FRESHER PROJECT

Cost-of-Illness Analysis for ESTONIA

Technical Report

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CONTENTS

1. General overview

This document presents the method and data used to perform the Cost-of-Illness (COI) analysis for Estonia within the FRESHER project. The goal is to compute incremental cost for ten non-comunicable diseases (NCD) as defined in table 1 by ICD-10 classification: Stroke, Heart Disease, Cancer, Diabetes (type 1 and 2), Chronic Kidney Disease (CKD), Chronic Obstructive Coronary Disease (COPD), Cirrhosis, Alcohol Use Disorder (AUD), Depression and Neurological Disorder (see table 1 for a definition).

Individual health care (HC) cost in Estonia can be defined as the sum of :

i. **Reimbursement cost from health insurance**
   Econometric analysis of reimbursed cost was performed on 2013 claim file of Estonian Health Insurance Found (EHIF). This dataset was provided by Taavi Lai.
ii. **Capitation payments**
   Capitation is introduced at individual level by computing an « implicit » cost of one visit to GP.
iii. **Prescribed medicines**
   No individual data on pharmaceutical consumption was available. Correction factor was applied over all bills recorded in EHIF claim file to inflate spendings with medicines expenditures found at macro level.
iv. **Out-of-pocket payments (OOP)**
   No individual data on OOP was available. Correction factor was applied over all bills recorded in EHIF claim file to inflate spendings with OOP expenditures found at macro level.

The econometric model specification for reimbursement cost follows the method described in reports by Cortaredona and Ventelou (2017) and Goryakin (2017). The method is adjusted to Estonian health care system and EHIF dataset characteristics as described below.

Table 1: List of disease groups and assigned ICD-10 codes used in COI analysis for Estonia

Disease group	Disease	ICD-10 codes
1. Stroke	Acute haemorrhagic stroke	I60 Subarachnoid haemorrhage I61 Intracerebral haemorrhage
	Acute ischemic stroke	I63 Cerebral infarction
	Chronic stroke (any type)	I69 Sequelae of cerebrovascular disease
2. Heart disease	Acute myocardial infarction	I21 Acute myocardial infarction I22 Subsequent myocardial infarction
	Chronic ischaemic heart disease	I20 Angina pectoris I23 Certain current complications following acute myocardial infarction I25 Chronic ischaemic heart disease
3. Cancer	Stomach	C16 Malignant neoplasm of stomach
	Colorectal	C18 Malignant neoplasm of colon C19 Malignant neoplasm of rectosigmoid junction C20 Malignant neoplasm of rectum C21 Malignant neoplasm of anus and anal canal
	Lung	C33 Malignant neoplasm of trachea C34 Malignant neoplasm of bronchus and lung
	Liver	C22 Malignant neoplasm of liver and intrahepatic bile ducts
	Breast	C50 Malignant neoplasm of breast
4. Diabetes		E10-E14 Diabetes mellitus
5. CKD*		N18 Chronic kidney disease
6. COPD**		J41 Simple and mucopurulent chronic bronchitis J42 Unspecified chronic bronchitis J43 Emphysema J44 Other chronic obstructive pulmonary disease J47 Bronchiectasis
7. Cirrhosis		I85 Oesophageal varices K70-K77 Diseases of liver
8. Alcohol use disorders		F10 Alcohol related disorders
9. Depression		F32 Depressive episode F33 Recurrent depressive disorder
10. Neurologic disorders		F00-F03, G30-G31

* : Chronic Kidney Disease
** : Chronic Obstructive Pulmonary Disease

2. EHIF claim file and Health Care System in Estonia

Population Representativity

In Estonia, 95% of the population (1.25 million people) is covered by a mandatory public insurance (EHIF) while private insurance is almost nonexistent. Analysis and data presented in this document are based on exhaustive 2013 EHIF claim file. This confers to our dataset 100% representativity of health care users, or of reimbursement cost (and 95% representativeness of the general population).

Cost Representativity

In 2013 overall expenditure in health accounted for 1.14 billion euros, or 6.0% of Estonian GDP. EHIF is the main purchaser of health care (HC) in Estonia and the public share of HC spending represented 76.2% of total health expenditure in 2013. According to National health accounts (table 2), EHIF expenses represented 65.5% of total HC expenses in 2013 where EHIF claims file represents 43 points of percentage of this total, or 490 739 914 euros (table 8).

Out-of-pocket (OOP) and prescribed medicines cost are not included in EHIF claim file but we know their relative size at macro level. OOP represented 22% of total health expenditure, mainly in form of co-payment for medicines and dental care (table 3).

Capitation

One particularity of Estonian HC system financing scheme is the capitation payement for primary care. Primary care budget is a mix of capitation payment, fee-for-service for tests and lab expenses, basic allowance and quality bonus scheme. Estonian capitation is a GP's payment mechanism in which every patient is assigned to a physician, or a group of medical practitioners : for each patient, practitioners receive a set amount of remuneration per period of time, whether or not the enrolled patients request care during the period considered. In Estonia capitation is paid once a year by EHIF to every GP on the basis of age structure of the GP's clientele. This remuneration is determined by the person's average expected health care costs : older patients with high health care needs imply greater payments. Capitation cost are not included in EHIF claim file but an implicit cost per visit can be computed using table 4 to correct at individual level.

Comparativeness of Health Insurance Systems

The public health insurance is financed through a solidarity-based mandatory contributions in the form of an earmarked social payroll tax collected by EHIF, an independent public institution. In this respect, Estonian and French HC system are similar.

Like in France, hospitals are owned and managed as public institutions. Costs are assigned using diagnosis-related groups (DRGs) system, fee-for-service payments and payments related to bed-days. Pharmaceutical products are sold by privately owned pharmacies.

Thus taxation and redistribution policy simulation could be performed similarly for both countries. For example, as an extension of the microsimulation tool, an economic model could be designed to study the impact of a change in reimbursement rate on OOP, a change of tax rate on labour particpation, on wages, on health, on wealth or even on people's welfare.

The only difference between both system is the capitation system for primary care. But like in France, Estonian family doctors are independent and primary care doctors are gatekeepers for secondary care, while some specialists can be accessed directly.

Table 2: Estonian health expenditure in 2013 by health care function and financing scheme (Thousands Euros)

