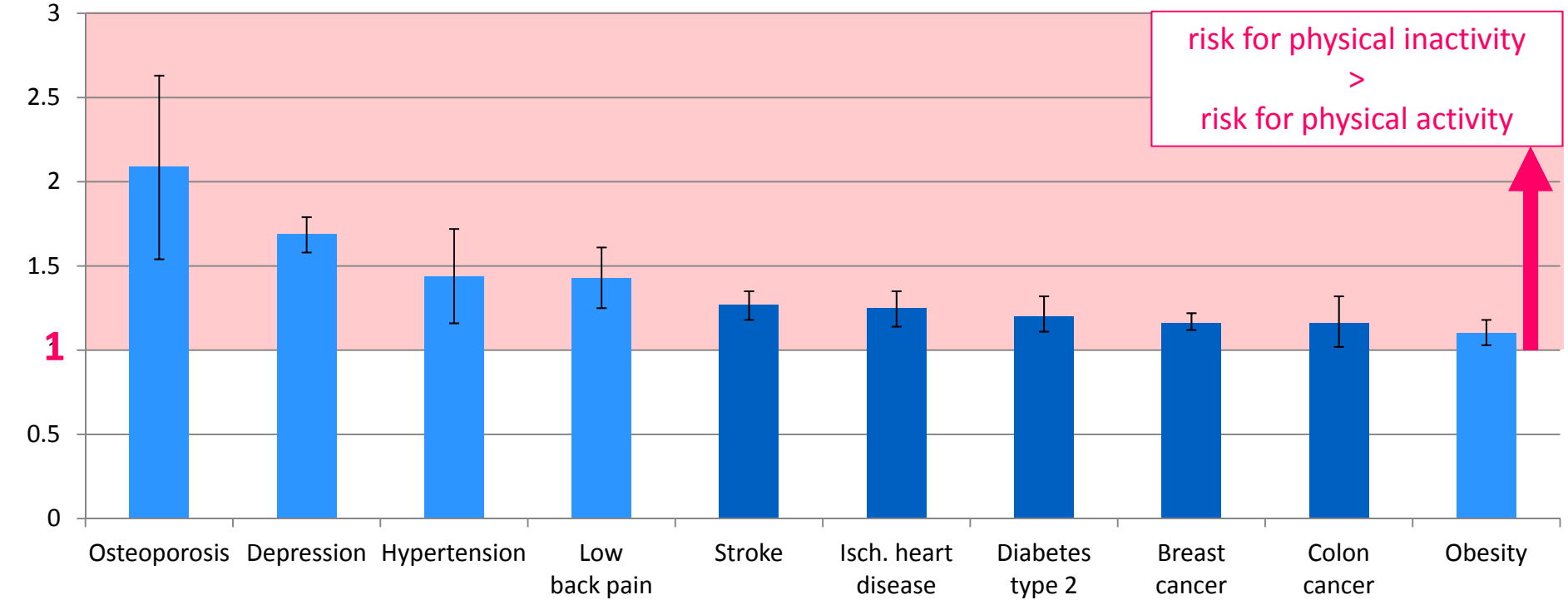


- **1.8%** of total health care expenditures

Prevalence inactivity in cases who finally develop the disease

