Technical University of Denmark

DTU

# What are the health and greenhouse gas implications of travel patterns in different European settings?

**Woodcock, J.; Tainio, M.; Götschi, T.; Nielsen, Thomas Alexander Sick; Schwanen, T.**

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# What are the health and greenhouse gas implications of travel patterns in different European settings?

**Woodcock J:** University of Cambridge

**Tainio M:** Systems Research Institute, Polish Academy of Sciences

**Götschi T:** Institute of Social and Preventive Medicine, University of Zurich

**Nielsen TS:** Transport policy and behaviour, Technical University of Denmark

**Schwanen T:** Transport Studies Unit, Oxford University

# Modelling Tool

ITHIM: Integrated Transport and Health Impact Modelling Tool

**The model**

Created by James Woodcock CEDAR, University of Cambridge
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Implemented in Analytica by James Woodcock & Marko Tainio
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Acknowledgements in development of ITHIM
Zaid Chalabi
Phil Edwards
Neil Maizlish
Marko Tainio

Burden summary **Calc**

Sensitivity analysis **Calc** mid

## Expert Data Entry

Physical activity data entry

Time min per week  (minutes per week) **Edit Table**

Mean speed km/h  (km/h) **Edit Table**

Cycling Travel Time Ratios **Edit Tabl**

Proportion of pop cycling on1 day          (fraction) **Edit Tabl**

Walking Travel Time Ratios          (Ratios) **Edit Table**

**Simple data entry click here**

CO2 & PM 2.5 emission factors

Emission factors by Mode by Road Type **Edit Table**

$CO_2$ emissi…  (mt CO2 per yr) **Calc** mid

Injury data entry

Age and sex ratios baseline for motorised tra… **Edit Table**

Baseline fatalities **Edit Table**

Demographic Relative Risks Victim **Edit Table**

Demographic Relative Risks Striking **Edit Table**

Fatalities & injuries summary including age & gender **Calc** mid

# ITHIM

- World Health Organization 2010 data for every country
- Weighted measure of health burden, compared against age specific 'ideal' life expectancy
- Disability Adjusted Life Year (DALY)
- Years of Life Lost (YLL)
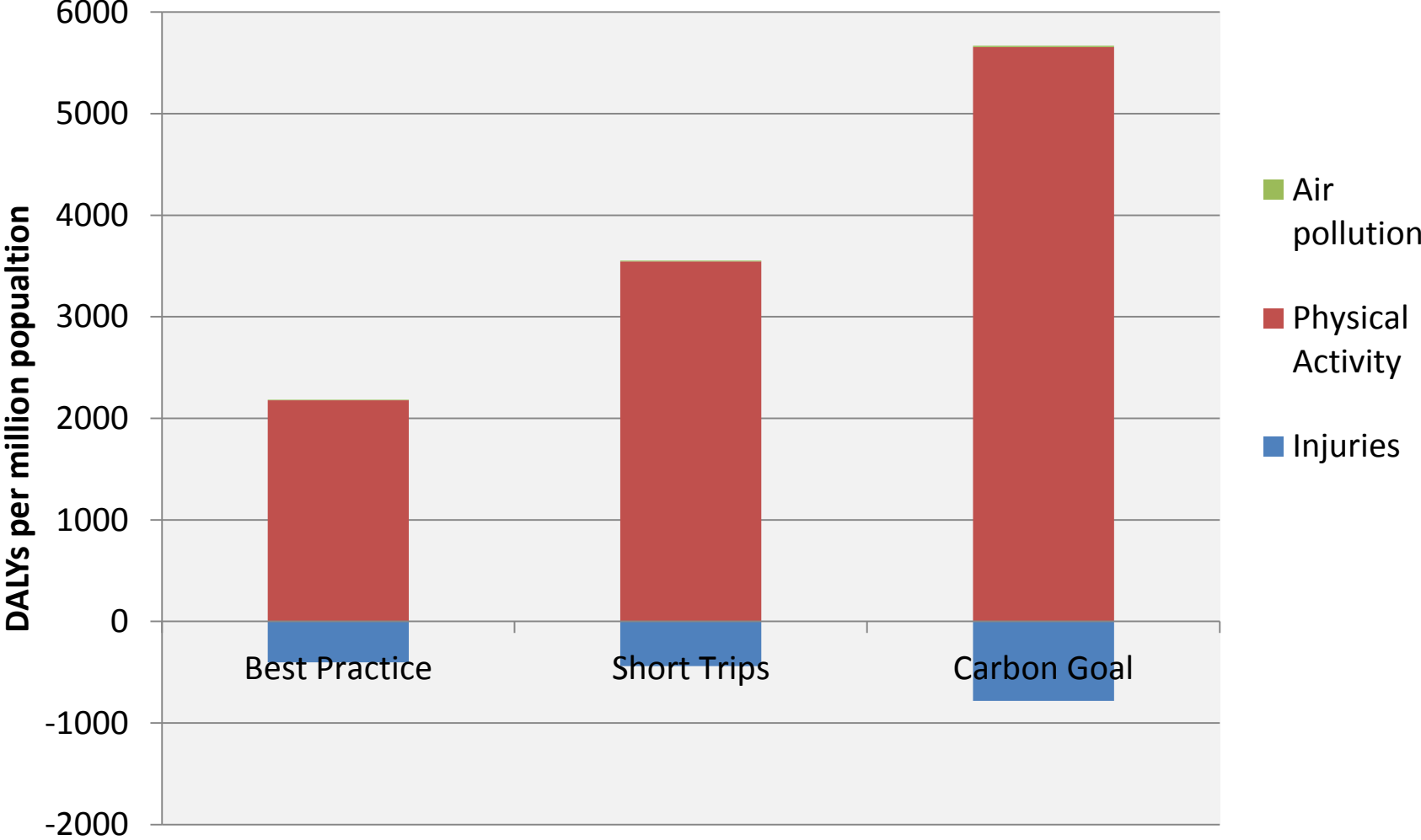- Years of Healthy Life Lost due to Disability (YLD)

