Course EPI302: Introduction to Health Care Epidemiology

Lab 5 - The Swiss Diabetes Cohort Study

Second part of Lab (60 min):

In this Lab you receive more information from the Swiss Diabetes Cohort Study.

Lab tasks

- Read the background text to the Swiss Diabetes Cohort below.

Background

The national research program of the Swiss National Science Foundation

The Swiss National Science Foundation (SNSF) funded a national research program (NRP) to investigate the effects of a tailored treatment protocol for Diabetes patients, in combination with specialized training of general practitioners (GP) and medical practice assistants (MPA), on patient and health care system outcomes. The SNSF mandated you for the evaluation of this NRP.

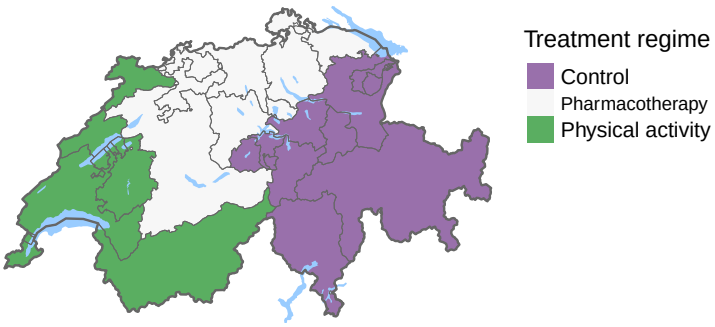
Intervention: The main intervention of the NRP was a treatment protocol which aimed to support the GPs and the patients in their shared-decision making process. The treatment protocol 1) highlighted the importance of at least three GP visits per year - as recommended by the Swiss Society of Endocrinology and Diabetology (SSED) guidelines - 2) recommended smoking reduction according to the general public health advice, and 3) promoted either a more physical active lifestyle or an intensified pharmacotherapy treatment, depending on the living region (see map below):

1) In the French speaking cantons of Switzerland, GPs and MPAs received a specialized training on physical activity,
2) In the "Middle" part of Switzerland, GPs and MPAs were sensitized and informed about the positive effects of pharmacotherapy use,
3) The "Eastern" part of Switzerland served as a control group which did not receive the treatment protocol.

Patients in the treatment regions received either: 1) A specialized program and motivational tips for physical activity, or 2) an intensified treatment with Metformin.

The research questions of the project were:

1) What are the positive and negative effects of the treatment protocol related to access and delivery of Diabetes care?
2) How does the intervention affect individual and population health?
3) How does the intervention affect health care system outcomes and variation in Diabetes care?



SSED recommendations for good Diabetes management in primary care

In the previous Labs we used the SSED guidelines for 'good Diabetes management in primary care'[1]. The SSED constructed an overall score of the sum of

- HBA1C level <53 mmol/mol: 12 points,
- HBA1C level <64 mmol/mol: 8 points,
- HBA1C level <75 mmol/mol. 5 points,
- 3 general practictioner visits per year: 10 points,
- Lifestyle recommendation physical activity: 5 points,
- Lifestyle recommendation smoking: 5 points,

i.e. a score ranging from 0 to 45 points, with a higher score indicating better Diabetes management.

Comoborbidites

The following comorbidities were assessed for each patient at each GP visit:

- Photocoangulation,
- Microalbuminuria,
- Gastrointestinal adverse effects,
- Stroke,
- Myocardial infarction (MI).

The sum of all present comorbidities was calculated. The presence of either stroke or MI was classified as a cardiovascular disease (CVD). The occurence of a CVD leads to an inpatient hospital admission). The treatment of photocoangulation, microalbuminuria and gastrointestinal adverse effects is possible in outpatient centers.

Follow-up information

The Swiss Federal Statistical Office confirmed that follow-up information is complete. For example, they validated death records with municipality registers, or the hospital admissions were validated by GP records and hospital admission records.

Costs and affordability

The costs for one GP visit of a Diabetes patient (without special laboratory measurement) were estimated at 80 Swiss Francs (CHF). GPs received a specialised training for the migration program (i.e. specialised counselling based on cultural background) in the canton Zurich and Ticino with costs of 150 CHF per visit

[1] www.sgedssed.ch/informationen-fuer-fachpersonen/ressourcen-fuer-hausarztmedizin-und-medizinische-grundversorgung/

(i.e. on average 70 CHF higher than a common GP visit). A daily dose of Metformin costs roughly 0.52 CHF. The daily costs for physical activity was estimated at 0.02 CHF. A photocoangulation laser outpatient surgery costs 10,293 CHF, yearly costs for treating albuminuria 3,546 CHF, inpatient treatment of an MI 37,964 CHF and the inpatient treatment of a stroke 50,273 CHF.