	TOTAL EXPENDITURE (HF.1-HF.4)	GOVERNMENT SCHEMES (HF.1)	Government schemes (HF.1.1)	Central government schemes (HF.1.1.1)	Local government schemes (HF.1.1.2)	Estonian Health Insurance Fund (HF.1.2.1)	VOLUNTARY HEALTH CARE PAYMENT SCHEMES (HF.2)	HOUSEHOLDS' OUT-OF-POCKET PAYMENT (HF.3)	REST OF THE WORLD FINANCING SCHEMES (HF.4)
Total expenditure by health care function (HC.1-HC.7)	1 138 893	868 339	122 566	108 988	13 578	745 773	19 650	252 103	192
%		**76,2%**				**65,5%**	**1,7%**	**22,1%**	
CURATIVE CARE (HC.1)	628 416	520 341	29 828	26 165	3 663	490 514	2 039	106 035	0
Inpatient curative care (HC.1.1)	275 911	270 970	5 354	4 400	954	265 615	1 554	3 388	0
Day curative care (HC.1.2)	23 260	22 069	3	3	0	22 066	13	1 177	0
Outpatient curative care (HC.1.3)	327 789	225 929	24 470	21 762	2 709	201 458	472	101 388	0
General outpatient curative care (HC.1.3.1)	157 033	154 966	5 079	2 371	2 709	149 886	420	1 647	0
Dental outpatient curative care (HC.1.3.2)	98 911	28 009	127	127	0	27 882	44	70 857	0
Specialised outpatient curative care (HC.1.3.3)	71 846	42 954	19 264	19 264	0	23 690	8	28 884	0
Home-based curative care (HC.1.4)	1 455	1 374	0	0	0	1 374	0	81	0
REHABILITATIVE CARE (HC.2)	20 975	12 504	1 302	1 302	0	11 202	194	8 276	0
Inpatient rehabilitative care (HC.2.1)	7 367	7 056	1 139	1 139	0	5 917	18	293	0
Day rehabilitative care (HC.2.2)	0	0	0	0	0	0	0	0	0
Outpatient rehabilitative care (HC.2.3)	13 607	5 449	163	163	0	5 285	176	7 983	0
Home-based rehabilitative care (HC.2.4)	0	0	0	0	0	0	0	0	0
LONG-TERM CARE (HEALTH) (HC.3)	57 216	39 582	19 311	13 769	5 541	20 271	25	17 608	0
Inpatient long-term care (health) (HC.3.1)	52 116	35 250	19 155	13 614	5 541	16 095	5	16 861	0
Day long-term care (health) (HC.3.2)	335	335	0	0	0	335	0	0	0
Outpatient long-term care (health) (HC.3.3)	157	156	156	156	0	0	0	1	0
Home-based long-term care (health) (HC.3.4)	4 607	3 842	0	0	0	3 842	20	746	0
ANCILLARY SERVICES (NON-SPECIFIED BY FUNCTION) (HC.4)	116 499	116 204	29 409	29 409	0	86 795	60	236	0
Laboratory services (HC.4.1)	51 609	51 345	347	347	0	50 998	28	236	0
Imaging services (HC.4.2)	35 208	35 205	157	157	0	35 048	2	0	0
Patient transportation (HC.4.3)	29 683	29 653	28 905	28 905	0	749	29	0	0
MEDICAL GOODS (NON-SPECIFIED BY FUNCTION) (HC.5)	261 064	140 983	19 865	18 987	878	121 718	503	119 947	21
Pharmaceuticals and other medical non-durable goods (HC.5.1)	223 714	122 410	3 598	3 352	246	118 812	490	101 784	21
Prescribed medicines (HC.5.1.1)	166 644	113 180	387	387	0	112 793	4	53 851	0
Over-the-counter medicines (HC.5.1.2)	45 409	1 454	1 454	1 308	147	0	487	43 468	0
Other medical non-durable goods (HC.5.1.3)	11 661	7 776	1 757	1 657	99	6 019	0	3 865	21
Therapeutic appliances and other medical goods (HC.5.2)	37 349	18 574	16 268	15 635	632	2 306	12	18 763	0
Glasses and other vision products (HC.5.2.1)	17 322	436	417	379	39	19	6	16 879	0
Hearing aids (HC.5.2.2)	15 527	15 171	15 171	15 041	130	0	0	356	0
Other orthopaedic appliances and prosthetics (HC.5.2.3)	13 417	12 463	10 753	10 435	317	1 710	2	953	0
All other medical durables, including medical technical devices (HC.5.2.9	5 083	4 504	3 927	3 780	146	577	4	575	0
PREVENTIVE CARE (HC.6)	33 888	17 138	9 202	9 202	0	7 936	167	50	0

Source : EHIF / Estonian Institute for Health Development, 2013

Table 3: OOP by type of service as percentage of total OOP expenditure in 2013

	TOTAL EXPENDITURE (HF.1-HF.4)	EHIF Compensated (HF.1.2.1)	HOUSEHOLD OUT-OF-POCKET PAYMENT (HF.3)	% OOP paid by HOUSEHOLDS	% contribution of care type on all OOP
Pharmaceuticals and other medical non-durable goods (HC.5.1)	223 714	118 812	101 184	45,2%	40,1%
Prescribed medicines (HC.5.1.1)	166 644	112 793	53 851	32,3%	21,4%
Over-the-counter medicines (HC.5.1.2)	45 409	0	43 468	95,7%	17,2%
Other medical non-durable goods (HC.5.1.3)	11 661	6 019	3 865	33,1%	1,5%
Dental outpatient curative care (HC.1.3.2)	98 911	27 882	70 857	71,6%	28,1%
Specialised outpatient curative care (HC.1.3.3)	71 846	23 690	28 884	40,2%	11,5%
Long-Term Care (HC.3)	57 216	20 271	17 608	30,8%	7,0%
Glasses and other vision products (HC.5.2.1)	17 322	19	16 879	97,4%	6,7%
Outpatient rehabilitative care (HC.2.3)	13 607	5 285	7 983	58,7%	3,2%
Others	656 277	549 813	8 708	1,3%	3,5%

Source : EHIF / Estonian Institute for Health Development, 2013

Table 4: EHIF Primary care budget 2013, thousands of euros

	Spendings in thousands of euro	Share in %
Base funding (Basic allowance)	9 037	12%
Distance compensation	486	1%
Additional payment for second nurse	1 830	2%
Capitation total	47 439	62%
Capitation, <3y olds	2 729	4%
Capitation, 3-6y olds	3 082	4%
Capitation, 7-49y	19 893	26%
Capitation 50-69y	12 741	17%
Capitation, >=70y	8 994	12%
Lab test fund (FFS)	15 336	20%
Quality bonus	1 246	2%
Family medicine hotline (national)	714	1%
Primary care reserve	0	0%
Total	76 088	100%

Source : EHIF, 2013

Table 5: Payment mechanisms by type of care in Estonia

Care Type	Payment mechanism
Primary care	No co-payment for office visits (capitation) Home visit fee (up to €5); children under 2 years and pregnant women after week 12 of gestation are exempted
Outpatient specialists (contracted by EHIF)	Co-payment of up to €5; children under 2 years and pregnant women after week 12 of gestation are exempted
Outpatient specialists (not contracted by EHIF)	All patients charged according to provider established pricelist, but up to the "reasonable" cost
Dental care	No co-payment for child dental care, covered by EHIF Adult dental care not covered by EHIF
Inpatient care	Co-payment of up to €2.5/day, for up to 10 days per episode of illness; children, pregnant women and patients in intensive care units exempted Co-payment established by providers for above-standard accommodation Co-insurance for specific services (such as in vitro fertilization, rehabilitation, voluntary termination of pregnancy) set out by EHIF Co-insurance of 15% for nursing care
Pharmaceuticals	Prescription medicines for chronic diseases: co-payment of €1.27 plus co-insurance of 0% or 25% of the drug price (or 10% for those aged 4–6, receiving disability or old age pensions, or older than 63) Prescription medicines for those younger than 4 years, only co-payment of €1.17 General prescription medicines: co-payment of €3.19 per prescription, plus co-insurance of at least 50% of the drug reference price Annual spending: outpatient prescription medicine expenditure is eligible for additional reimbursement at 50% (yearly expenditures €384–640), 75% (€640–1300), 0% (>€1300)

Source : WHO, 2015

3. Data Characteristics

General characteristics

The dataset is an extract from EHIF discharge database, it contains all reimbursement costs for primary care, specialists, hospital stays and rehabilitation claimed to EHIF by each Estonian people who have used the HC system during the year 2013. The data does not furnish any information on pharmaceutical costs and does not contain neither OOP payment nor over the counter expenses.