$$DALY = YLL + YLD$$

# California Bay Area



Maizlish N, **Woodcock J**, Co S, Ostro B, Fanai A, Farley D. Health Co-Benefits and Transportation-Related Reductions in Greenhouse Gas Emissions in the Bay Area: Technical Report. California Department of Public Health, November 2011.
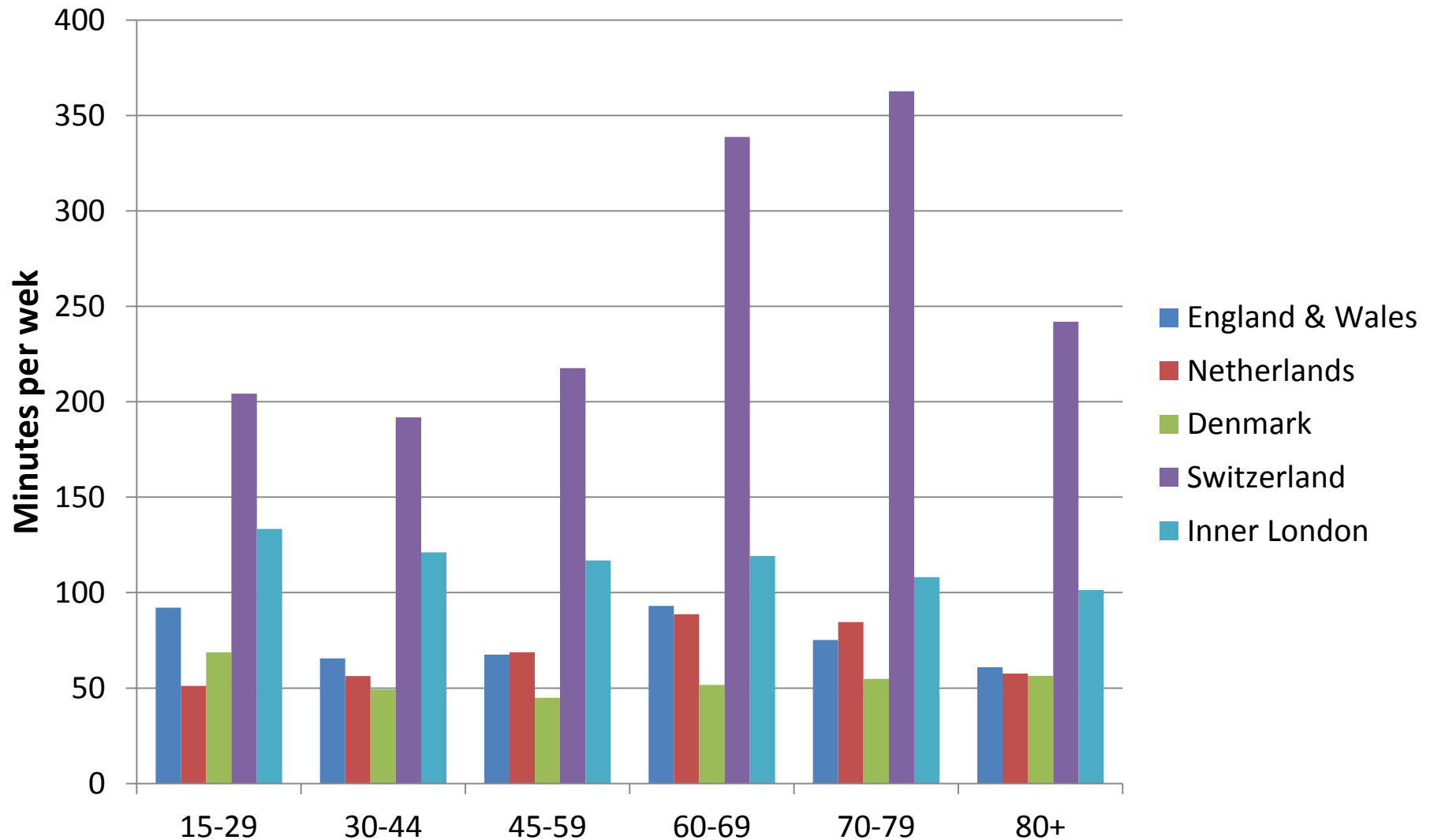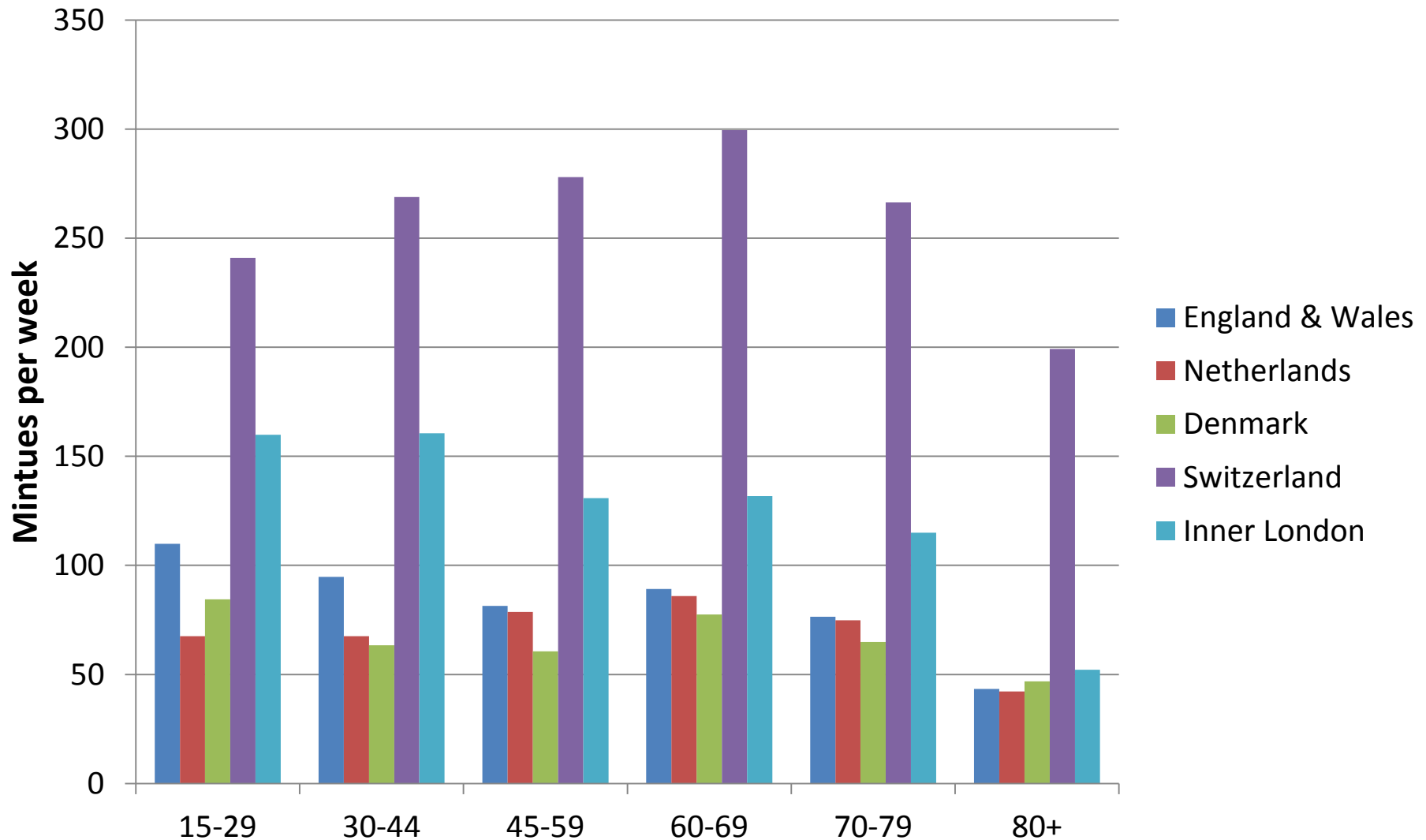Centre for Diet and Activity Research

# California Bay Area



Legend:
- Air pollution
- Physical Activity
- Injuries

Y-axis: DALYs per million popualtion

X-axis categories: Best Practice, Short Trips, Carbon Goal

# Modelling Impact of Geographical Variation

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|  | England & Wales (urban) | Netherlands (urban) | Denmark (urban) | Switzerland (urban) | London |
|---|---|---|---|---|---|
| **Years** | 2002-2008 analysed | 2005 | 2006 | 2005 | 2005-2008 |
| **Sample Size (approx)** | 80,000 people | 35,000 people | 7,000 people | 30,000 people | 12,000 people |
| **Length of survey** | 7 day travel diary but walking trips <1 mile only on 1 day | 1 day travel diary | 1 day travel diary | 1 day travel diary | 1 day travel diary |
| **Population covered (urban)** | 40 million | 13.7 million | 4.7 million | 5.7 million | 2.9 million |
| **Walking trip** | 250 metres | 250 metres | 250 metres | 250 metres | 250 metres |
| **Time & distance estimated by** | Self-reported time & distance | Self-reported time & distance | Self-reported time and distance, but telephone support | Self-reported time & distance | Self-reported time. Point to point distance |

# Walking: minutes per week men



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# Walking: minutes per week women