At each GP visit a patient was asked whether she or he 'Can you afford your health care spendings?' with a yes/no answer.

Health-related quality of life and quality-adjusted life years

Health-related quality of life (HRQOL) was introduced in Lab 4. In brief, HRQOL is assessed by the EQ-5D instrument and standardized to a 0 to 1 score with a higher score indicating better health (0 equals death, 1 equals perfect health).

'Quality-adjusted life years' (QALY) is a commonly used measure to quantify health gain or loss in a single measure[2]. In the Swiss Diabetes Cohort Study, for example, individuals were under investigation for 10 years, i.e. years 2002 to 2012. If an individual reported each year a HRQOL of 1 (i.e. perfect health), she or he has 10 QALY (i.e. 1 HRQOL $\times$ 10 years). Another individual which reported a HRQOL of 0.7 for the first three years (i.e. living in a less than perfect health status for 3 years), then a 0.8 for the next two years and then died in the consequent year has 3.7 QALY (i.e. 0.7 HRQOL $\times$ 3 years + 0.8 HRQOL $\times$ 2 years + 0 HRQOL, because of death). For the second individual one could say that she or he lost 1.3 years of life due to decreased life quality, compared to an individual with similar characteristics (say, age and sex), but who reported 'perfect health' and died at the same time point as the second individual. This individual would have 5 QALY and the difference to the second individuals is 1.3 QALY.

Accessability

In Lab 4 we introduced the cantonal hospital density per 100,000 inhabitants. In Lab 6 we will introduce the concept of accessability. In brief, for each cantonal border we constructed a 10km buffer and counted how many hospitals are accessable within this buffer zone (i.e. how many hospitals are accessable when the cantonal border is extended by 10km). We then calculated a hospital density within this 10km buffer zone for each canton per 100,000 inhabitants.

Codebook

Variables in alphabetic order.

- **afford_0**: 'Can you afford your health care spendings?' in 2002 (0: No, 1: Yes),
- **afford_9**: 'Can you afford your health care spendings?' in 2012 (0: No, 1: Yes),
- **age65_0**: Age category in 2002 (0: $<$ 65 years, 1: $\geq$ 65 years),
- **canton_0**: Cantons (1-26),
- **comorb1_0**: Presence of comorbitidies in 2002 (0: No, 1: Yes),
- **comorb1_9**: Presence of comorbitidies in 2012 (0: No, 1: Yes),
- **cpq**: Costs per QALY from 2002 to 2012 (>=0 CHF/QALY),
- **cumcosttotal**: Total cumulative costs from 2002 to 2012 (>=0 CHF),
- **cvd**: Presence of CVD within 2002 to 2012 (0: No, 1: Yes),
- **death**: Death within 2002 to 2012 (0: No, 1: Yes),
- **educ_0**: Highest attained education (1: Compulsory, 2: Secondary, 3: Tertiary),
- **female_0**: Sex (0: Men, 1: Female),
- **gastroad_0**: Presence of gastrointestinal adverse effects in 2002 (0: No, 1: Yes),

[2]Drummond MF et al.: *Methods for the Economic Evaluation of Health Care Programmes*. 4th Edition. 2015. Oxford University Press. ISBN: 978-0-19-966588-4.

