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National burden of diseases studies using Disability-Adjusted Life Years (DALYs) measure. Evolution of methods and construction of DALY – the example of Poland, 1997 – 2019

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The aim:

- to show the burden of diseases work (applying the Global Burden of Disease study methodology) done in Poland for over two decades,

- to discuss the evolution of methods incorporated in the construction of Disability Adjusted Life Years - DALYs,

- to list the possible sources of data for national burden of disease performance.

Four stages can be distinguished in the GBD study evolution

Stage 1: GDB results released in 1993–1995:

- **incidence approach** was used to calculate YLDs,
- **six classes of disability** were applied to estimate the average disability weights,

Each class represents a greater loss of welfare than the class before.

- data required for generic YLDs calculation:
  - ✓ **new cases of disease (incidence number),**
  - ✓ **disability duration,**
  - ✓ **age of onset,**
  - ✓ **and distribution by severity class**,

  all of which disaggregated by age.

Based on the criticisms and expanding literature and debate on alternative methods for preference measurement, the approach used to define, measure and value disabilities for Years Lived with Disability (YLD) was revised for estimates of GBD in 1996

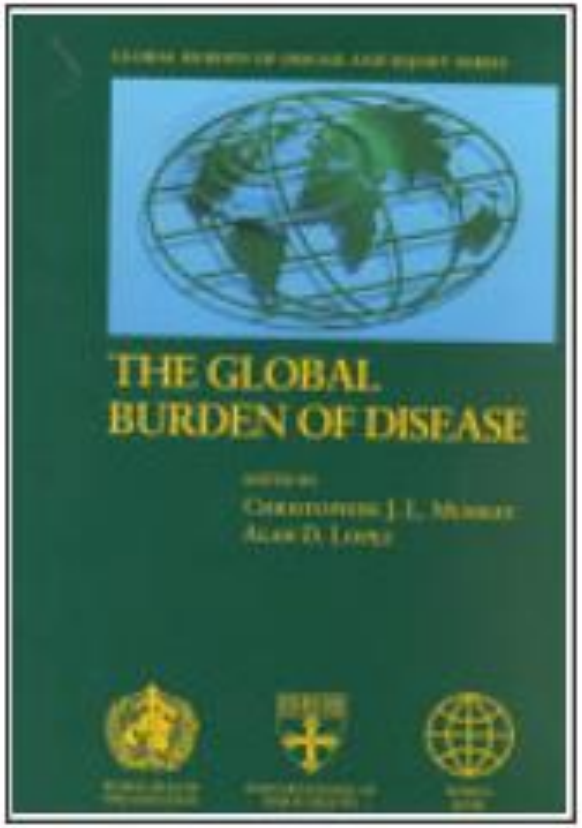
See publication of two volumes: The Global Burden of Disease, edited by Christopher J.L. Murray and Alan Lopez, 1996.

The Global Burden of Disease and Injury: 1

Global Burden of Disease

A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020

Edited by Christopher J.L. Murray and Alan D. Lopez

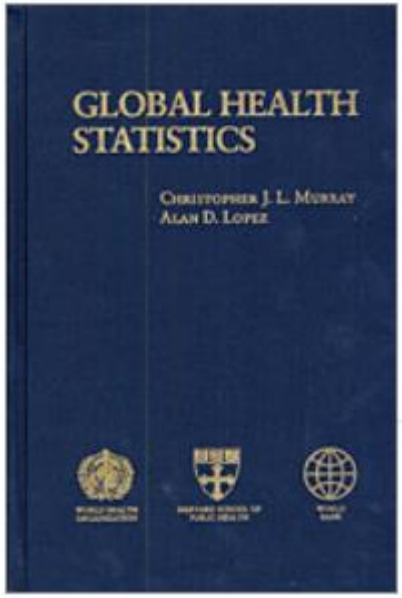


The Global Burden of Disease and Injury: 2

Global Health Statistics

A Compendium of Incidence, Prevalence and Mortality Estimates for Over 200 Conditions

Edited by Christopher J.L. Murray and Alan D. Lopez



- The major change resulting from this revision:
  - ✓ shifting away from defining disability classes in terms of the four domains of recreation, education, procreation and occupation,
  - ✓ moving to a deliberative process for choosing weights for any given disabling sequela based on several variants of the person-trade-off (PTO) method,
  - ✓ a protocol for disability severity weight measurement was developed.

Four stages of GBD methodology evolution cont'd

Stage 2: results published in 1996–2009:

- disability weights based on 7 classes of disability (*Person-Trade-Off* - PTO method) were used to estimate the average disability weights for treated and un-treated forms of the disease by age group,
- distribution of cases between 7 disability classes was defined (each class contains two or three indicator disorders that act as benchmarks for the definition of each class),
- Stages 1&2 took into consideration additional social preferences:
  - age weighting,
  - discounting years lost due to death and disability,
  - gender differentiated standard life expectancies at birth used to calculate the YLLs: M = 80.0; F = 82.6

In 1997 first national burden of disease study in Poland and national and subnational (49 voivodeships) was performed with the K. Kissimova-Skarbek fellowship grant of the Phare ACE Programme (Action for Cooperation in the field of Economics)

Data and data sources used for YLLs estimates:

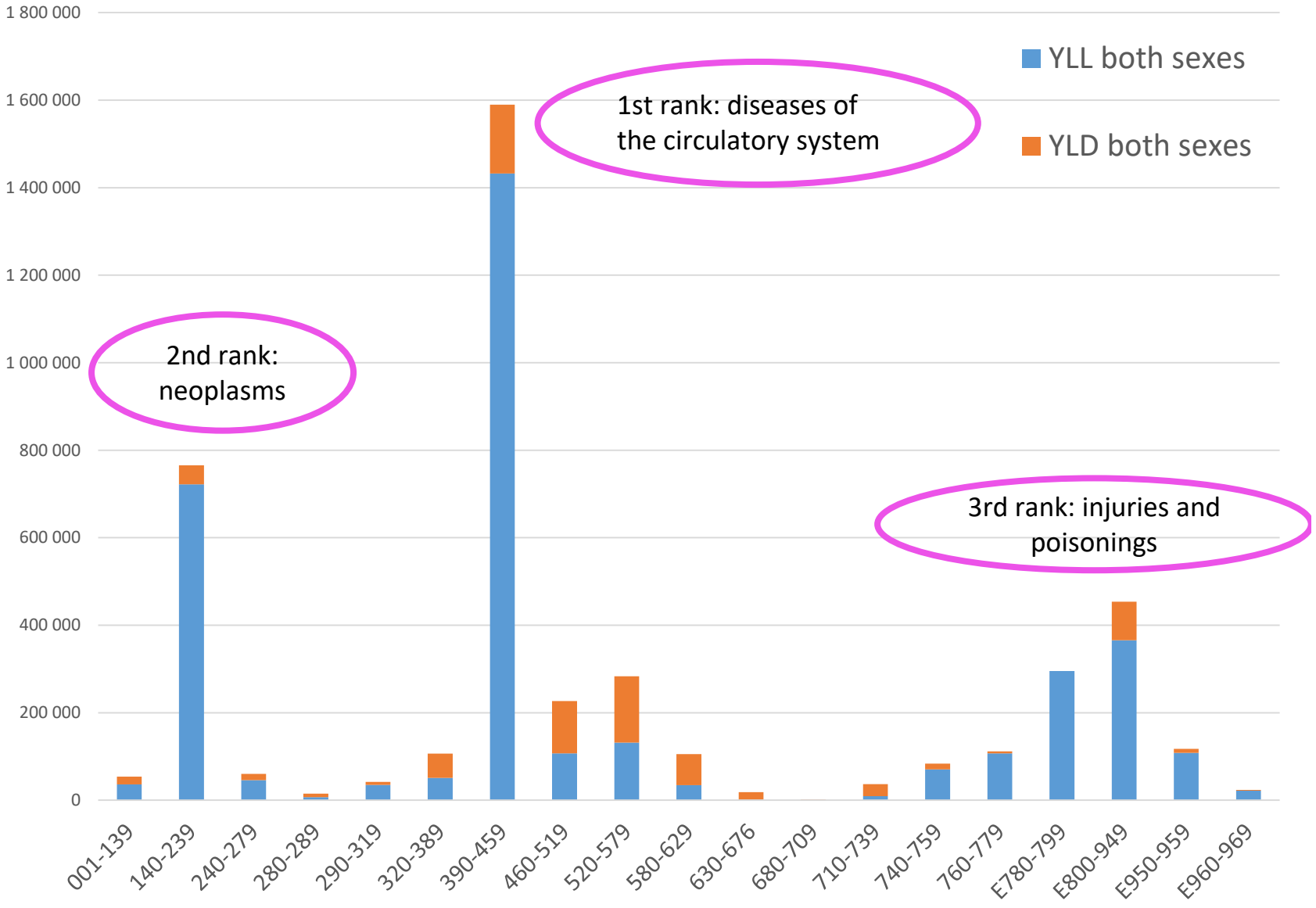
- number of deaths in year 1995 by voivodeship, single age, cause (ICD-9 codes; over 800 causes) and sex – obtained from Main Statistical Office in Poland,
- STD Life Table (for male and female) – provided by GBD study team,
- age weighting formula - provided by GBD team.

The period of life lost was discounted with 3% discount rate.

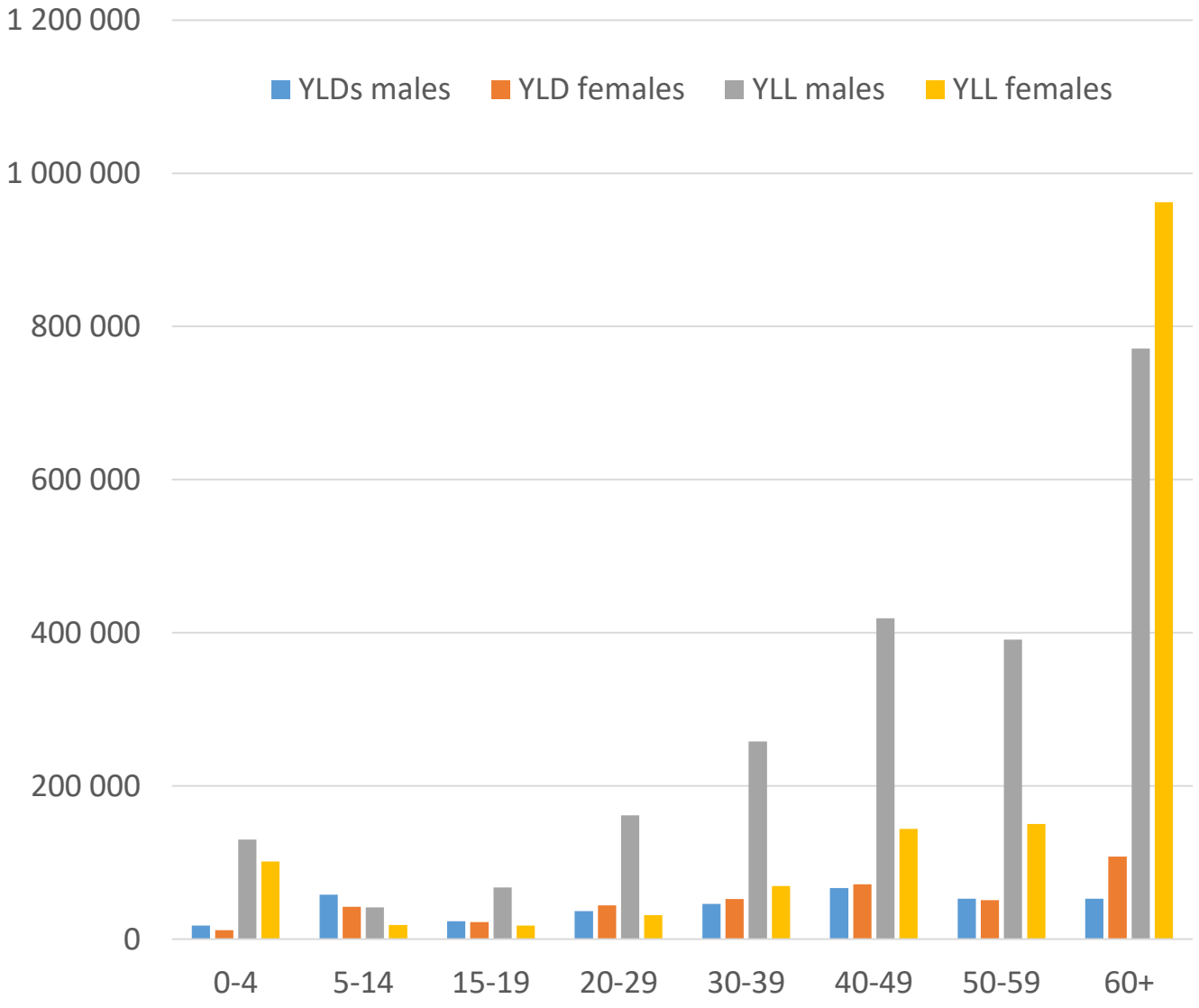
Data and data sources used for YLDs estimates