# % cycling on one day men



**Legend:**
- England & Wales
- Netherlands
- Denmark
- Switzerland
- London

X-axis categories: 15-29, 30-44, 45-59, 60-69, 70-79, 80+

Y-axis: 0% to 40%
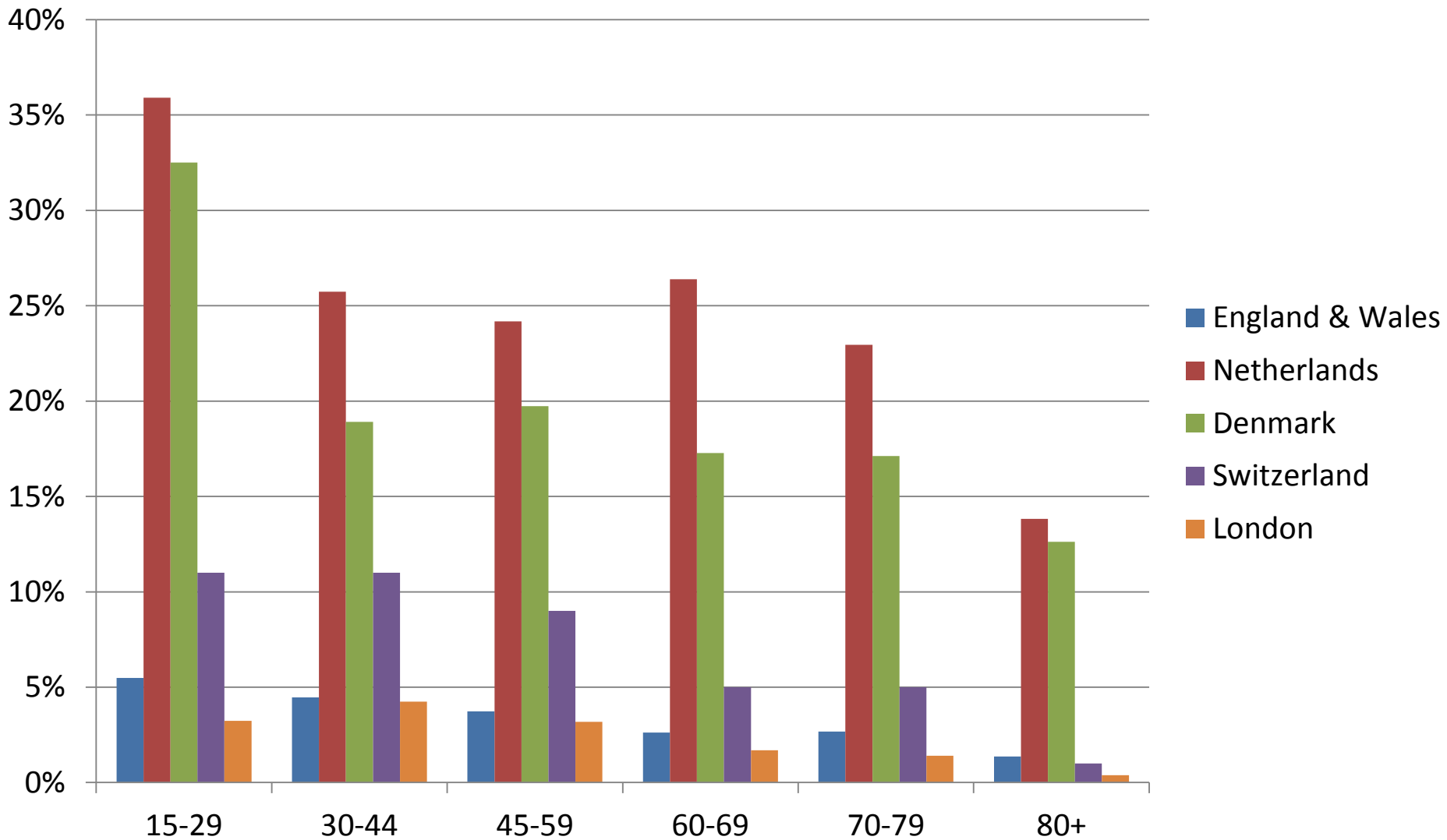
# % cycling on one day women

# Mode split: time



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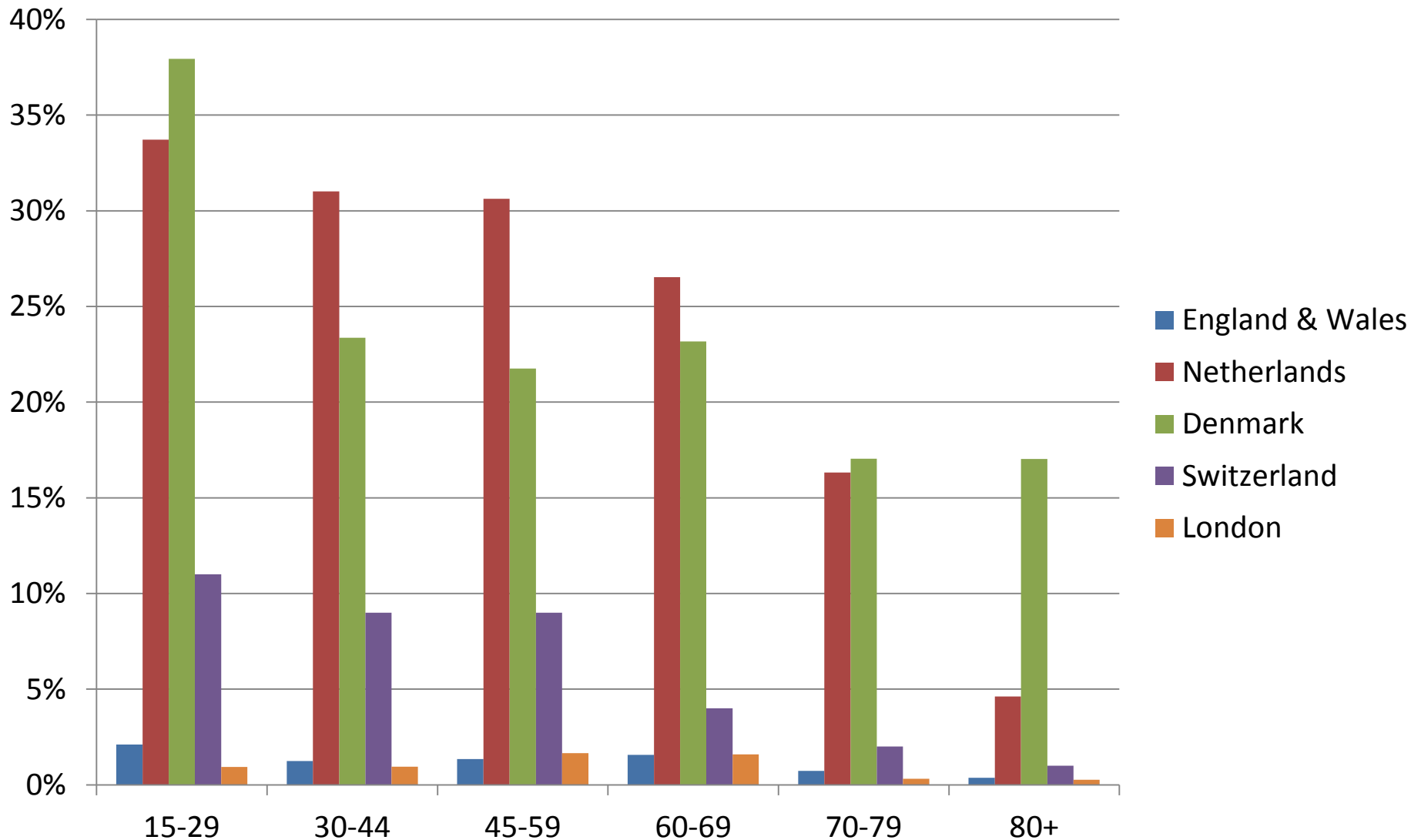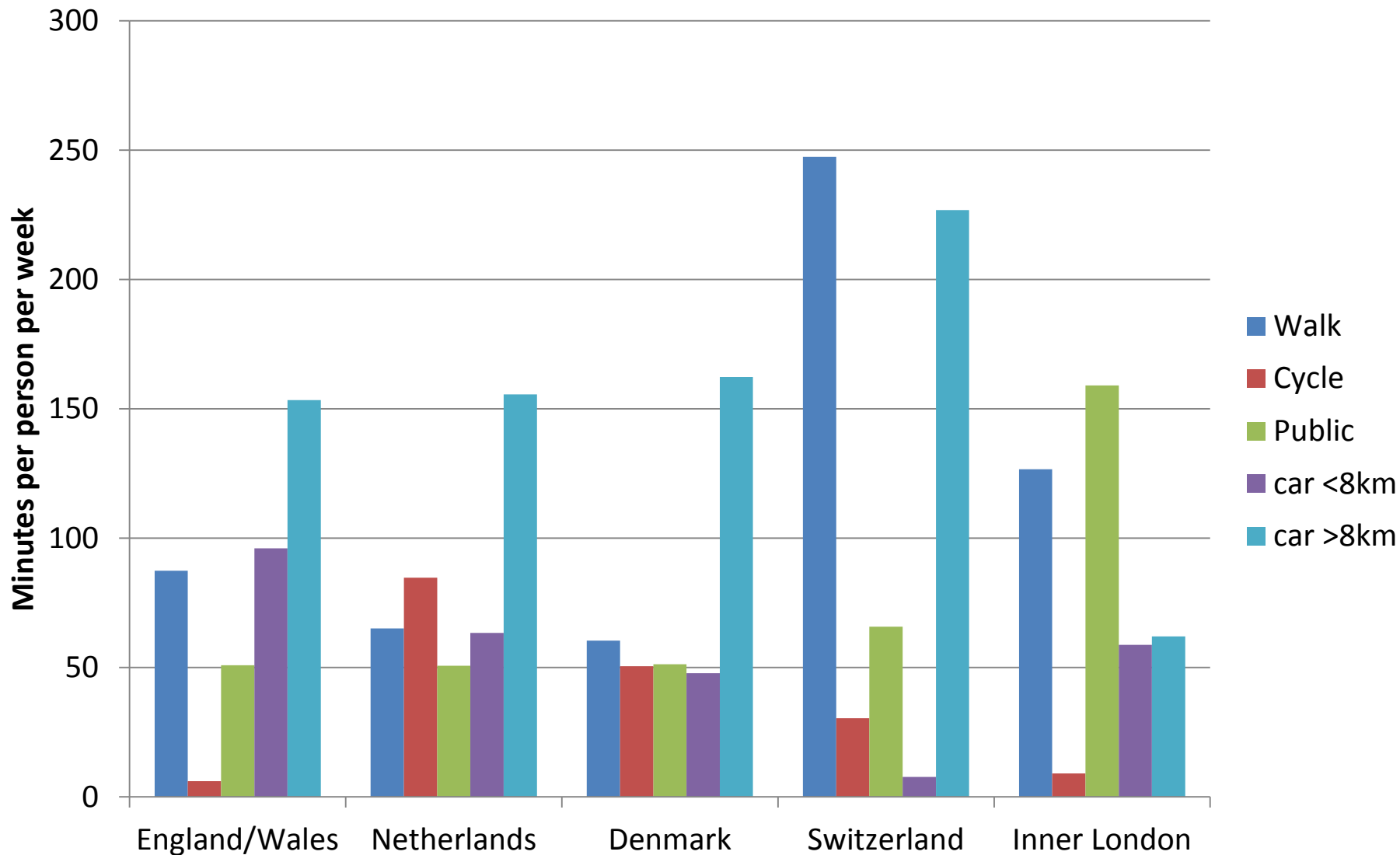
# Car km