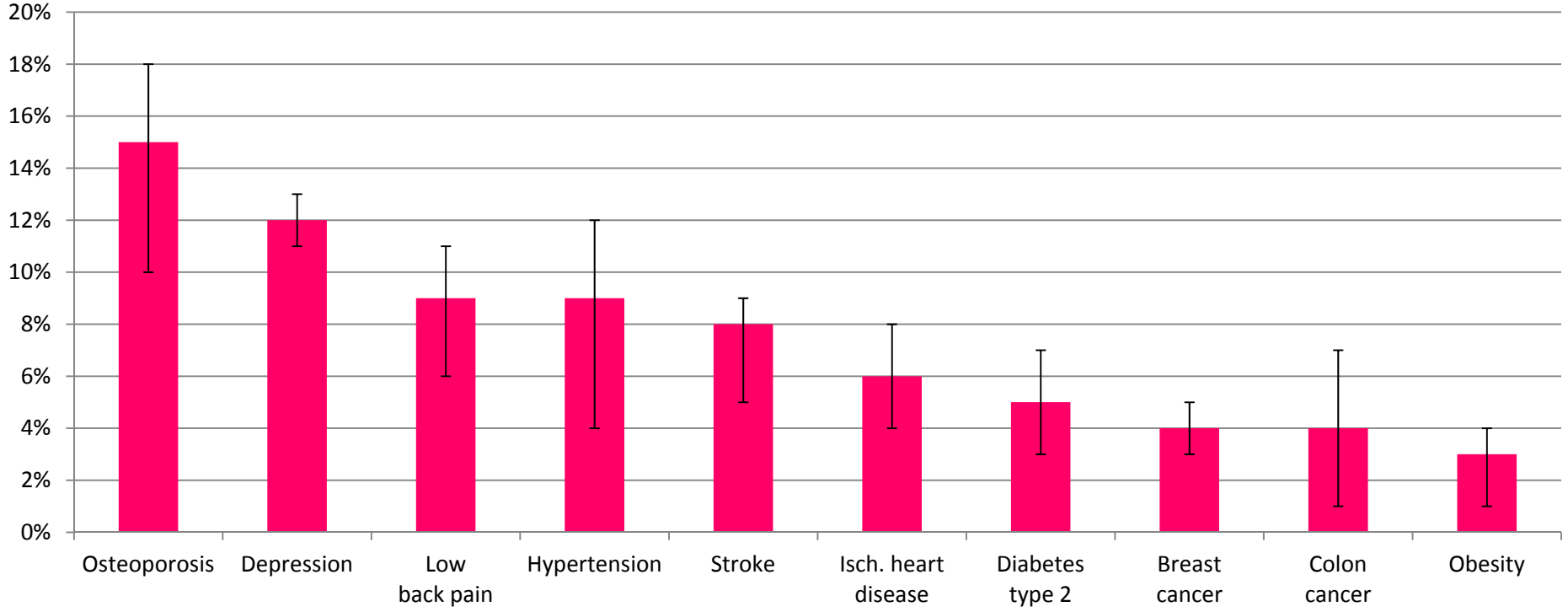


Risk ratios

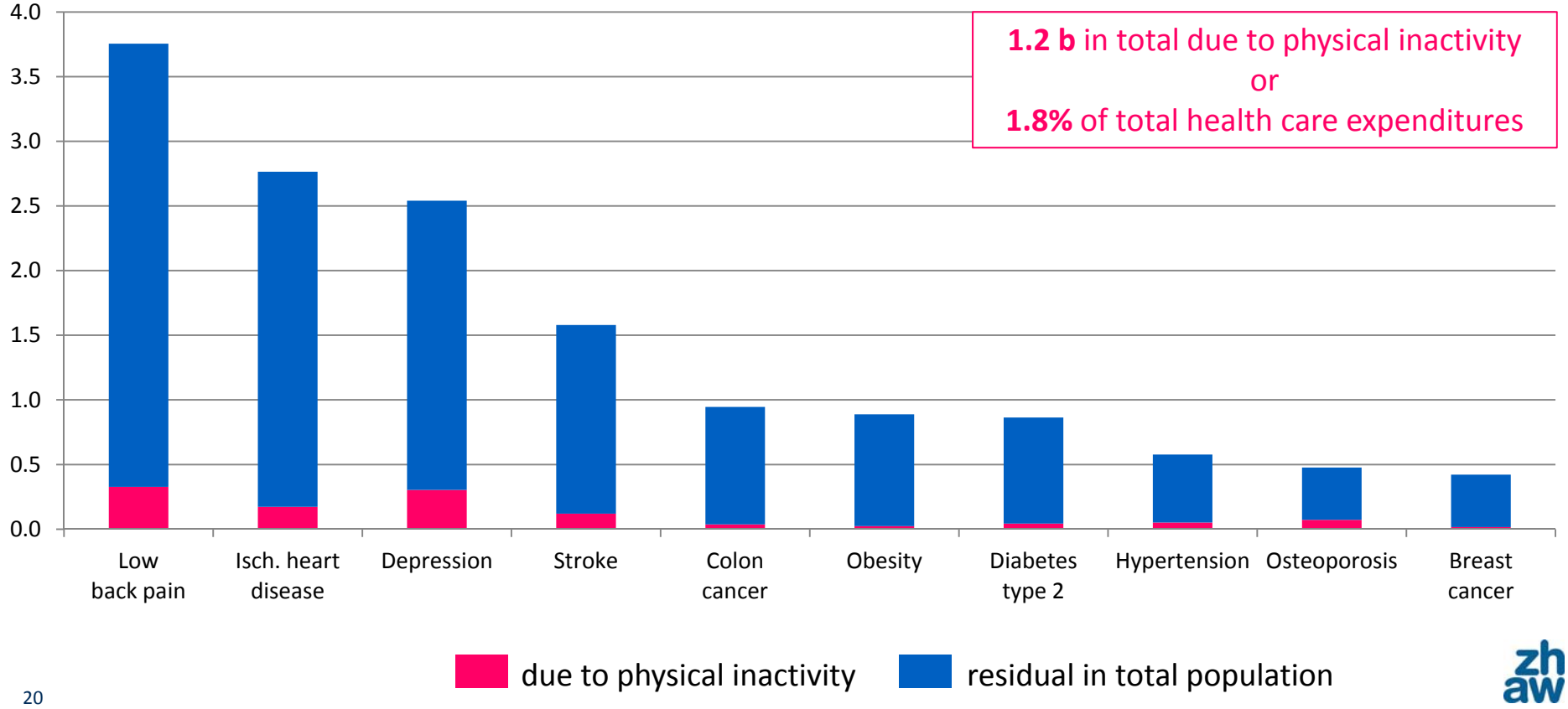


Data source: primary studies meta-analysis