A total of 9 912 363 observations (1 043 824 individuals) were recorded in the original database. Each observation corresponds to one of the multiple ICD10 codes recorded by each health professional at each visit (= 1 bill = many ICD10).

A total of 46 952 observations (= 25 656 individuals) had missing information on cost, age and sex. Given the size of the data, people with missing information were simply removed from the sample (around 2.5%).

After having purged for missing information, kept only people over 18 and removed long-term care (LTC) costs, **817 522 individuals** are available for analysis.
The age and sex structure of the population available for econometric analysis is given in table 6.

The dataset contains information on :

- Age in 2013
- Gender
- Diagnosis in form of ICD10 codes on four digits (e.g. for acute myocardial infarction: I21.0, I21.1, I21.2, I21.3 I21.4 I21.9)
- Diagnosis sequence that orders diagnoses according to care priority of medical visit or hospital stay
- Care type that distinguishes family medicine, specialist outpatient, inpatient and rehabilitation (in- and outpatient)
- Total reimbursed cost by EHIF for each given bill corresponding to one medical visit or one hospital stay
- Length of care episode
- Geographical indicators

Table 6: Age and sex structure of the population for analysis in EHIF claims file

Age Group	Male	Female
18-39	111 884	140 604
40-49	58 617	76 223
50-59	58 516	79 732
60-64	28 088	40 659
65-69	21 918	34 013
70-74	19 720	34 845
75-79	15 611	33 142
80-84	10 007	25 538
85-89	4 627	15 830
90+	1 374	6 574
TOTAL	330 362	487 160

Table 7: List of variables available in EHIF claims file

Variable	Definition
age	Age of the patient
sex	Sex of the patient
diagnosis	ICD10 code related to the medical act or procedure
dgn_seq	Hierarchisation of all ICD10 of the same bill (visit)
care_type	Type of care
reimb_cost	Total reimbursed cost by EHIF for a given bill (visit)
person_id	Unique individual identification number
bill_number	Unique visit or hospital stay identification number
bill_start	Issue date of the bill
bill_end	Ending date of the stay (relevant for inpatient)
county	County of issued bill
municipality	Municipality of issued bill
municip_code	Municipality administrative code

Bills and reimbursement costs in EHIF claim file

Total spendings reported in 2013 EHIF claim file are 490, 739, 914 Euros which represent 43% of total health expenses in Estonia for 2013.

The average bill amount is higher among men. Spendings are increasing with age in a non linear way. We may note as well that standard deviations for average bill amount are very large (table 8).

Inpatient is the highest expense accounting for half total reimbursed cost in 2013, followed by specialist outpatient accounting for 30% of reimbursement reported (table 8 and table 9). Family medicine accounts only for 3% in that claims file since capitation payments are not included.

Table 8: Total reimbursement costs in EHIF claims file, reported average bill amount and standard deviation, by age and sex (Euros)

	OVERALL		MALE		FEMALE	
Age Group	**SUM**	**Mean (SD)**	**SUM**	**Mean (SD)**	**SUM**	**Mean (SD)**
-18	43 856 333	46.76 (626.23)	23 376 128	47.46 (589.82)	20 480 205	45.98 (664.18)
18-39	78 238 616	69.63 (400.59)	29 747 802	69.93 (514.44)	48 490 814	69.45 (311.45)
40-49	48 714 907	71.46 (418.61)	21 199 758	82.30 (484.54)	27 515 149	64.87 (372.77)
50-59	70 766 217	81.70 (554.77)	33 664 516	105.70 (708.53)	37 101 701	67.75 (440.77)
60-64	45 552 117	94.64 (627.72)	22 932 248	127.65 (757.72)	22 619 869	74.99 (534.54)
65-69	43 987 108	100.84 (608.06)	22 327 978	139.15 (806.70)	21 659 130	78.54 (452.61)
70-74	50 366 395	107.78 (652.11)	23 542 385	145.00 (838.39)	26 824 010	87.96 (525.64)
75-79	48 493 492	109.50 (663.62)	19 642 763	143.50 (892.93)	28 850 729	94.29 (529.12)
80-84	34 683 659	108.47 (615.06)	12 379 173	135.79 (783.56)	22 304 486	97.57 (532.83)
85-89	19 323 673	112.84 (620.75)	5 386 706	132.75 (742.74)	13 936 967	106.66 (577.51)
90+	6 757 397	119.02 (487.58)	1 315 555	121.34 (558.85)	5 441 842	118.47 (469.19)
TOTAL	490 739 914	82.00 (560.78)	215 515 012	94.69 (669.38)	275 224 902	74.21 (482.01)

Table 9: Total reimbursement costs in EHIF claim file, by care type (Euros)

Age Group	1-day inpatient	Family medicine	Inpatient	Inpatient nursing care (LTC)	Inpatient rehabilitation	Outpatient nursing (LTC)	Outpatient rehabilitation	Specialist outpatient
-18	2 631 667	1 387 322	23 013 837	8 955	448 429	6 331	1 061 729	15 298 063
18-39	5 007 794	2 356 520	36 255 735	152 445	388 449	77 269	690 446	33 309 958
40-49	3 531 432	1 920 459	21 671 023	205 759	332 350	121 877	736 995	20 195 011
50-59	4 422 901	2 610 551	36 846 573	672 755	799 396	223 298	1 113 803	24 076 941
60-64	2 387 273	1 453 999	25 974 951	646 388	609 123	252 279	526 764	13 701 340
65-69	2 517 858	1 289 085	25 460 188	1 108 093	687 370	301 693	417 234	12 205 588
70-74	3 540 741	1 297 581	29 717 636	1 759 486	845 289	499 814	368 035	12 337 813
75-79	3 325 176	1 146 842	29 532 127	2 580 863	905 375	659 540	263 605	10 079 963
80-84	2 292 162	728 901	20 648 634	3 542 378	594 637	887 577	106 892	5 882 478
85-89	867 469	317 859	11 279 952	3 576 512	252 468	734 911	29 313	2 265 190
90+	161 628	78 217	3 571 364	2 038 820	54 307	372 342	2 908	477 811
TOTAL	30 686 101	14 587 336	263 972 019	16 292 455	5 917 194	4 136 930	5 317 724	149 830 156

Table 10: Mean and standard deviation of reimbursed bills in EHIF claims file, by care type