# Relative time & distance active travel

■ active travel time   ■ active travel distance

**93 mins 7 km / week**

England/Wales  Netherlands  Denmark  Switzerland  London

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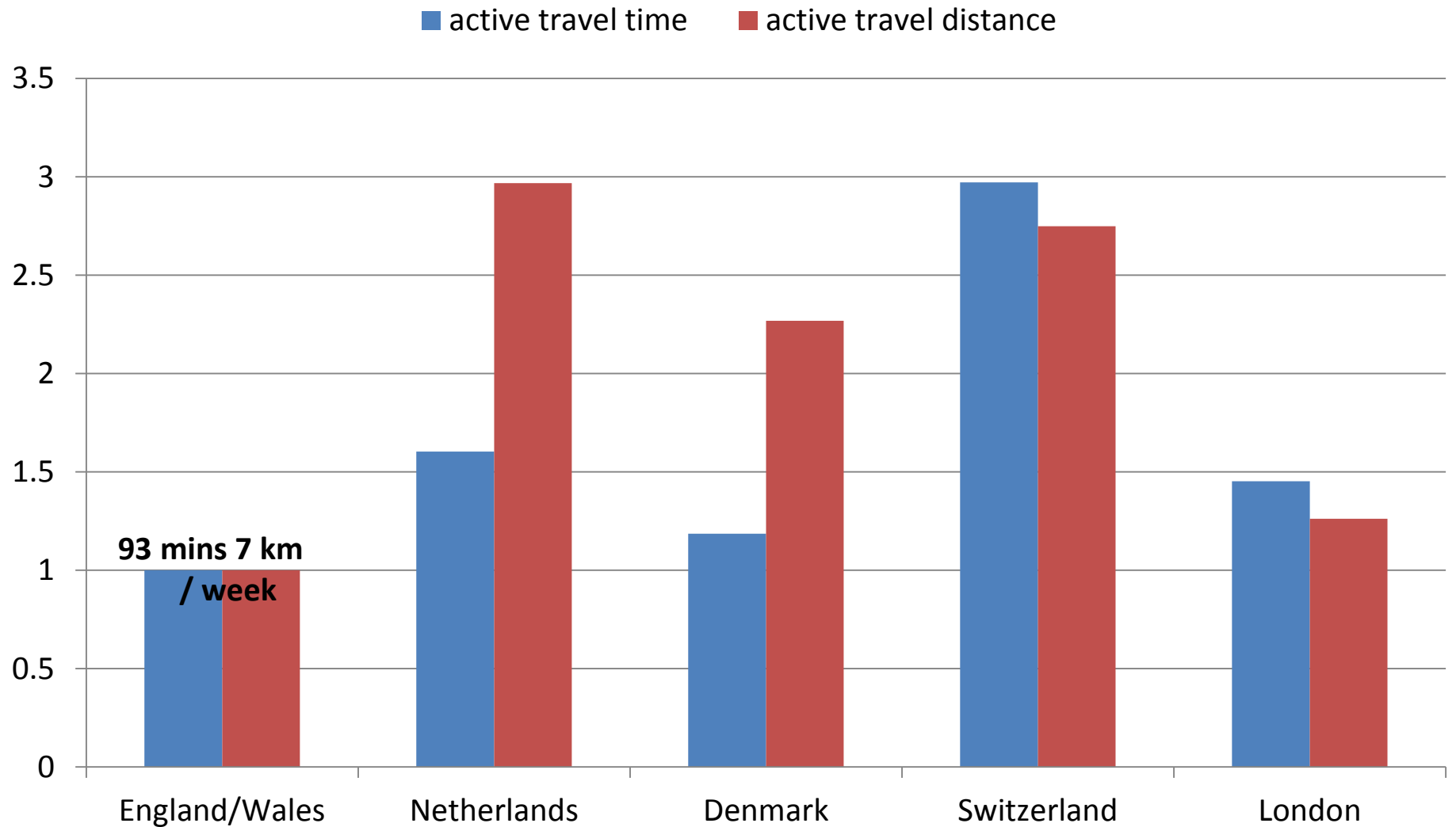
# Metabolically Equivalent Tasks (METs)

- Mass adjusted measure of energy expenditure

| | |
|---|---|
| **3.0** | walking, 2.5 mph, level, firm surface |
| **3.3** | walking, 2.5 mph, downhill |
| **3.5** | walking, 2.8 to 3.2 mph, level, moderate pace, firm surface |
| **4.3** | walking, 3.5 mph, level, brisk, firm surface, walking for exercise |
| **7.5** | bicycling, general |
| **3.5** | bicycling, leisure, 5.5 mph |
| **5.8** | bicycling, leisure, 9.4 mph |
| **6.8** | bicycling, 10-11.9 mph, leisure, slow, light effort |
| **8.0** | bicycling, 12-13.9 mph, leisure, moderate effort |
| **10.0** | bicycling, 14-15.9 mph, racing or leisure, fast, vigorous effort |