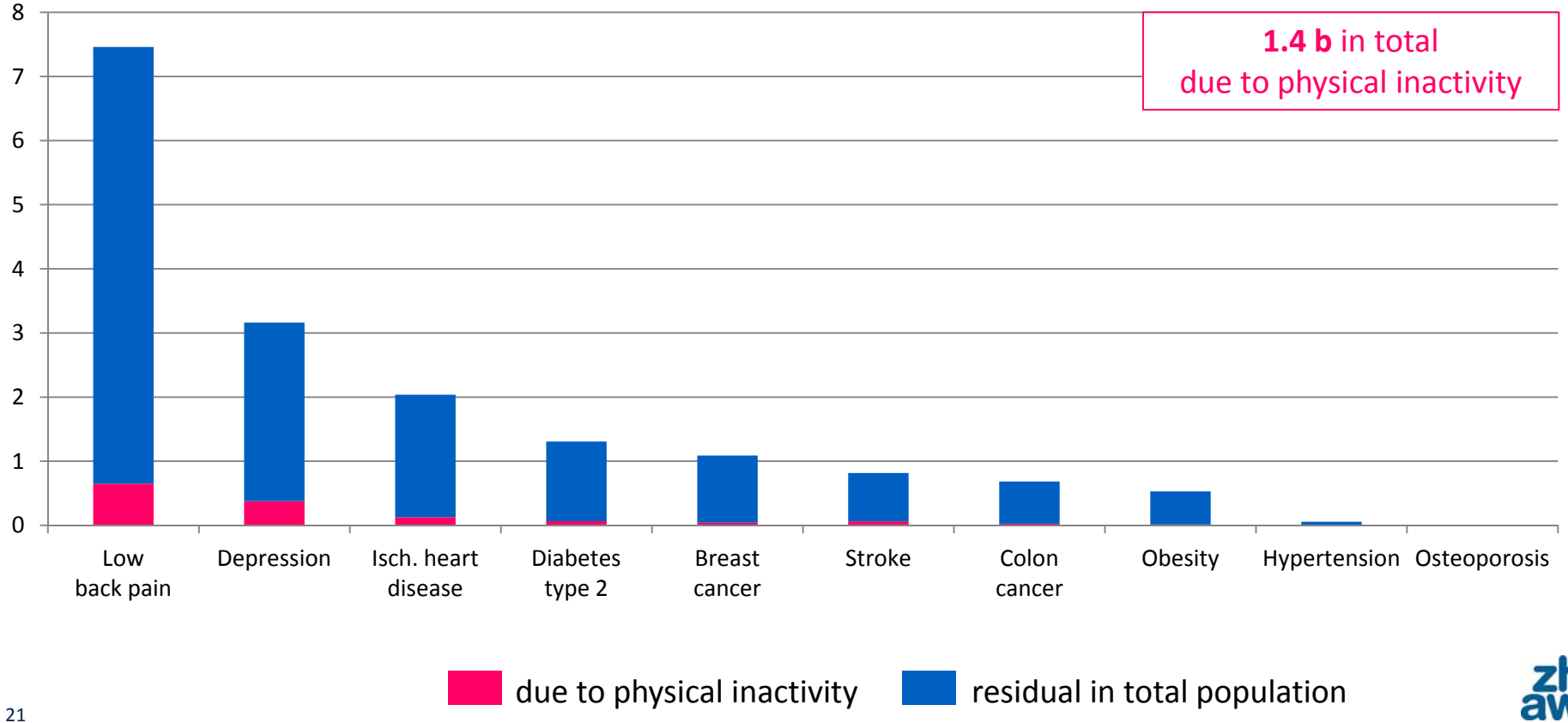
Population attributable fractions



Direct medical costs due to physical inactivity (in billion CHF)