Age Group	1-day inpatient	Family medicine	Inpatient	Inpatient nursing care (LTC)	Inpatient rehabilitation	Outpatient nursing (LTC)	Outpatient rehabilitation	Specialist outpatient
-18	318.37 (292.46)	2.69 (8.09)	757.26 (3 152.57)	639.62 (257.55)	862.36 (256.55)	143.89 (113.68)	71.24 (57.26)	41.60 (359.91)
18-39	282.10 (444.04)	4.77 (11.34)	841.36 (1 492.07)	1 002.93 (727.85)	1 011.59 (939.85)	126.67 (87.94)	74.00 (65.45)	59.67 (303.05)
40-49	428.21 (554.90)	5.75 (12.80)	1 199.61 (2 031.14)	779.39 (573.83)	791.31 (522.41)	135.42 (88.97)	85.31 (68.54)	64.94 (228.55)
50-59	557.25 (701.58)	5.78 (12.95)	1 558.72 (2 849.19)	828.52 (627.59)	856.80 (569.87)	128.63 (81.52)	85.80 (67.61)	65.70 (187.85)
60-64	582.26 (646.89)	5.59 (12.64)	1 707.53 (2 974.86)	791.17 (587.53)	873.92 (596.68)	119.96 (80.52)	84.12 (64.75)	71.35 (218.52)
65-69	595.24 (661.78)	5.46 (12.41)	1 732.10 (2 714.65)	855.67 (583.81)	876.75 (566.30)	118.78 (70.93)	84.60 (67.34)	71.09 (197.49)
70-74	647.89 (655.74)	5.13 (11.77)	1 736.76 (2 832.94)	849.99 (577.33)	890.72 (580.48)	118.52 (70.85)	83.72 (67.42)	68.49 (187.09)
75-79	592.51 (546.01)	4.71 (11.16)	1 696.08 (2 806.38)	865.19 (583.16)	871.39 (558.17)	113.17 (76.97)	79.14 (63.90)	61.72 (162.73)
80-84	599.41 (549.58)	3.93 (10.14)	1 571.19 (2 498.70)	872.08 (570.75)	882.25 (538.71)	116.39 (79.29)	76.41 (70.38)	56.74 (140.87)
85-89	554.29 (450.18)	3.00 (8.63)	1 463.60 (2 420.55)	903.84 (568.93)	908.16 (524.46)	119.19 (75.23)	62.90 (55.82)	50.11 (119.14)
90+	516.38 (354.62)	2.07 (7.84)	1 284.66 (1 543.04)	950.06 (614.52)	936.33 (543.86)	117.68 (76.65)	51.92 (49.91)	45.45 (83.22)
ALL	455.89 (559.65)	4.68 (11.39)	1 298.76 (2 575.11)	877.26 (585.08)	878.44 (575.52)	118.42 (77.19)	79.73 (65.03)	60.66 (252.56)

4. Method to analyze Estonian data

4.1. Adjusting the methodology to the nature of the data

For harmonisation purpose, statistical methodology used for Estonia is very similar to the COI analysis made for France : it is a bottom-up approach, the main econometric model is a Log-Gamma model to estimate positive expenditures, and a residual-cost is computed to correct for cost of people with none of FRESHER-modeled NCDs.

Estonian data are different from French data in various ways and this has been taken into account to avoid estimation bias. The features to be adjusted for are :

No reimbursement

EHIF dataset is a claims file for reimbursement : only people who have used HC system during year 2013 are recorded in the dataset. Age and sex structure of population with no consumption over the year are to be found in national census. But we cannot know the health status of the non-consumers. The implicit assumption made here is that non-consumers are « healthy » (i.e. : they did not have any ICD10 recorded during the year 2013). This means that people with at least one ICD10 code recorded in 2013 all have had at least one use of HC system during the year.

Capitation

As noted in the first section, family doctors payment scheme in Estonia is regulated by a capitation system. A consequence is the lack of GP remuneration cost in EHIF claim file. Individual cost has been corrected by computing an implicit cost of GP's visit. Capitation payment from EHIF to GP is a function of age, sex and disease of clientele as it reflects the intensity of care use, just like does number of visits of each kind of patient. Family medicine total capitation EHIF budget was 47 439 000 Euros in 2013 (table 4) while people have been visting GPs 5 189 249 times in 2013 according to claim file. This leads to an implicit cost for one GP visit valued at 9.14 Euros, that was added to each bill for family medicine visits.

Diagnosis date

No information about the diagnosis date is available and therefore estimated costs are to be understood as average costs over the illness duration. However, the age variable in every model somehow already controls for the illness duration if we assume that onset of disease occurs at an average age.

Pharmaceutical cost

The claim file does not contain individual medication consumption. However EHIF accounts provides annual prescribed medicine cost compensated by EHIF : 112 793 thousands Euros in 2013. Knowing total EHIF claimed reimbursement from our dataset is equal to 490 740 thousands Euros, we compute a ratio of prescribed medicine as share of EHIF reimbursed cost : 112 793 / 490 740 = 0.23, or pharmaceuticals cost = 0.23 times observed reimbursed cost. We apply this factor to each bill amount to get individual prescribed medicine cost.

OOP

Table 3 presents distribution of OOP expenditure highlighting main components : prescribed and OTC medicines, dental care, specialists outpatient, LTC, glasses, and outpatient rehabilitation. OOP for prescribed medicines was differentiated by disease group according to table 11 : previously estimated prescribed medicine cost is multiplied by OOP/EHIF ratio according to NCD identified as main diagnosis for visit/stay using diagnosis sequence

variable. Other OOP components were not included (OTC, LTC, specialists, rehabilitation, glasses and dental care).

Table 11: EHIF prescribed medicines reimbursement and factor correction for OOP

ICD10 codes	Coresponding FRESHER modeled NCD	Total cost	EHIF compensated	Patient OOP	OOP/EHIF ratio
A00 - B99		5 909	4 358	1 551	0.356
C00 - D48	Cancer	15 376	14 714	662	0.045
D50 - D89		3 025	2 966	60	0.020
E00 - E90	Diabetes	26 080	21 771	4 309	0.198
F00 - F99	Depression, Neurologic Disorder and AUD	7 598	4 363	3 236	0.742
G00 - G99		10 683	9 320	1 363	0.146
H00 - H59		5 399	4 239	1 160	0.274
H60 - H95		1 108	428	680	1.589
I00 - I99	Stroke and HD	40 462	22 515	17 947	0.797
J00 - J99	COPD	13 695	9 256	4 439	0.480
K00 - K93	Cirrhosis	5 261	2 238	3 023	1.351
L00 - L99		4 929	2 993	1 936	0.647
M00 - M99		10 170	4 839	5 331	1.102
N00 - N99	CKD	7 245	3 209	4 036	1.258
O00 - O99		294	206	88	0.427
P00 - P96		43	42	1	0.024
Q00 - Q99		169	159	10	0.063
R00 - R99		710	305	404	1.325
S00 - T98		1 240	999	241	0.241
Z00 - Z99		7 247	3 873	3 374	0.871
V01 - Y98		2	1	1	1.000
Grand Total		166 644	112 793	53 851	0.477
Residual costs (Diseases not part of FREHSER)		50 928	34 728	16 200	0.466

Source : EHIF

4.2. Econometric strategy

Our econometric analysis aimed at estimating expected total reimbursed cost for each type and combination of FRESHER-modelled NCDs.

The total reimbursement cost reported in the data for patient i can be defined as the sum of $\widehat{cost}_{residual}$ a residual-cost that any person would generate over the year and $\hat{c}_{i|\sum D_j}$ the incremental cost properly inherent to $\sum D_j$ the sum of illnesses patient i suffers from. In order to isolate the proper cost for each disease we need to disentangle the residual-cost from the total cost generated by people with FRESHER-modelled NCD.