- prevalence numbers in year 1995 by voivodeship, cause (over 800 causes, ICD-9), age, sex: provided by Polish Institute of Hygiene (based on hospital statistics),
- average age of onset for males and females by sequelae: from GBD study results for the Formerly Socialist Economies of Europe region (which Poland belonged to)
- duration of the disease assumed 1 year,
- age specific disability weights for treated and untreated form of sequelae used in the Global Buren of Disease Study,
- proportion of treated cases: GBD study results for FSE region.

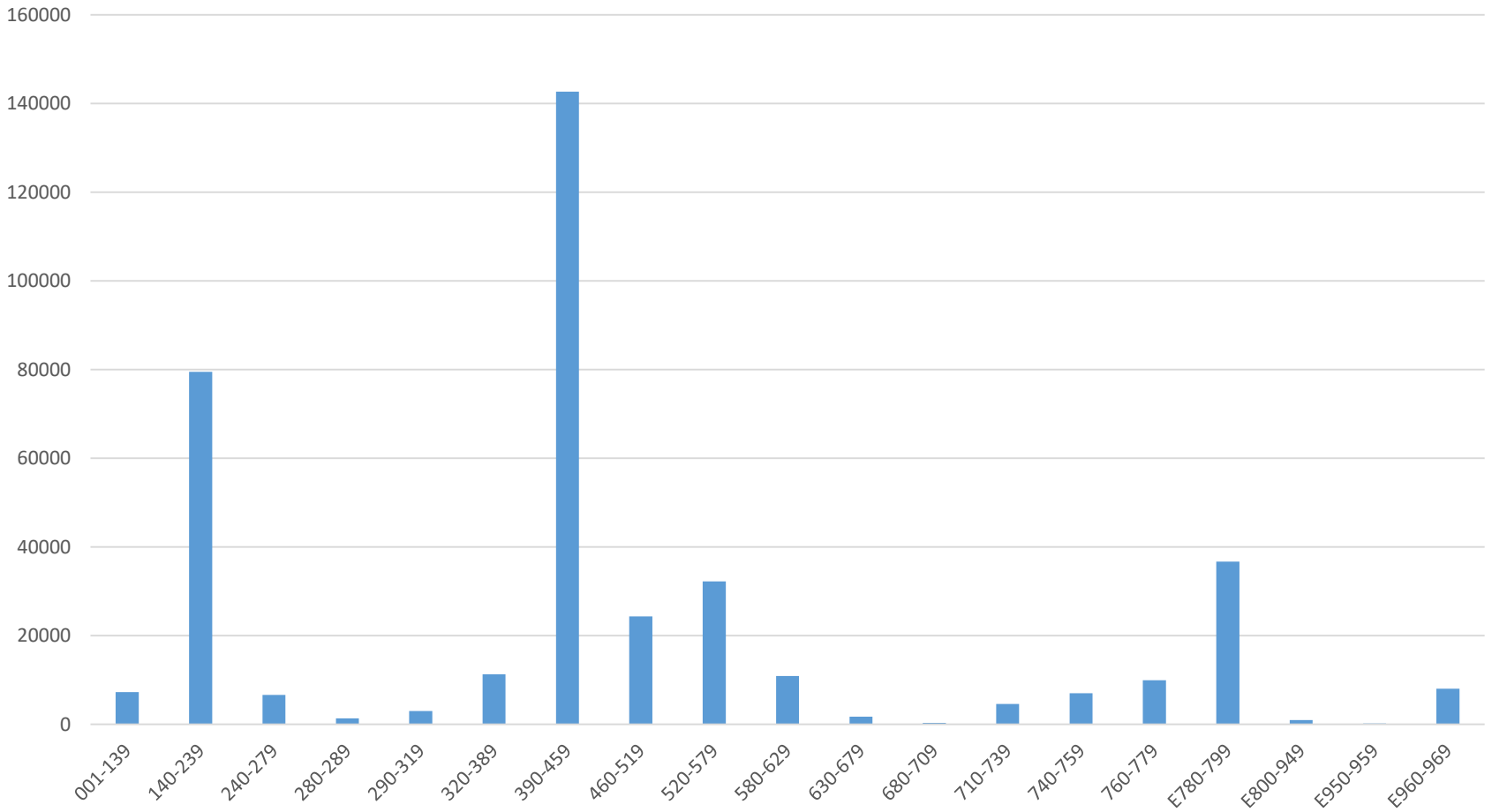
DALYs in Poland 1995 all ages, both sexes, by disease group