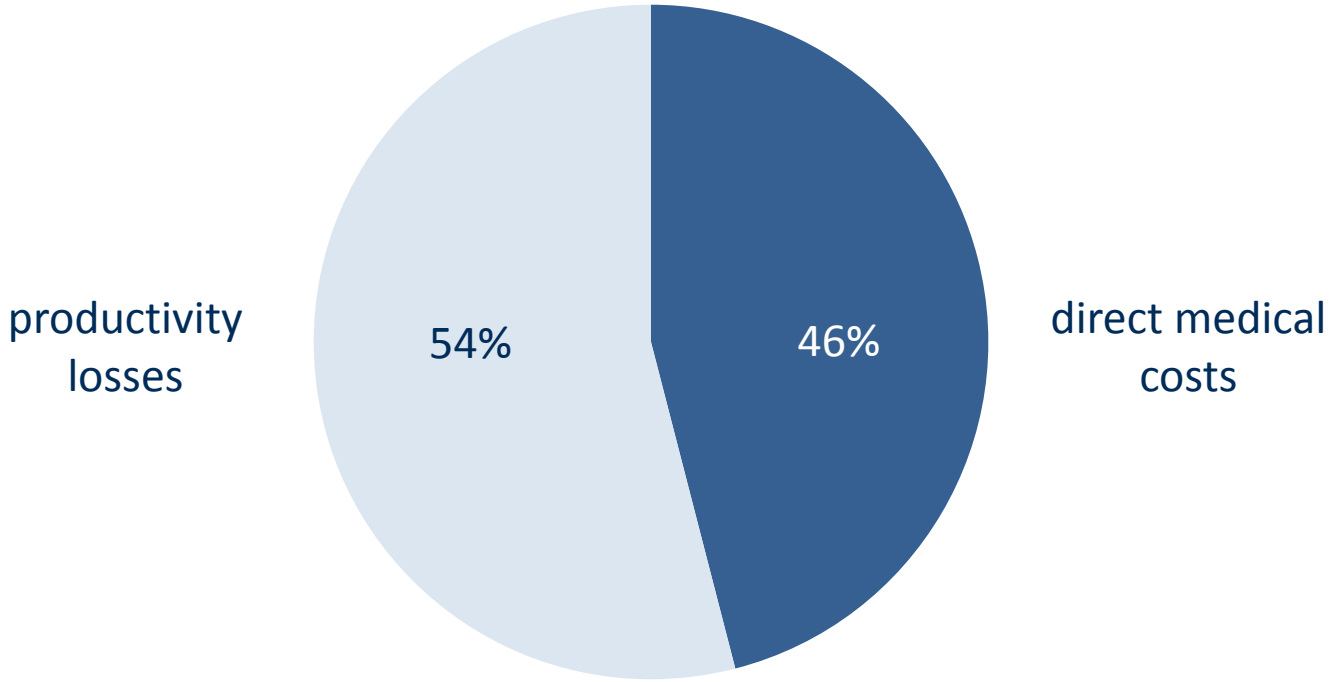


Productivity losses due to physical inactivity (in billion CHF)