The econometric strategy is defined by four steps:

- Step 1 provides the extra cost of disease in sample of people with no model-defined comorbidities
- Step 2 provides the extra cost of disease in sample of people with at least one model-defined comorbidities
- Step 3 provides the joint cost of comorbidities, effects of NCDs interactions
- Step 4 provides the residual cost

A two-part model is used for step1 to step 3 :

$$E[Y/X] = Pr[Y > 0/X] \times E[Y/Y > 0, X]$$

where Y is the dependent variable of total reimbursement cost and X the set of explanatory variables.

The two-part model aims at quantifying the probability to have used the HC system over the year 2013 (part 1) and the expected amount of reimbursement (part 2). The cost is then the product of both parts. Part 1 is modeled by a Logit and part 2 with a Log-Gamma model.

Estimates from the first part gives smoothed proportion of people who did not used the HC system in 2013, knowing they had no NCD's recorded over the year. The sample is built from (1) 2013 national census to get the age and sex structure of people with no use of the HC system and (2) EHIF claims file (table 12). The probability is computed for each of the three steps presented below, with the same sample definition as for the positive part of spendings.

In order to offer some control for other NCD not in FRESHER list, the variable Other_ALD is built and is defined by the following vector of ICD10 codes according to ALD registry (see Cortaredona and Ventelou (2017) about ALD registry) :

```
Other_ALD <-
 c('A15','A16','A17','A18','A19','A30','B20','B21','B22','B23','B24','B65','B92','D46','D56','
 D57','D58','D59','D60','D61','D66','D67','D68','D69','D70','D80','D81','D82','D83','D84','E84
 ','G20','G21','G35','G82','I05','I06','I07','I08','I10','I15','I27','I34','I35','I36','I37','
 I42','I47','I48','I49','I50','I51','I65','I66','I67','I70','I71','I72','I73','I74','K50','K51
 ','K55','M05','M06','M07','M08','M30','M31','M32','M33','M34','M35','M41','M45','M46','Q20','
 Q21','Q22','Q23','Q24','Q25','Q26','Z20','Z21','Z94')
```

Step 1 : Cost estimates for people without comorbidity

We compare people with one given FRESHER-modeled NCD to people without any NCD (no FRESHER-modeled NCD and no NCD of the ALD registry).

For step 1, ten distinct models are estimated, one for each disease and the estimation is stratified on gender. It corresponds to the first approach designed for French case.

The following model is run on total individual expenses Y_i for each FRESHER-modeled NCD with $AGEcat$ as age covariate and D_{ij} a dichotomic variable taking value 1 iff individual i suffers from disease D_j, zero otherwise.

$$\ln Y_i = \alpha_0 + \alpha_1 AGEcat_i + \alpha_2 D_{ij} + \varepsilon_{iD_j}$$

$\hat{\alpha}_0$ is the estimated parameter for baseline reimbursed cost, $\hat{\alpha}_1$ is the estimated age effect on reimbursed cost and $\hat{\alpha}_2$ is the parameter estimate of extra cost for disease D_j, ε_{iD_j} are residuals.

Step 2 : Cost estimates for people with comorbidity

We compare costs for people with more than one FRESHER-modeled NCD to people with any other NCD (FRESHER-modeled NCD, or NCD of the ALD registry).
Econometric model for step 2 is exactly the same as for step 1, the only difference between both sets of model is the sample definition.

Step 3 : Interaction effect between diseases

Two-ways interactions effects are computed on the entire EHIF claims file population to capture crossed effects of comorbidities on cost. One only Log-Gamma model is estimated on the entire sample : dichotomic variables are introduced to control for each NCD proper effects and to estimate parameters for interactions between NCD's. Here intercept and age are common to the whole sample, they are not specific to one illness, or a combination of illnesses. This means that this model only produces the two-ways interactions between NCDs diseases, but with some control for the baseline cost (intercept) and for the age effects, and for the presence of other chronic disease not included into the NCDs 10-list.

$$\ln Y_i = \beta_0 + \beta_1 \cdot AGEcat_i + \sum_j \beta_j \cdot D_{i,j} + \sum_{j \neq k} \beta_{jk} \cdot D_{i,j} \cdot D_{i,k} + D_{i,OtherALD} + \varepsilon_i$$

Step 4 : Residual-cost

The residual-cost is the cost for people in EHIF data file in 2013 who did not have any FRESHER-modeled NCD. We compute the arithmetic mean spendings by age and gender from EHIF corrected dataset.

Table 12: Artificial population for first-part estimates of base-cost

	Population size from Statistics Estonia (national census)		Population size from EHIF data set		"Artificial" population with no HC system utilization (difference between national census and EHIF)	
Age class	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
-20	139 255	131 585	111 668	107 436	27 587	24 149
20-39	190 364	180 207	103 194	130 495	87 170	49 712
40-49	87 665	89 343	58 617	76 223	29 048	13 120
50-59	84 374	97 108	58 516	79 732	25 858	17 376
60-64	35 155	47 065	28 088	40 659	7 067	6 406
65-69	24 352	36 027	21 918	34 013	2 434	2 014
70-74	23 498	41 190	19 720	34 845	3 778	6 345
75-79	16 123	34 170	15 611	33 142	512	1 028
80-84	10 199	26 965	10 007	25 538	192	1 427
85+	5 182	20 347	6 001	22 404	0	0
TOTAL	616 167	704 007	433 340	584 487	183 646	121 577