# Variation weekly walking energy expenditure:
## England & Wales men
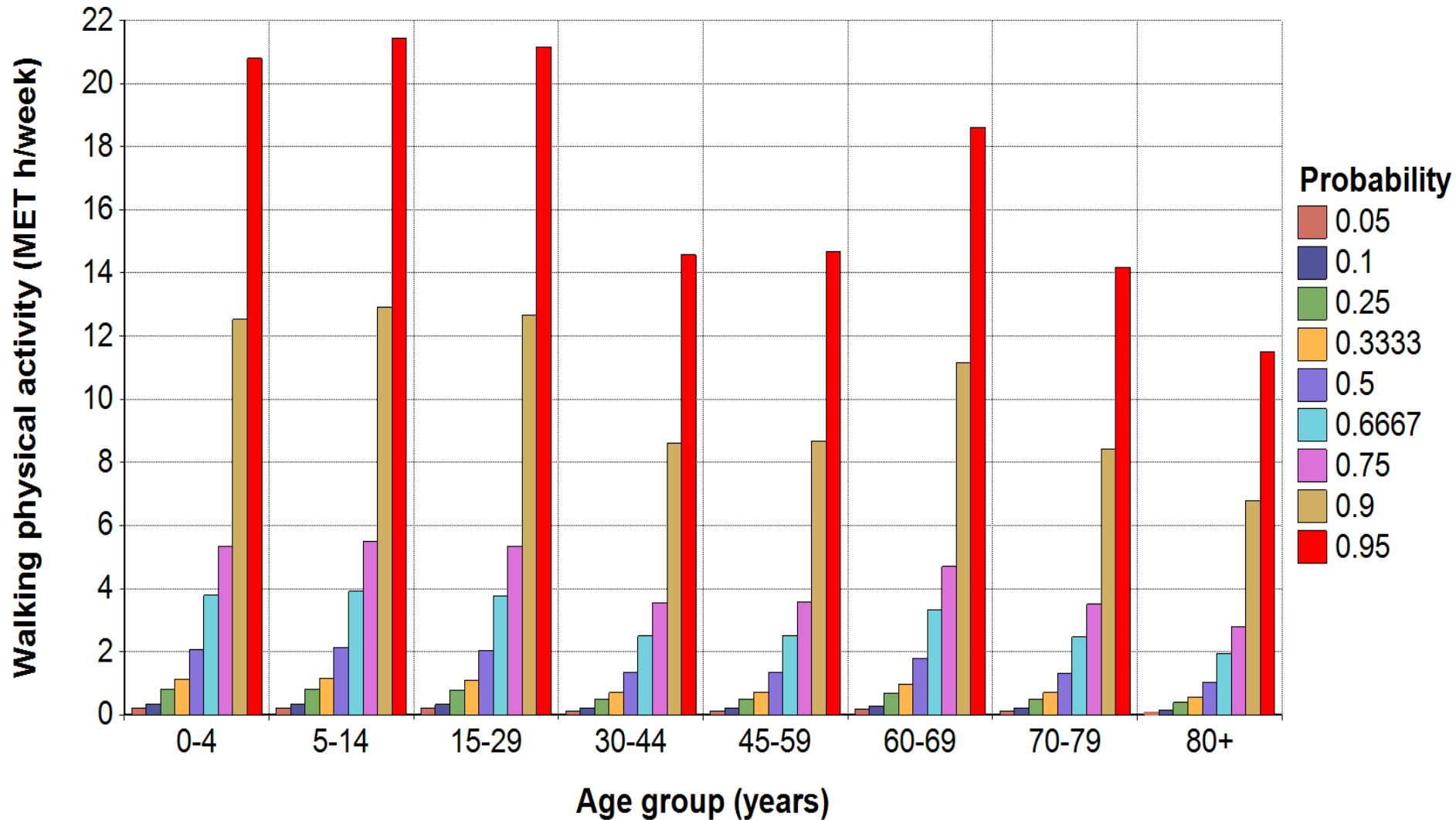
# Swiss: men walking distribution
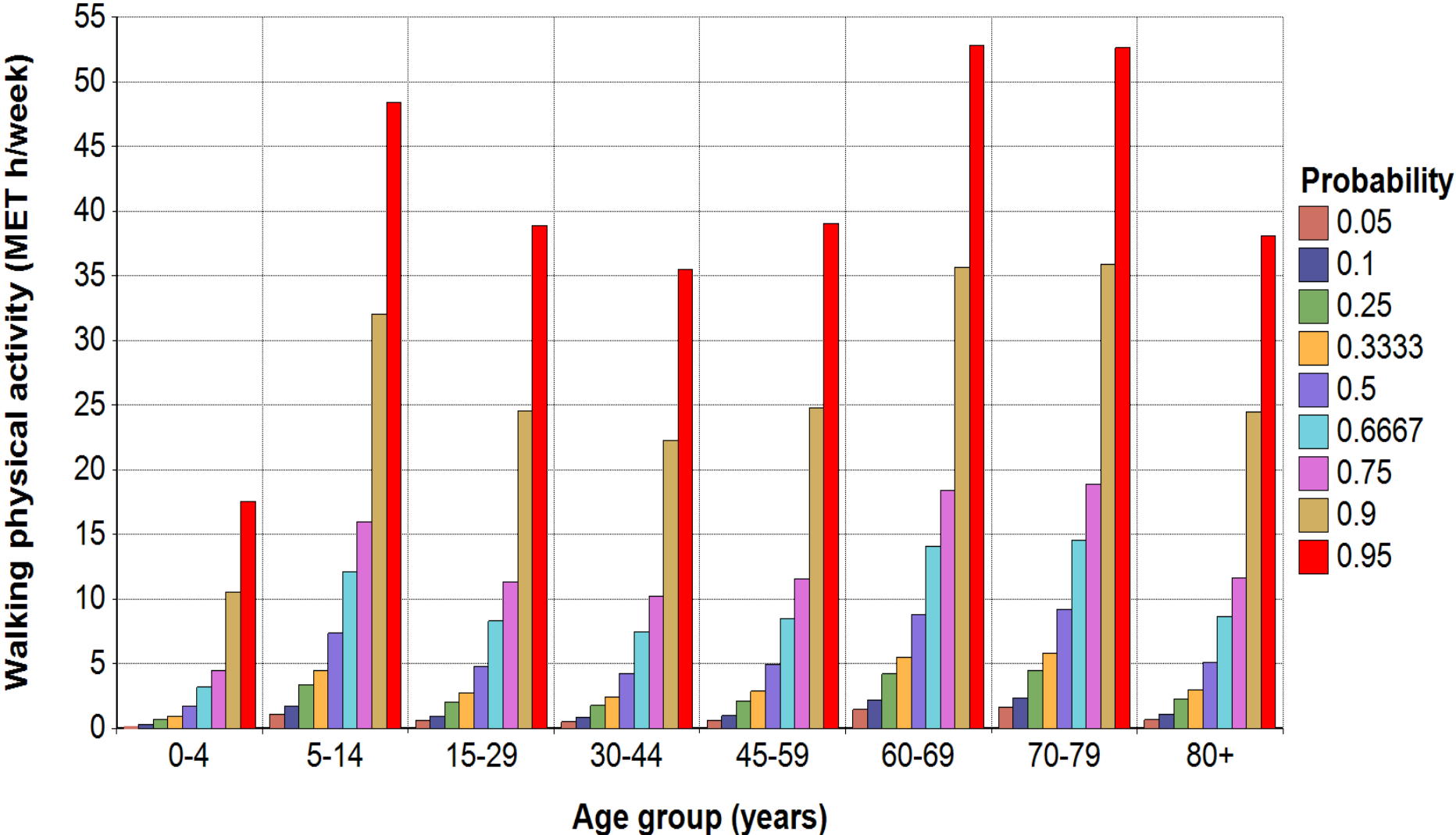
# England & Wales: women cycling distribution
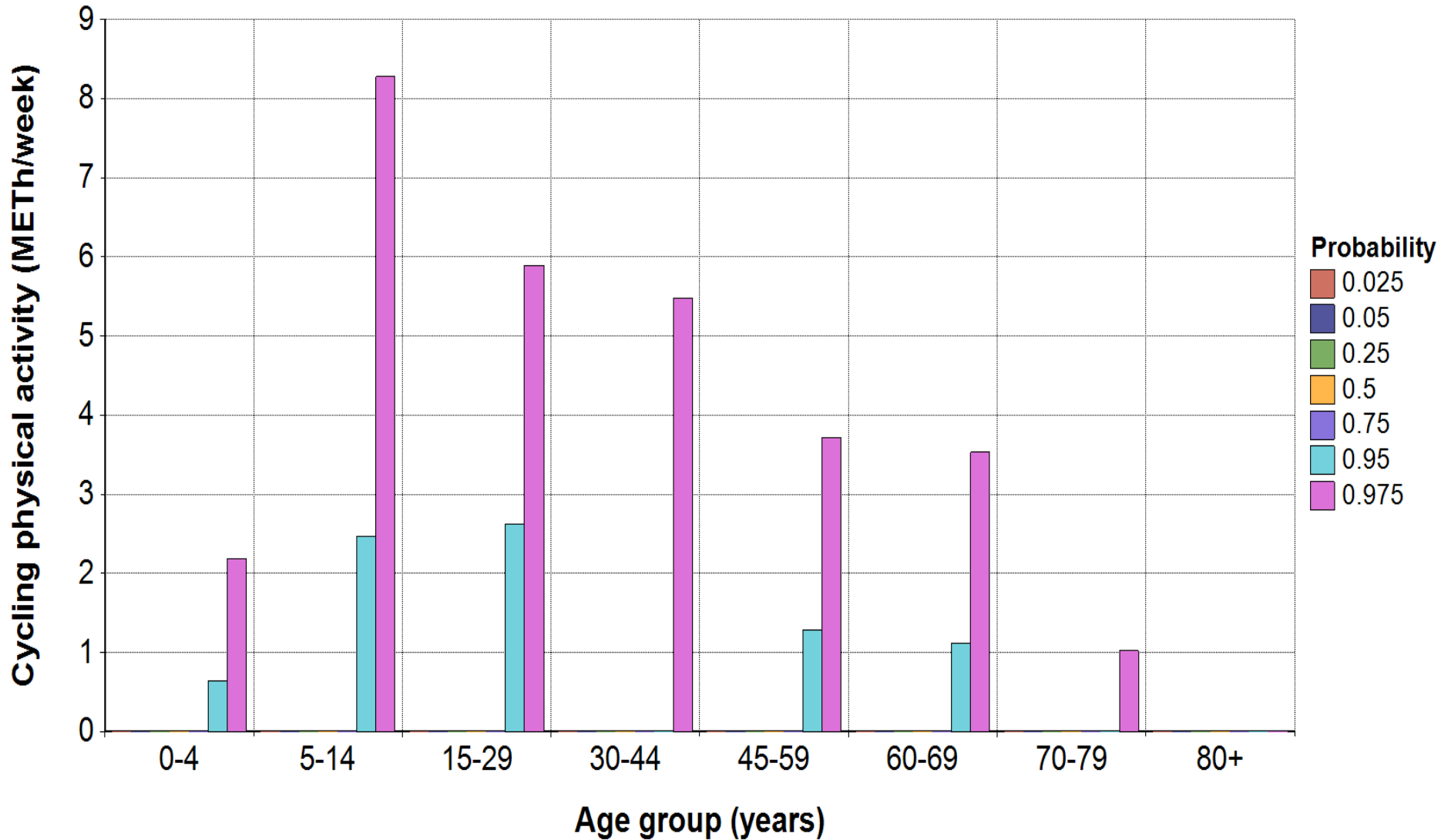
# Netherlands: women cycling distribution