YLLs and YLDs all causes by age group, Poland 1995



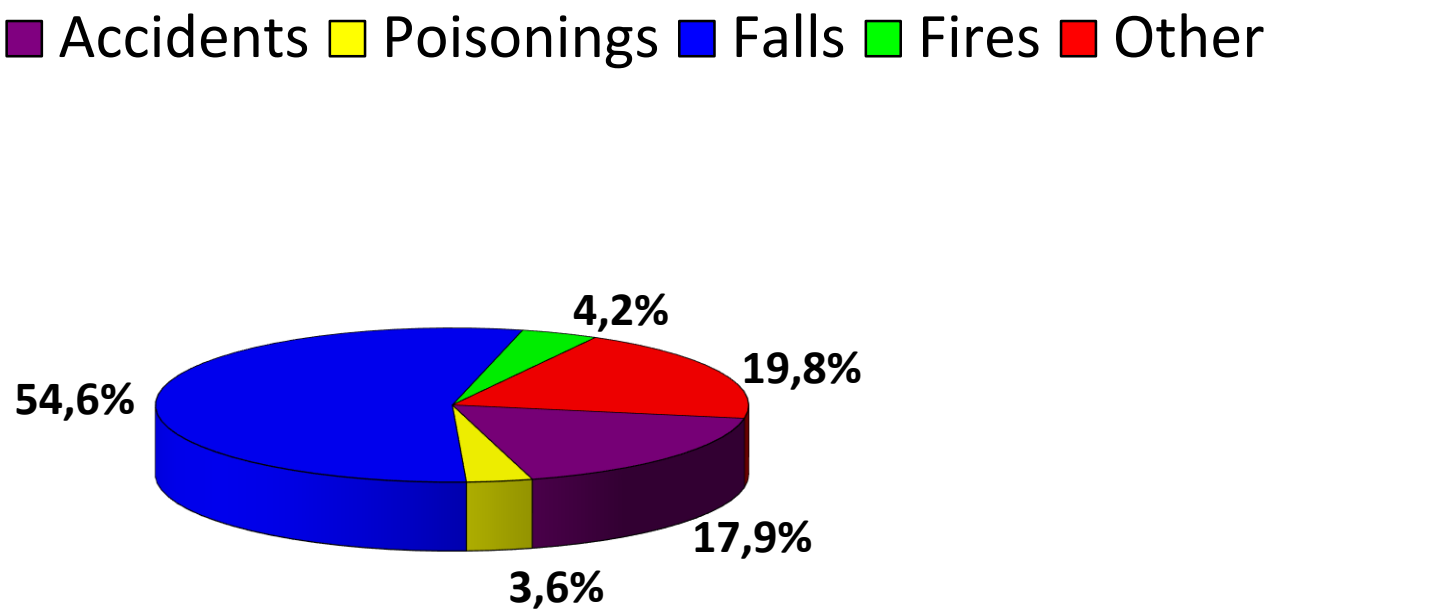
DALYs in Katowice voivodeship, found to have the highest per capita DALYs, both sexes, 1995



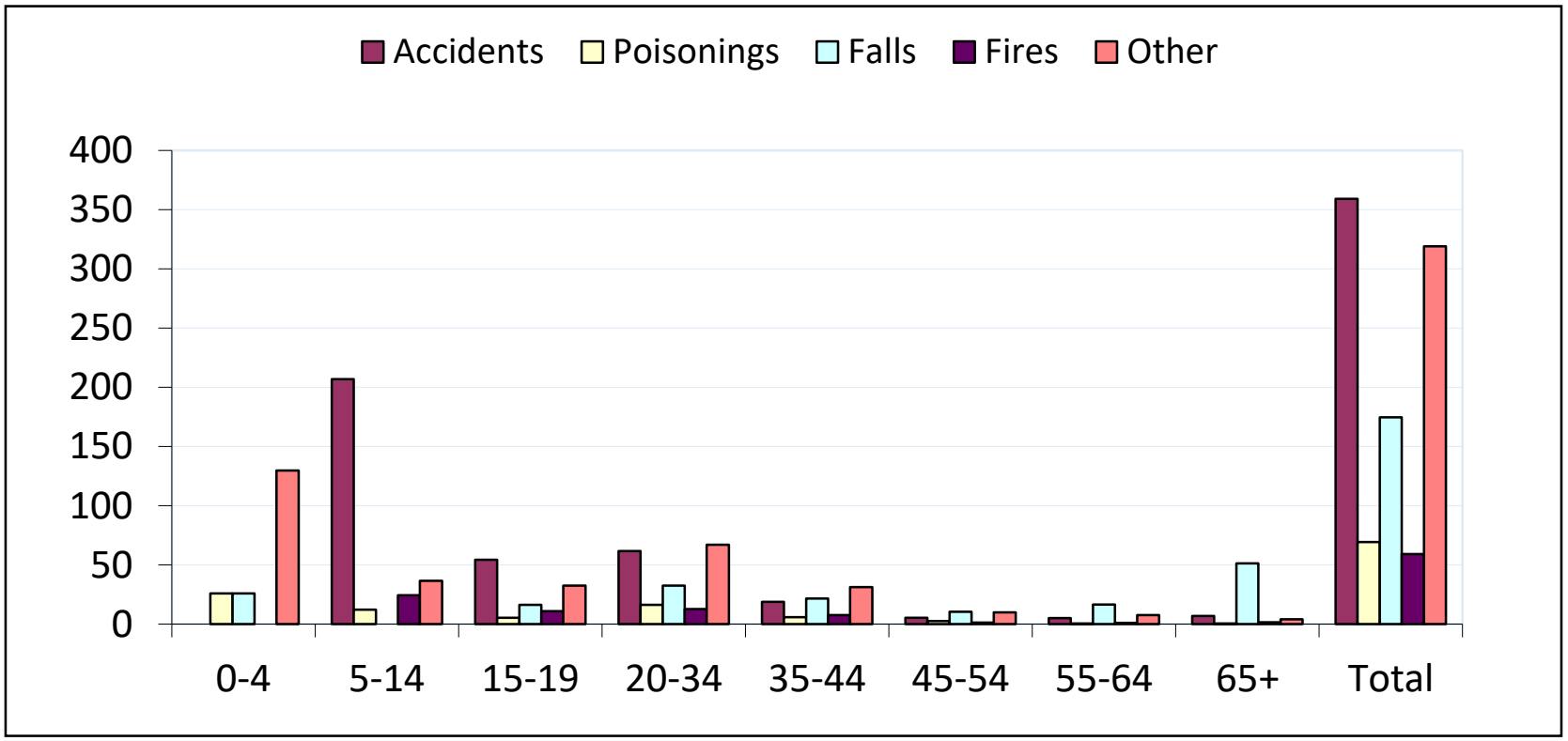
Analyses for injuries were done also monthly for Katowice voivodeship

Next slide presents an example of burden of injuries in Katovice voevodeship in one month of the year 1995.