Total cost composition

total costs **2.5 b CHF**



Total cost composition

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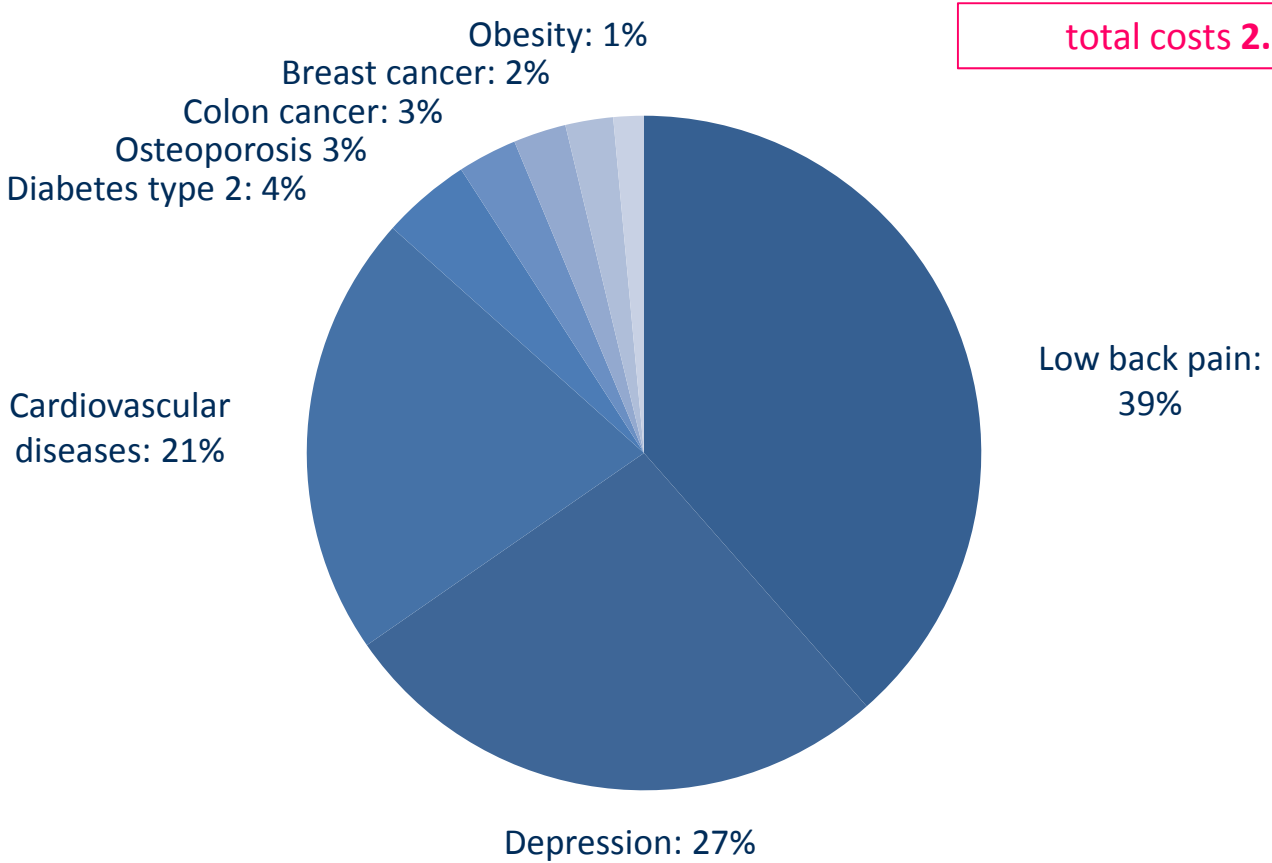

Univariate sensitivity analysis

Scenario	Direct medical costs (in billion CHF)	Δ%	Productivity losses (in billion CHF)	Δ%
Basis scenario:				
Basis	1.165		1.369	
Influence of PAF formula:				
PAF formula (1)	1.391	(+19%)	1.654	(+21%)
Influence of risk ratio:				
Risk ratio lower bound	802	(-31%)	973	(-29%)
Risk ratio upper bound	1.451	(+25%)	1.688	(+23%)

Total costs (in billion CHF): 2.5 (range: 1.8 – 3.1)
Direct medical costs: 1.8% (range: 1.2% – 2.2%) of total health care expenditures

Discussion

- Prevalence:

  In cases with outcome: Results same direction as Lee et al., 2012, but lower amount

- Risk ratios:

  International risk ratios applicable to Switzerland?

- Population attributable fractions:
  - We applied the formula recommended by Lee et al., 2012
  - SA: Use of formula (1) leads to 20% higher results
- Direct medical costs attributable to physical inactivity:

  Globally between 1% and 2.6% of total health care expenditures (Pratt et al., 2014)

- Productivity losses due to physical inactivity:
  - Often not included in studies estimating costs of physical inactivity
  - Janssen, 2012 (Canada): 64% of total costs; Zhang and Chaaban, 2013 (China): 49% of total costs

Conclusions

- Policy implications:
  - The problem: Physical inactivity increases the risk for several non-communicable diseases.
  - The effect: Close to 2% of total health care expenditures are attributable to physical inactivity. Productivity losses double the amount.
  - The solution: Invest in cost-effective interventions to reduce physical inactivity.

- What this study adds:
  - Beside cardiovascular diseases, low back pain and depression, two diseases often not included in cost studies related to physical inactivity, significantly contribute to direct medical costs and productivity losses.
  - The PAF-formula recommended by Lee et al., 2012 was applied to a cost-of-illness study.

thank you!