# Health gains across settings



A bar chart titled "Health gains across settings" with the y-axis labeled "DALY per million population" ranging from 0 to 6000. The x-axis shows four settings:

- Inner London: approximately 800
- Denmark: approximately 2080
- Netherlands: approximately 3350
- Switzerland: approximately 4750
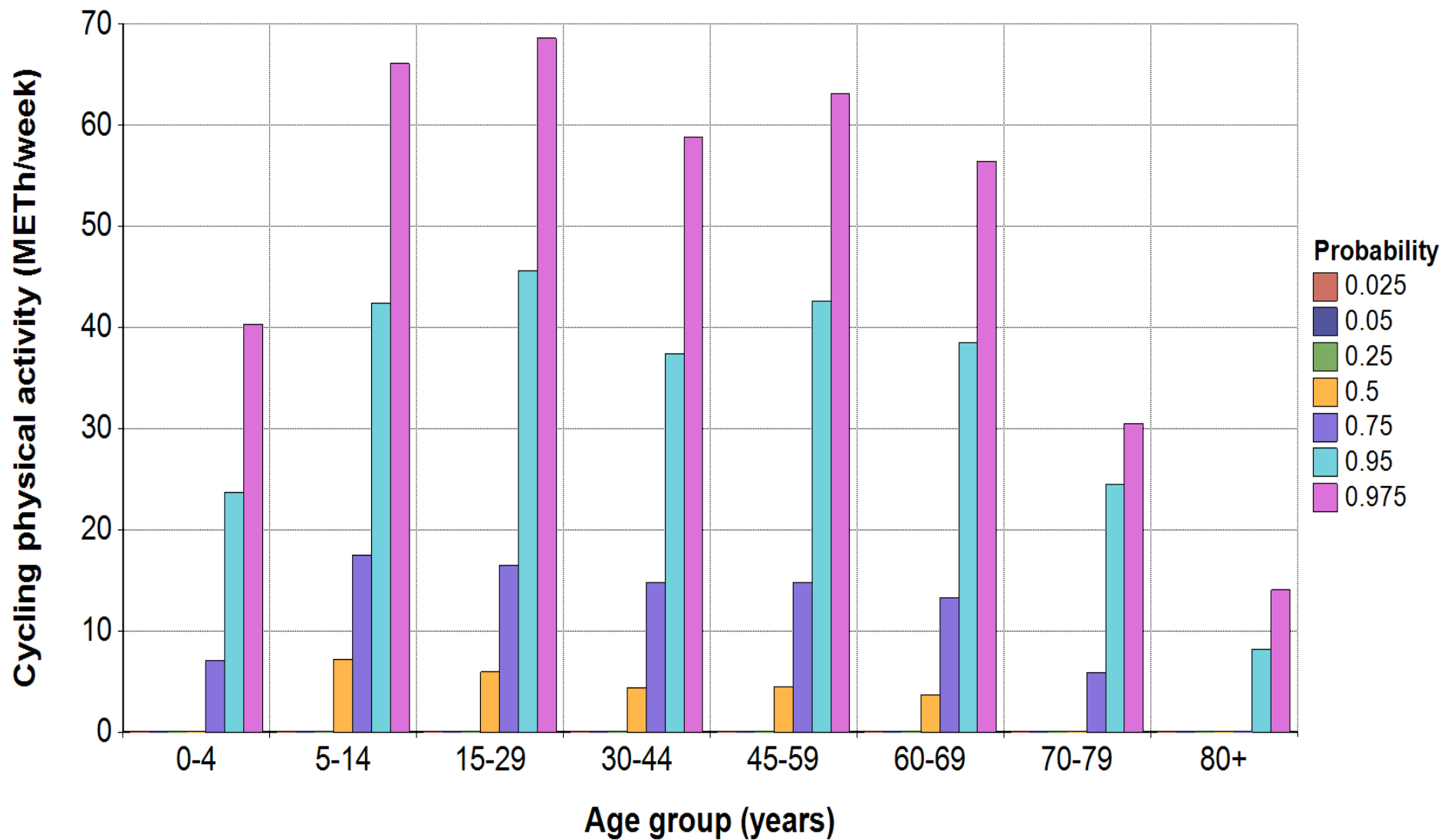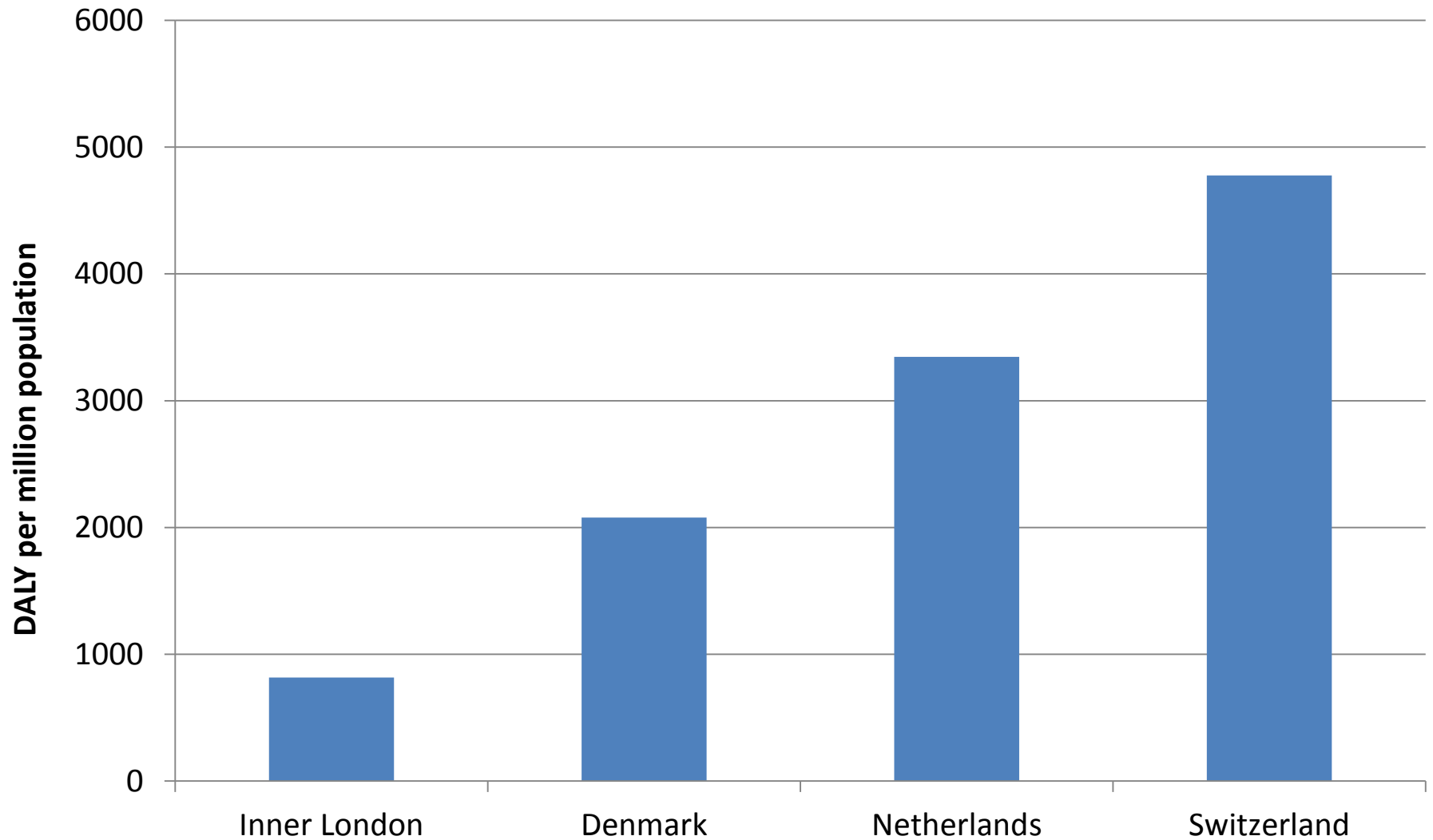
# Obesity rates adults 2009