5. Results

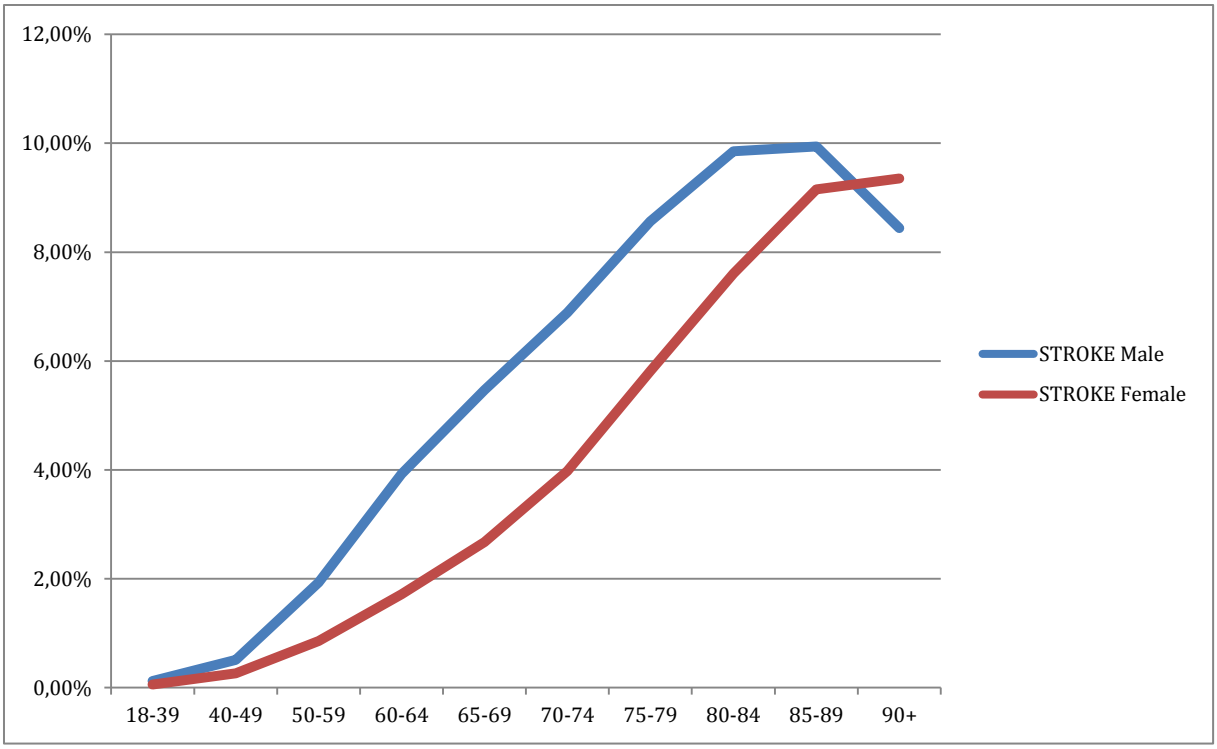
Prevalence

Table 13: Number of cases for each NCD identified in EHIF claim file, by age and gender

		18-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+
STROKE	Male	135	301	1 130	1 103	1 198	1 359	1 337	986	460	116
	Female	84	199	683	697	910	1 387	1 927	1 942	1 449	615
HD	Male	301	1 259	4 479	3 605	3 519	3 994	3 782	2 781	1 421	454
	Female	139	521	2 454	2 504	3 216	4 631	6 051	5 628	3 867	1 662
CANCER	Male	24	134	484	577	645	756	708	487	200	44
	Female	134	609	1 691	1 232	1 204	1 330	1 367	1 023	591	187
DIABETES	Male	1 239	2 345	5 788	4 045	3 693	3 127	2 536	1 464	591	154
	Female	956	1 657	5 513	5 347	5 630	6 167	6 288	4 598	2 378	690
CKD	Male	116	205	393	321	365	503	635	566	322	100
	Female	115	139	304	234	314	536	814	862	662	267
COPD	Male	551	822	2 061	1 626	1 436	1 629	1 445	961	423	103
	Female	494	856	1 931	1 341	1 203	1 437	1 348	1 021	627	248
CIRRHOSIS	Male	968	1 209	1 464	648	407	286	193	96	34	5
	Female	363	604	1 347	795	526	459	348	181	85	16
AUD	Male	1 981	1 765	1 882	656	389	229	113	29	6	0
	Female	426	441	506	217	106	80	41	14	6	1
DEPRESSION	Male	3 243	2 156	2 105	900	628	549	422	314	146	38
	Female	5 853	5 369	6 488	2 921	2 272	2 284	2 057	1 522	883	304
NEURODISO	Male	122	327	707	395	322	430	501	501	370	143
	Female	45	102	250	209	249	492	972	1 356	1 416	790
Other_ALD	Male	12 699	12 597	19 782	11 757	10 291	10 280	8 773	6 132	3 030	930
	Female	10 551	13 036	26 857	17 068	15 974	18 067	18 730	15 527	10 103	4 418
NoALD	Male	92 961	40 150	29 870	11 266	7 612	6 013	4 115	2 282	931	259
	Female	123 101	56 455	43 103	17 412	12 549	11 021	8 896	6 020	3 455	1 355

Table 14: Prevalences of FRESHER-modelled NCDs in EHIF claim file population, by age and gender