The falls caused the most deaths among all types of injuries (54.6%) in Katowice voivodeship (April, 1995, both sexes)

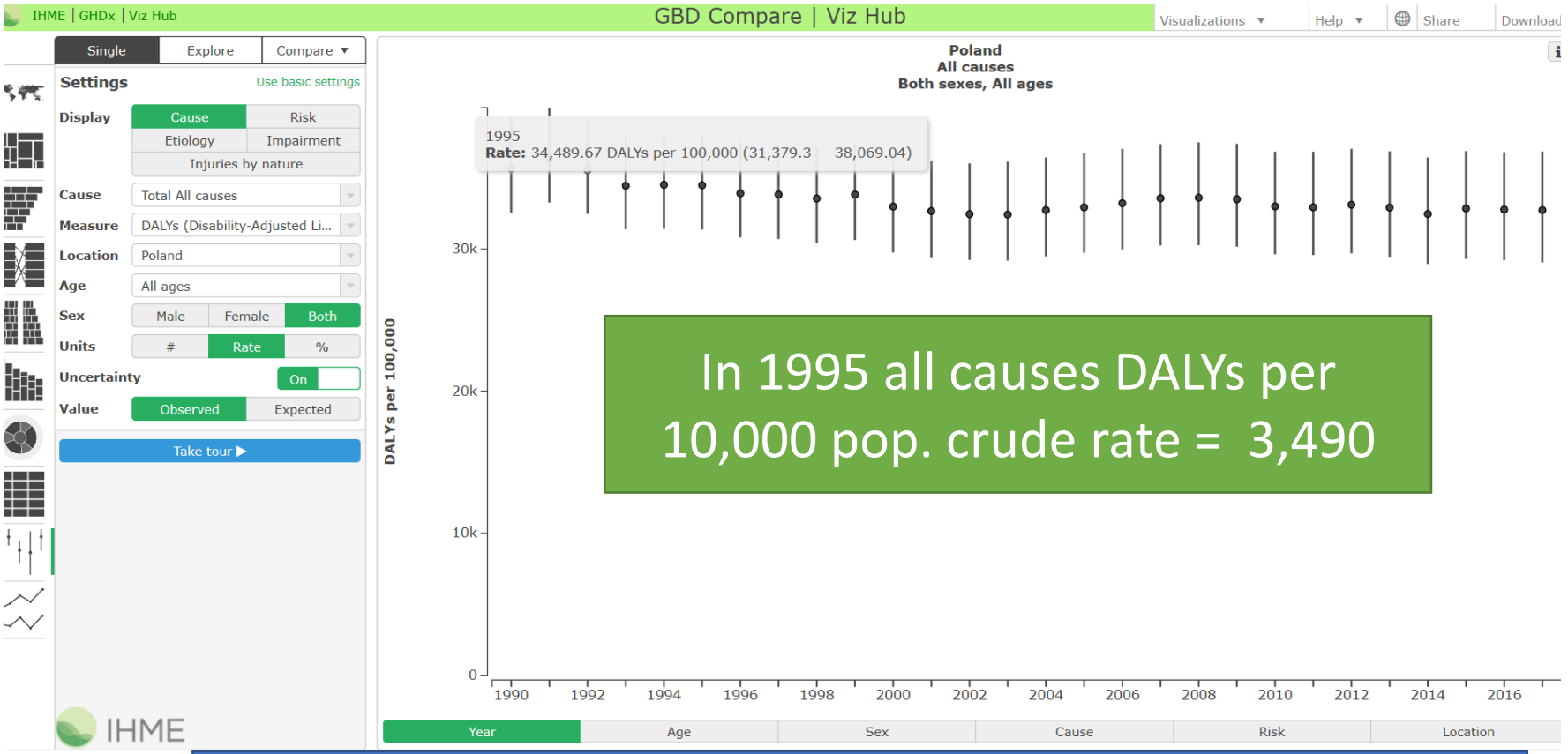


Years of Life Lost caused by injuries in Katowice voivodeship in April 1995 (both sexes, 8 age groups)



When YLLs are presented – the ranking changes.
Now the highest burden is due to accidents.

Burden of all-causes in year 1995 estimated using generic DALY and new DALY (GBD-2017 estimates) for Poland:



In 1995 all causes DALYs per 10,000 pop. crude rate = 3,490

Generic DALY (age weighted and discounted) shows much lower disease burden = all causes DALYs per 10,000 pop. crude rate = 1, 419 (2,5 times less)

Four stages cont'd

Stage 3: Work in years 2010–2012:

New GBD-2010 methodology introduced and results released in 2012.

This was the first significant revision in calculating DALY in that it:

- eliminates age weights,
- uses a prevalence approach to calculate YLD,
- removes discounting of time-period lost,
- introduces an equal standard life expectancy for both sexes **(86.6 years at birth)** in order to avoid gender inequalities while assessing diseases burden and health interventions' impact.

Four stages cont'd

Stage 4: Years 2013 - the last (published) GBD-2017, and GBD-2019 estimates ready for release concurrently with the World Health Assembly in Maj 2020.

- group of countries with estimated burden of diseases increased (now 197 countries/territories),
- estimates are done for over 680 subnational locations in 21 countries,
- here are examples of using GBD-2015 results to present burden of diseases in Poland.

Zdrowie Publiczne i Zarządzanie

www.ejournals.eu/Zdrowie-Publiczne-i-Zarzadzanie/2016/Tom-14-zeszyt-3/

Wydawnictwo Uniwersytetu Jagiellońskiego

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Approaches to Disease Burden Measurement: Disability-Adjusted Life Years (DALYs) Globally and in Poland, and National Income Lost Due to Disease in Poland, 1990–2015