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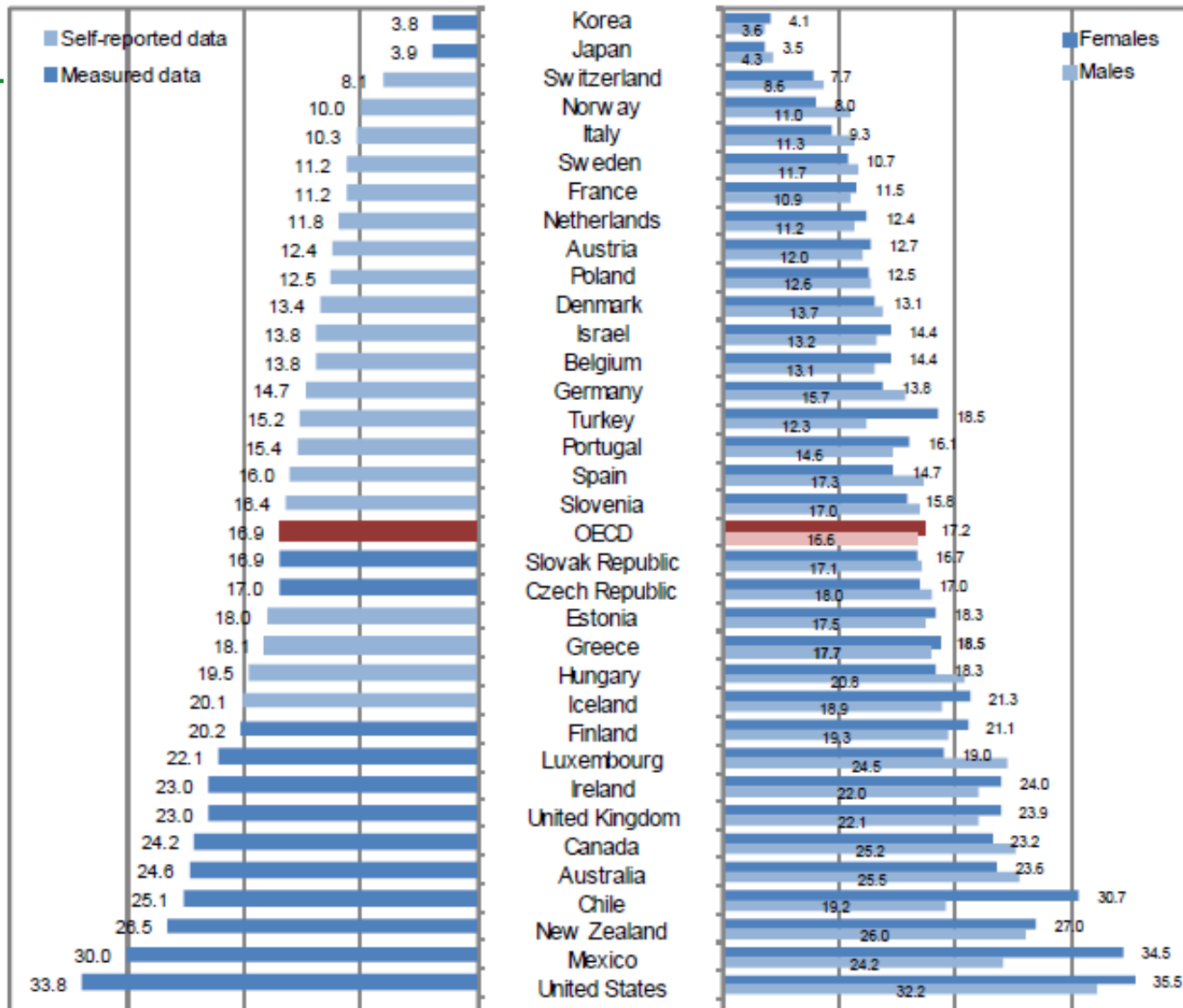
# Netherlands: contribution of disease to reduction in total burden