		18-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84	85-89	90+
STROKE	Male	0,12%	0,51%	1,93%	3,93%	5,47%	6,89%	8,56%	9,85%	9,94%	8,44%
	Female	0,06%	0,26%	0,86%	1,71%	2,68%	3,98%	5,81%	7,60%	9,15%	9,36%
HD	Male	0,27%	2,15%	7,65%	12,83%	16,06%	20,25%	24,23%	27,79%	30,71%	33,04%
	Female	0,10%	0,68%	3,08%	6,16%	9,46%	13,29%	18,26%	22,04%	24,43%	25,28%
CANCER	Male	0,02%	0,23%	0,83%	2,05%	2,94%	3,83%	4,54%	4,87%	4,32%	3,20%
	Female	0,10%	0,80%	2,12%	3,03%	3,54%	3,82%	4,12%	4,01%	3,73%	2,84%
DIABETES	Male	1,11%	4,00%	9,89%	14,40%	16,85%	15,86%	16,24%	14,63%	12,77%	11,21%
	Female	0,68%	2,17%	6,91%	13,15%	16,55%	17,70%	18,97%	18,00%	15,02%	10,50%
CKD	Male	0,10%	0,35%	0,67%	1,14%	1,67%	2,55%	4,07%	5,66%	6,96%	7,28%
	Female	0,08%	0,18%	0,38%	0,58%	0,92%	1,54%	2,46%	3,38%	4,18%	4,06%
COPD	Male	0,49%	1,40%	3,52%	5,79%	6,55%	8,26%	9,26%	9,60%	9,14%	7,50%
	Female	0,35%	1,12%	2,42%	3,30%	3,54%	4,12%	4,07%	4,00%	3,96%	3,77%
CIRRHOSIS	Male	0,87%	2,06%	2,50%	2,31%	1,86%	1,45%	1,24%	0,96%	0,73%	0,36%
	Female	0,26%	0,79%	1,69%	1,96%	1,55%	1,32%	1,05%	0,71%	0,54%	0,24%
AUD	Male	1,77%	3,01%	3,22%	2,34%	1,77%	1,16%	0,72%	0,29%	0,13%	0,00%
	Female	0,30%	0,58%	0,63%	0,53%	0,31%	0,23%	0,12%	0,05%	0,04%	0,02%