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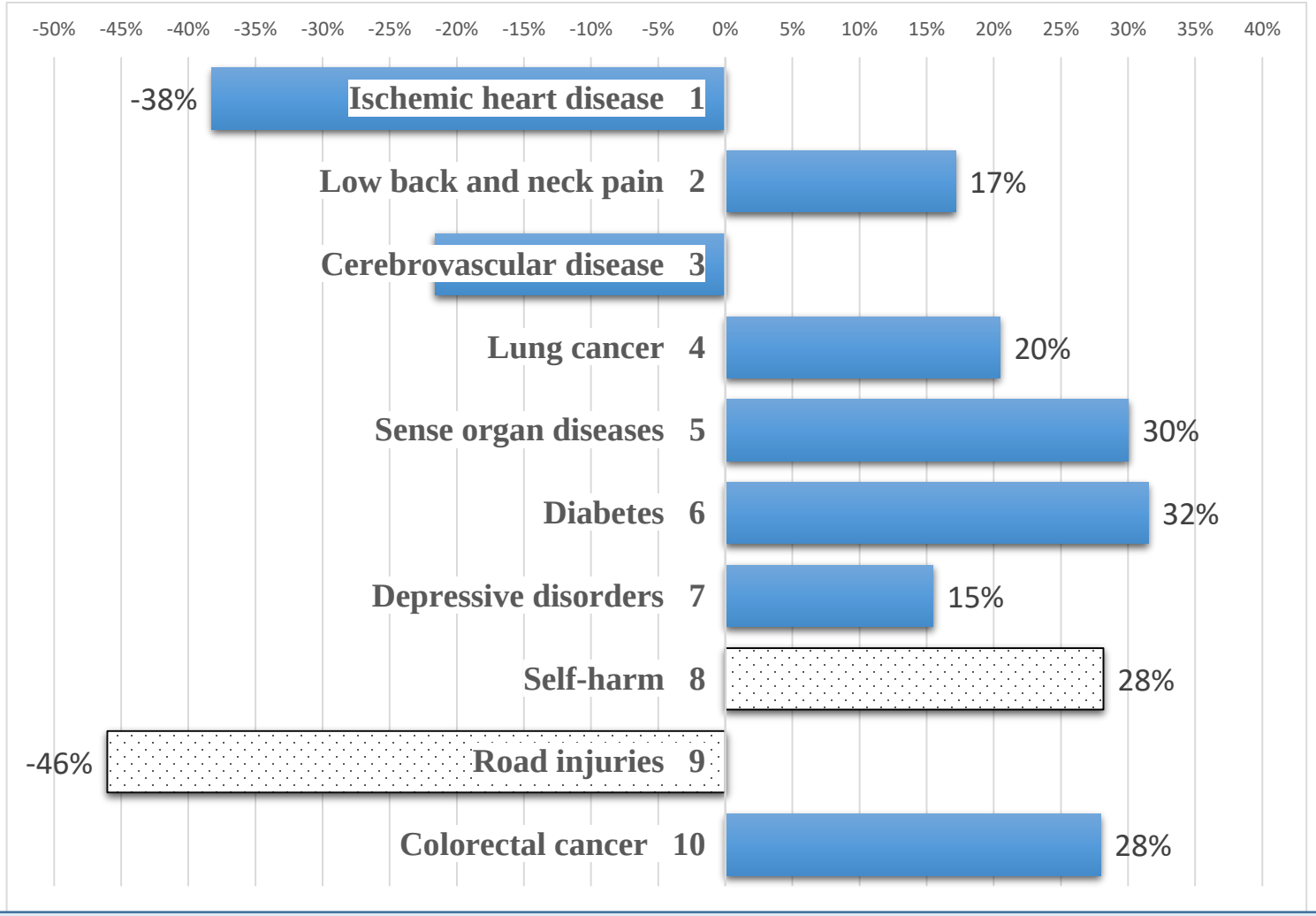
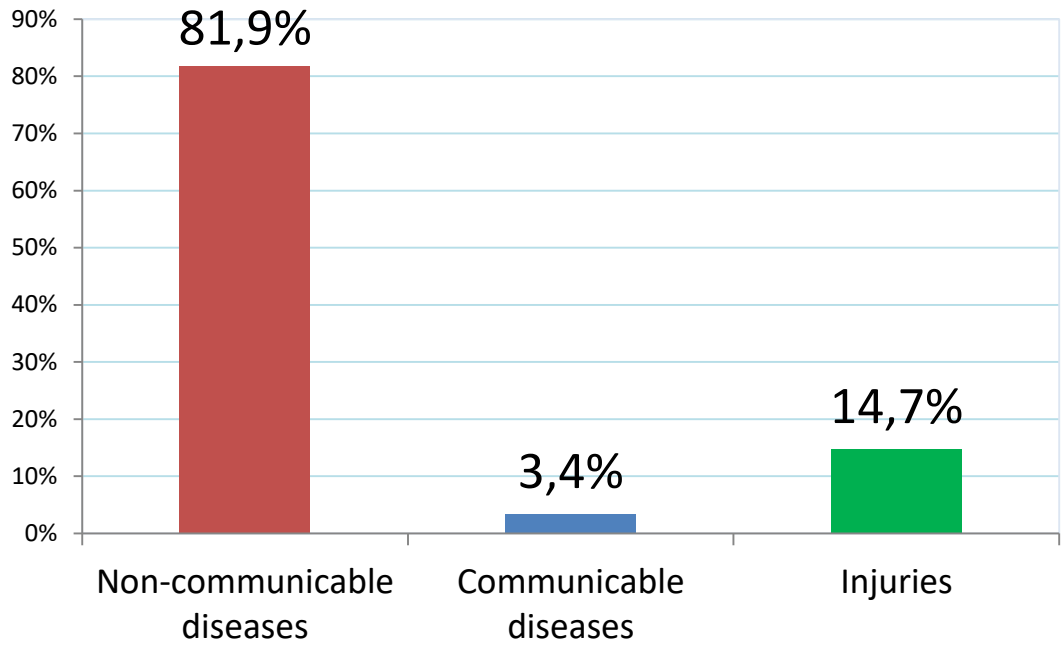
Leading causes of DALYs in Poland, 2015 and percent change, 1990-2015 (based on GBD-2015 estimates, IHME)