Colon cancer 5%

Breast Cancer 5%

Depression 10%

Ischemic Heart Disease 37%

Diabetes 9%

Dementia 15%

Stroke 19%

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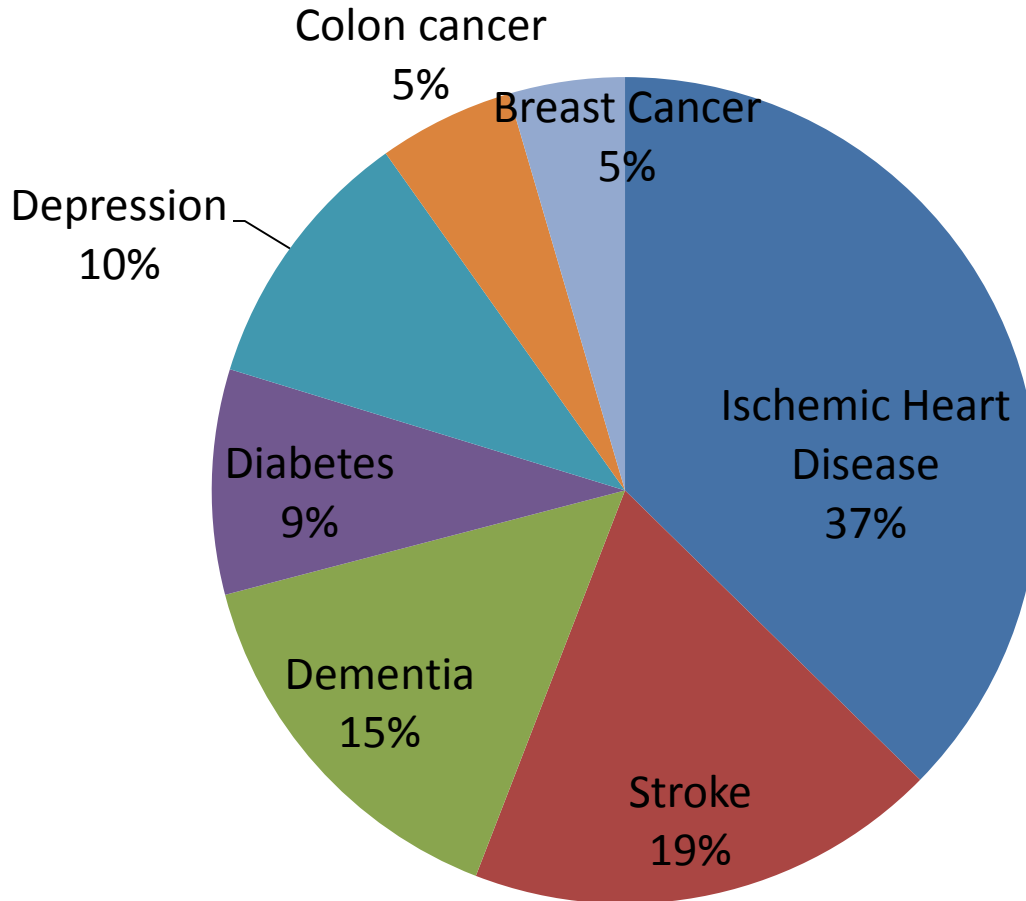
# Switzerland: % reductions by disease
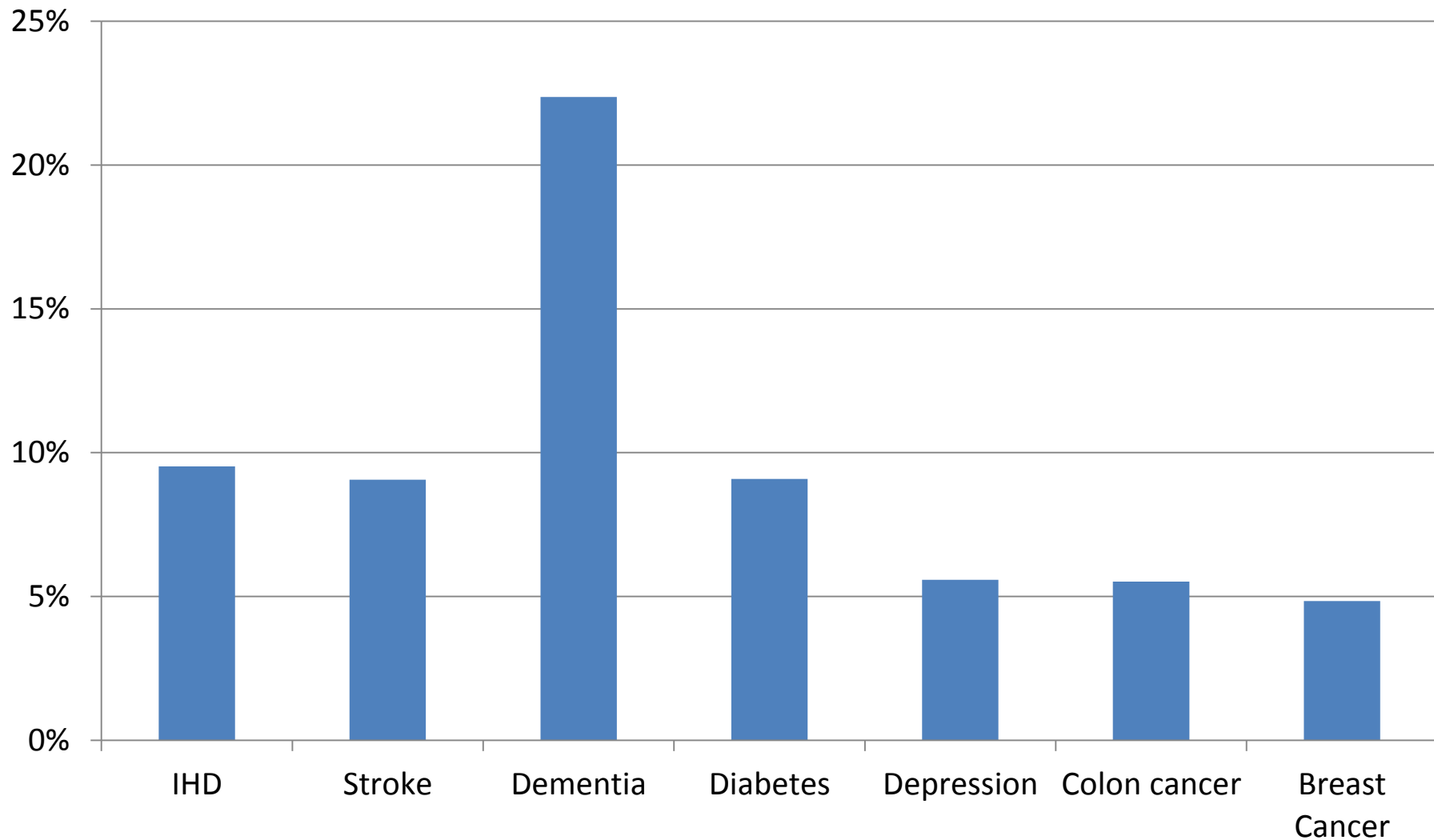
# Conclusions

- Impact of differences on health large

- Co-benefits not automatic

- How can we achieve both?

# Next Steps

# ACKNOWLEDGEMENT

# England & Wales Scenarios
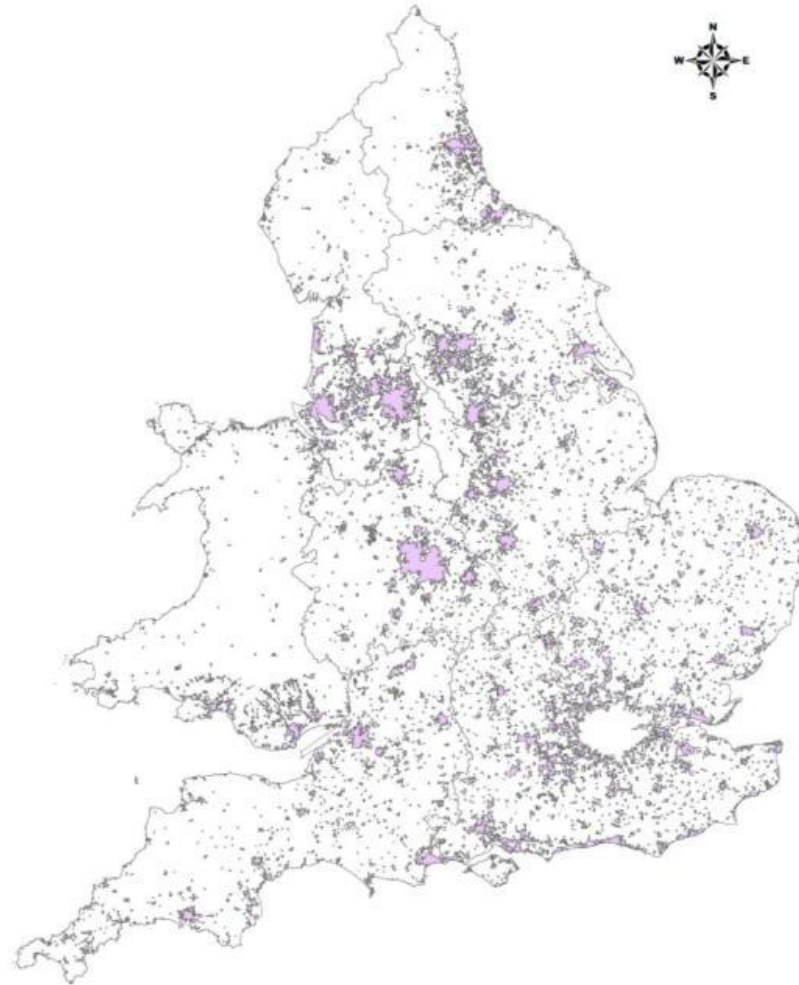
# England & Wales Results

# ITHIM