- **gastroad_9**: Presence of gastrointestinal adverse effects in 2012 (0: No, 1: Yes),
- **gpdens_0**: Cantonal GP density in 2002 (number of GP per 100,000 inhabitants, per canton),
- **gpdenscat_0**: GP density above Swiss average in 2002 (0: No, 1: Yes),
- **hosp**: Number of inpatient hospital admissions from 2002 to 2012 (≥ 0),
- **hospdens_0**: Cantonal hospital density in 2002 (number of hospitals per 100,000 inhabitants, per canton),
- **hospdenscat_0**: Hospital density above Swiss average in 2002 (0: No, 1: Yes),
- **hosp10kmdens_0**: Cantonal (+ 10km buffer) hospital density in 2002 (number of hospitals per 100,000 inhabitants, per canton),
- **hosp10kmdenscat_0**: Cantonal (+ 10km buffer) hospital density above Swiss average in 2002 (0: No, 1: Yes),
- **hl_0**: Good health literacy in 2002 (0: No, 1: Yes),
- **hl_9**: Good health literacy in 2012 (0: No, 1: Yes),
- **hrqol_0**: Health-related quality of life in 2002 (0-1),
- **hrqolcat_0**: Health-related quality of life rated as 'high' (i.e. $\geq$ 75%-quantile) 2002 (0: No, 1: Yes),
- **hrqol_9**: Health-related quality of life in 2012 (0-1),
- **hrqolcat_9**: Health-related quality of life rated as 'high' (i.e. $\geq$ 75%-quantile) 2012 (0: No, 1: Yes),
- **intgroup_0**: Treatment regime group from the SNSF (1: Control group (Eastern part), 2: Pharmacotherapy (Middle part), 3: Physical activity (French part)),
- **langreg_0**: Language region (1: German, 2: French, 3: Italian),
- **metformin_0**: Metformin used as pharmacotherapy in 2002 (0: No, 1: Yes),
- **metformin_9**: Metformin used as pharmacotherapy in 2012 (0: No, 1: Yes),
- **mig_0**: Migration background (0: No, 1: Yes),
- **migprog_0**: Participant of migration health literacy program (0: No, 1: Yes),
- **obstime**: Years at risk (0-10 years),
- **pa_0**: Physical activity in 2002 (0: Low physical activity, 1: Moderate to high physical activity),
- **pa_9**: Physical activity in 2012 (0: Low physical activity, 1: Moderate to high physical activity),
- **proage_0**: Intervention group in health behavioral trial (0: No, 1: Yes),
- **qaly**: Quality-adjusted life years from 2002 to 2012 (0-10 years),
- **smok_0**: Smoking status in 2002 (0: Non-smoker, 1: Smoker),
- **smok_9**: Smoking status in 2012 (0: Non-smoker, 1: Smoker),
- **ssedhba1ccat1_0**: Achieved HBA1C levels <53 mmol/mol in 2002 (0: No, 1: Yes),
- **ssedhba1ccat2_0**: Achieved HBA1C levels <64 mmol/mol in 2002 (0: No, 1: Yes),
- **ssedhba1ccat3_0**: Achieved HBA1C levels <75 mmol/mol in 2002 (0: No, 1: Yes),
- **ssedhba1ccat1_9**: Achieved HBA1C levels <53 mmol/mol in 2012 (0: No, 1: Yes),
- **ssedhba1ccat2_9**: Achieved HBA1C levels <64 mmol/mol in 2012 (0: No, 1: Yes),
- **ssedhba1ccat3_9**: Achieved HBA1C levels <75 mmol/mol in 2012 (0: No, 1: Yes),
- **ssedscore_0**: SSED 'good Diabetes management in primary care' score in 2002 (0-45 points),
- **ssedscore_9**: SSED 'good Diabetes management in primary care' score in 2012 (0-45 points),
- **visits3_0**: Achieved 3 GP visits in 2002 (0: No, 1: Yes),
- **visits3_9**: Achieved 3 GP visits in 2012 (0: No, 1: Yes).

Note: All variables measured in 2012 may have missing values due to patients who died.

Dataset

The dataset 'SDC_III.csv'

```
datafile <- "SDC_III.csv"
# Example path for MacOSX: path <- "~/Desktop/"
databl <- read.csv2(paste(path, datafile, sep=""))
```

contains 102949 records and 50 variables:

```r
names(databl)
```

```
##  [1] "afford_0"          "afford_9"          "age65_0"
##  [4] "canton_0"          "comorb1_0"         "comorb1_9"
##  [7] "cpq"               "cumcosttotal"      "cvd"
## [10] "death"             "educ_0"            "female_0"
## [13] "gastroad_0"        "gastroad_9"        "gpdens_0"
## [16] "gpdenscat_0"       "hl_0"              "hl_9"
## [19] "hosp"              "hosp10kmdens_0"    "hosp10kmdenscat_0"
## [22] "hospdens_0"        "hospdenscat_0"     "hrqol_0"
## [25] "hrqol_9"           "hrqolcat_0"        "hrqolcat_9"
## [28] "intgroup_0"        "langreg_0"         "metformin_0"
## [31] "metformin_9"       "mig_0"             "migprog_0"
## [34] "obstime"           "pa_0"              "pa_9"
## [37] "proage_0"          "qaly"              "smok_0"
## [40] "smok_9"            "ssedhba1ccat1_0"   "ssedhba1ccat1_9"
## [43] "ssedhba1ccat2_0"   "ssedhba1ccat2_9"   "ssedhba1ccat3_0"
## [46] "ssedhba1ccat3_9"   "ssedscore_0"       "ssedscore_9"
## [49] "visits3_0"         "visits3_9"
```