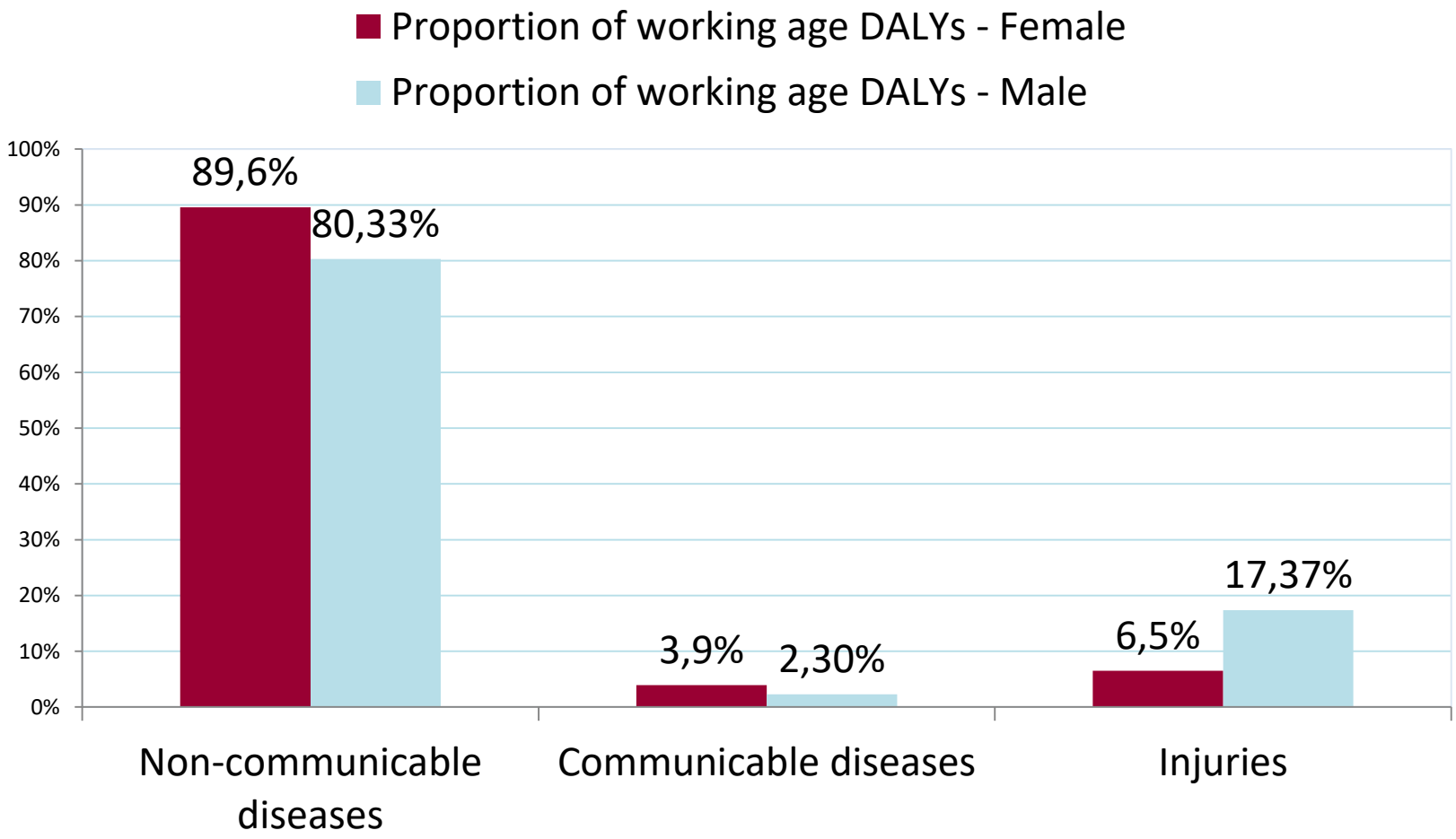
Eight out of the ten leading causes of death and disability combined in Poland 2015 were NCDs

Burden of diseases on the working age population (between 15-60 years of life) – Poland 2015

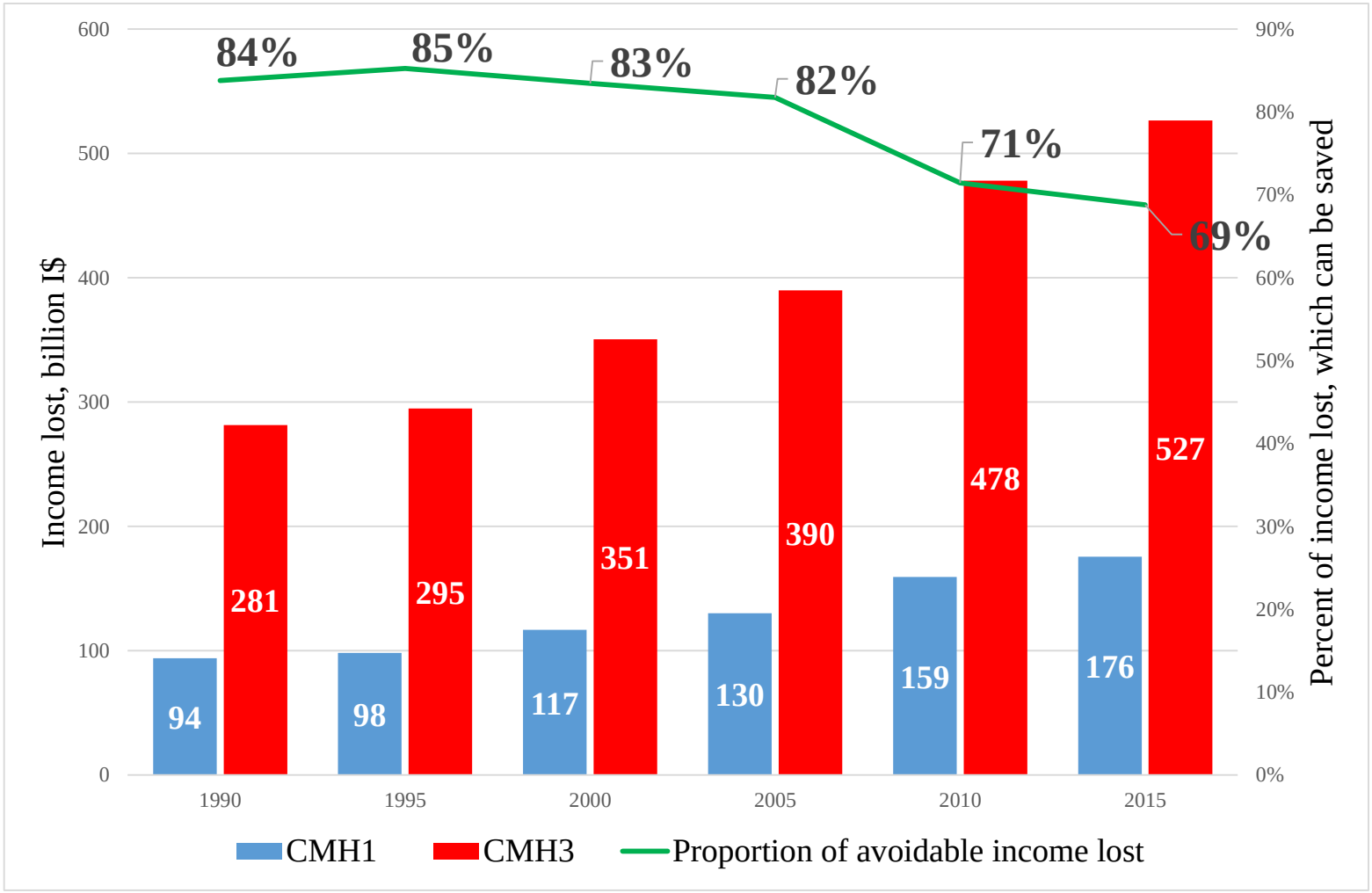


- Although the share of non-communicable diseases in the overall burden of disease varied in countries with different income levels, it was prevailing everywhere.
- In *High-Income Countries* as in Poland 82% of DALYs in the working age population are due to chronic non-communicable diseases.

Distribution of working-age DALYs results for Poland in 2015 **adopting the working age range for women of 18-59 and for men of 18-64.**



Total and **avoidable** income loss due to YLLs in Poland, all causes, both sex groups (in billion I$, 2015 prices) – WHO CMH1 and CMH3 methods



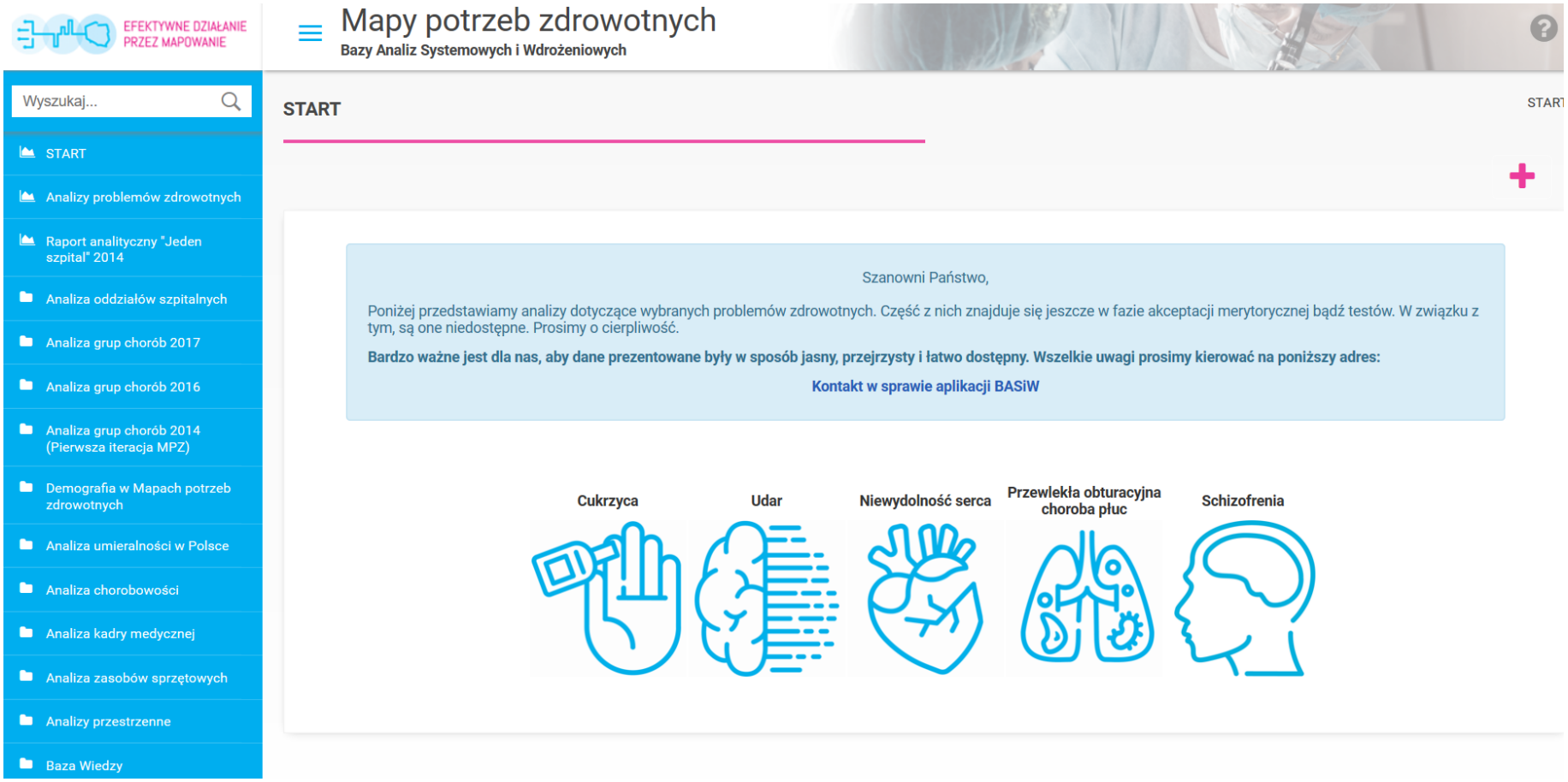
Data sources: GBD 2015 Results, World Bank, World Development Indicators, GDP per capita PPP (current international $), World Bank, World Development Indicators, GDP deflators, and World Bank, World Development Indicators, PPP conversion factor, GDP (Local Currency Unit per international $), International Comparison Program database

Four stages cont'd

- Poland has implemented the subnational burden of diseases study in GBD-2019 round (for 16 voivodeships),
- data sources from Poland included in the GBD: individual claims data from National Health (Insurance) Fund; number of deaths by cause, age, sex – for each voivodeship up to 2017; census data and demography data (up to 2017) etc.
- Results from subnational burden of diseases study will support development of new **Regional Health Needs Maps** – used in the process of purchasing health services by Regional Health Funds and for designing health prevention programmes:

Health needs maping

https://basiw.mz.gov.pl/index.html#/visualization



Conclusions:

- Polish example illustrates how the national burden of disease studies can be performed for national evidence-based policy making employing all available and acceptable data sources.
- GBD methodology is constantly being changed, data sources and locations - increased.
- This avoids comparability of results from different rounds of estimates.
- It is crucial to adapt the GBD methods for national diseases burden assessment.

Recommendation: at national or sub-national level when using DALY indicator as an intervention impact measure:

- It is crucial to keep methods stable during the evaluation period and use, where possible national data sources such as:
  - Mortality
  - Prevalence
  - National Life Expectancies
  - Average population number
- Collaboration with IHME (GBD study global leader), EBoD Network (Both COST and WHO) for:
  - Garbage Codes Mortality causes redistribution
  - YLDs calculation – health states distributions (produced by IHME) for average disability weights calculation.