DEPRESSION	Male	2,90%	3,68%	3,60%	3,20%	2,87%	2,78%	2,70%	3,14%	3,16%	2,77%
	Female	4,16%	7,04%	8,14%	7,18%	6,68%	6,55%	6,21%	5,96%	5,58%	4,62%
NEURODISO	Male	0,11%	0,56%	1,21%	1,41%	1,47%	2,18%	3,21%	5,01%	8,00%	10,41%
	Female	0,03%	0,13%	0,31%	0,51%	0,73%	1,41%	2,93%	5,31%	8,95%	12,02%
Other_ALD	Male	11,35%	21,49%	33,81%	41,86%	46,95%	52,13%	56,20%	61,28%	65,49%	67,69%
	Female	7,50%	17,10%	33,68%	41,98%	46,96%	51,85%	56,51%	60,80%	63,82%	67,20%
NoALD	Male	83,09%	68,50%	51,05%	40,11%	34,73%	30,49%	26,36%	22,80%	20,12%	18,85%
	Female	87,55%	74,07%	54,06%	42,82%	36,89%	31,63%	26,84%	23,57%	21,83%	20,61%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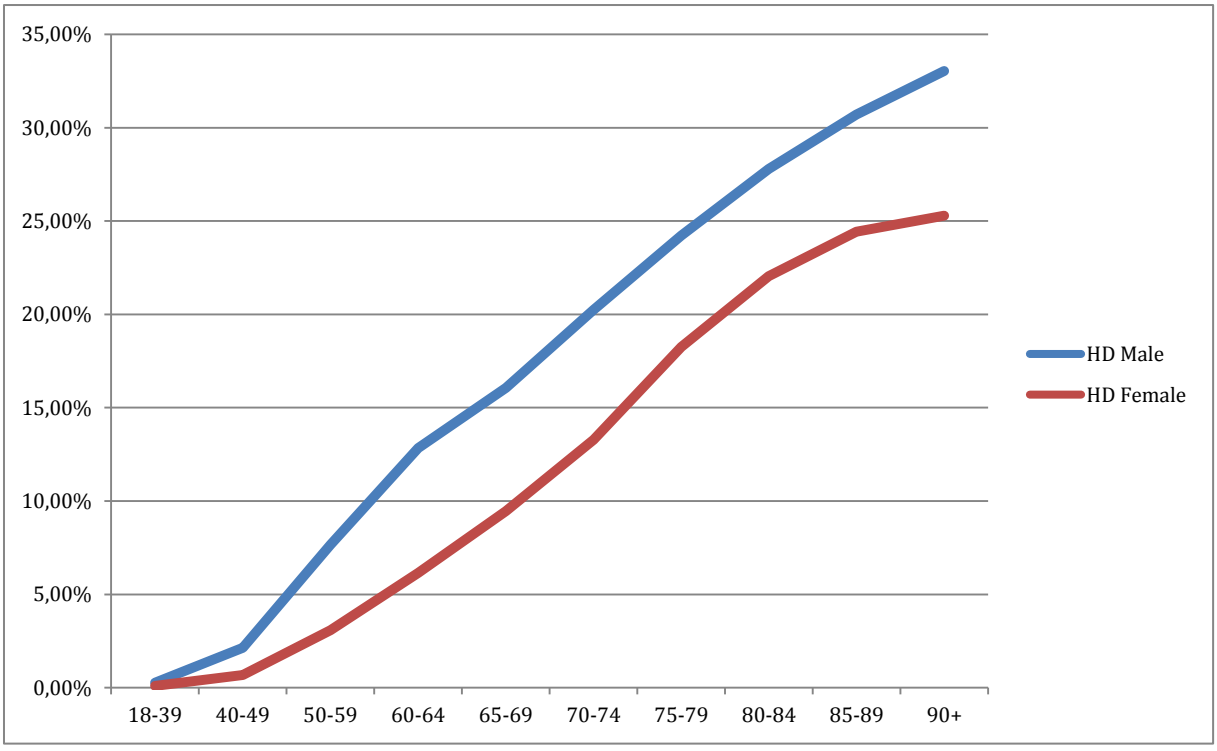
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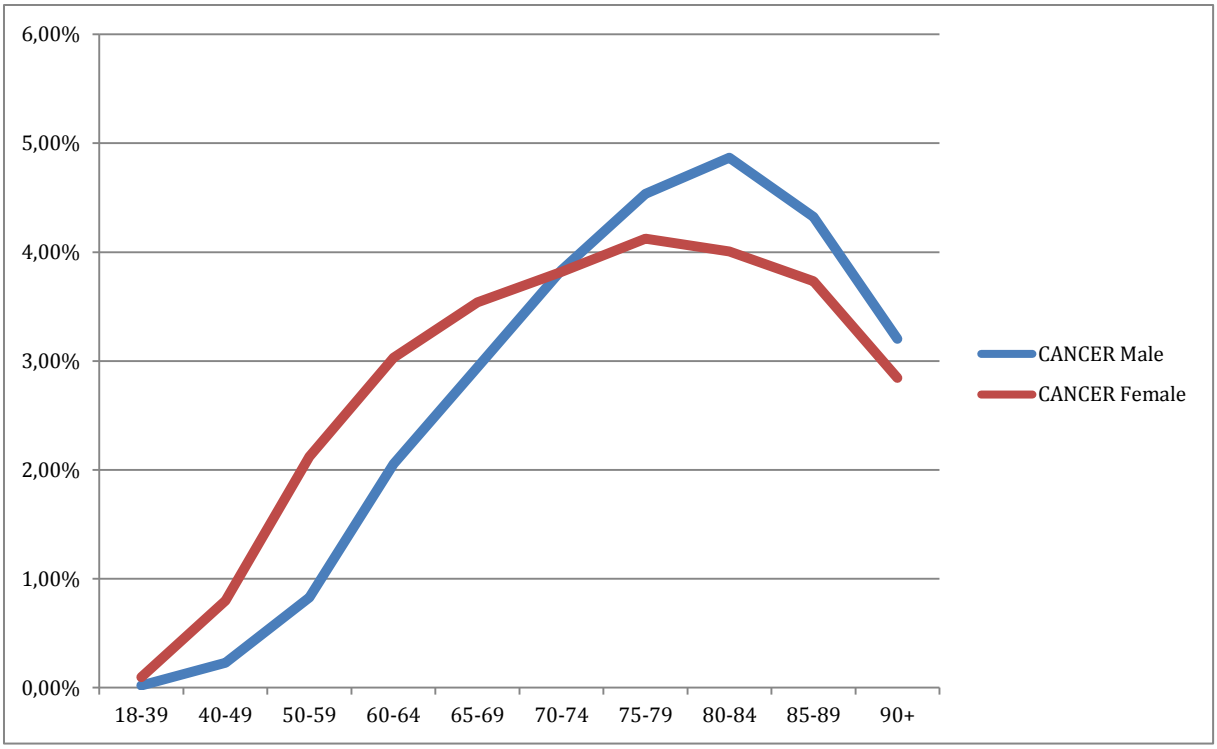
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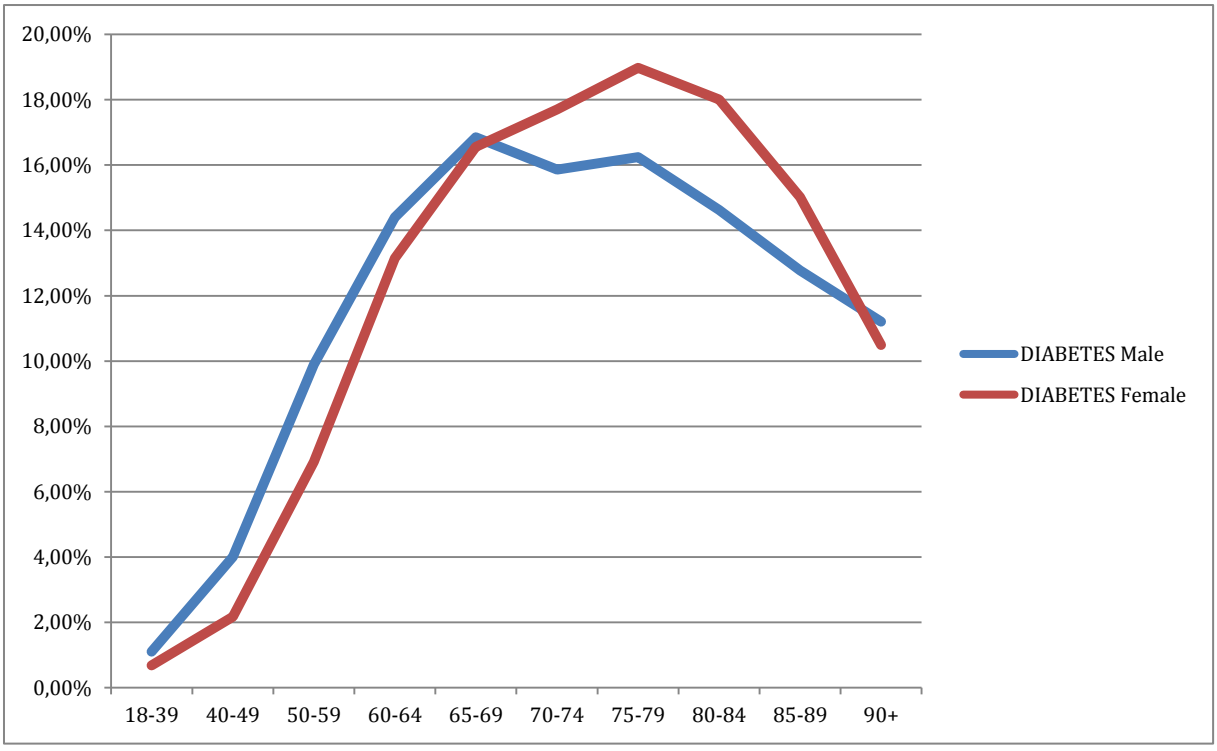
CANCER Female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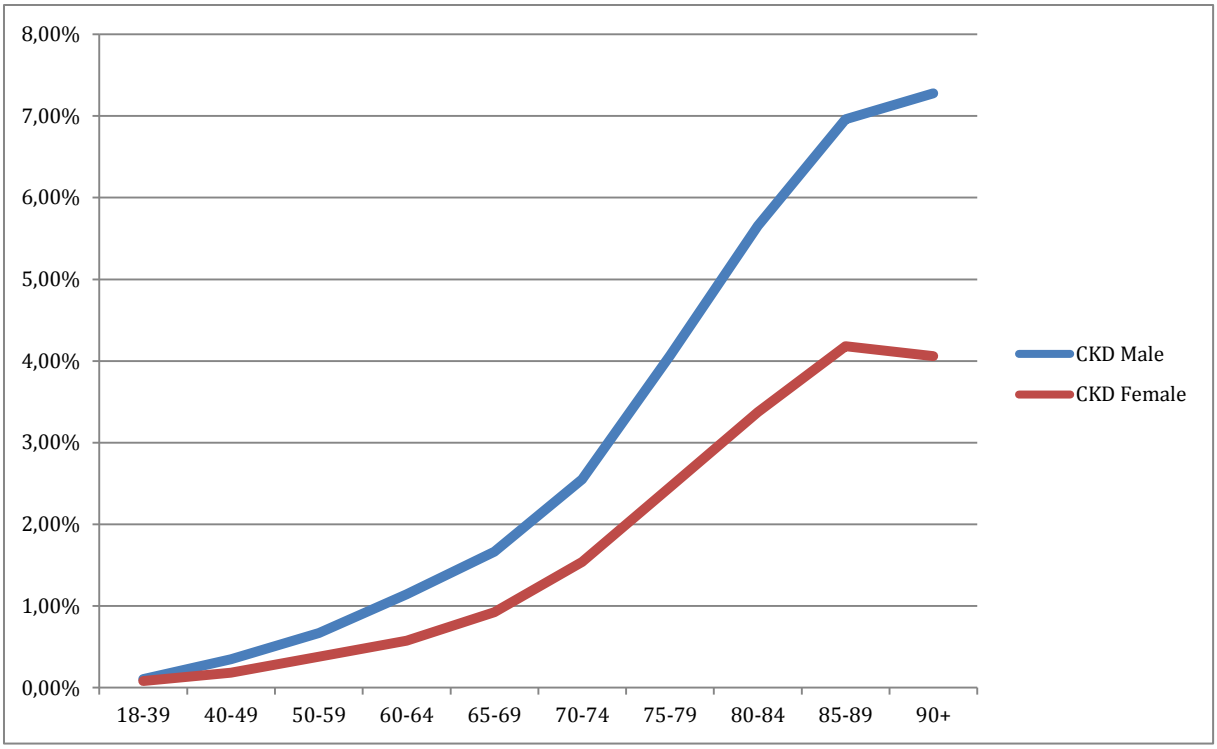
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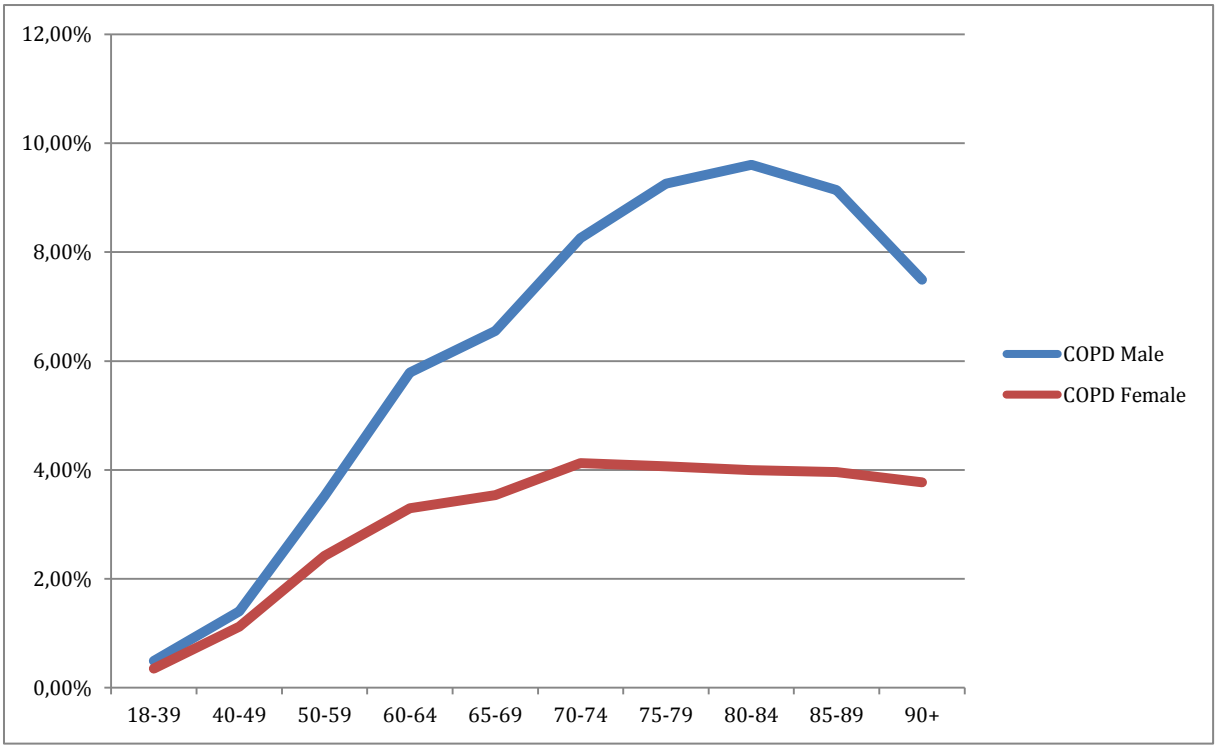
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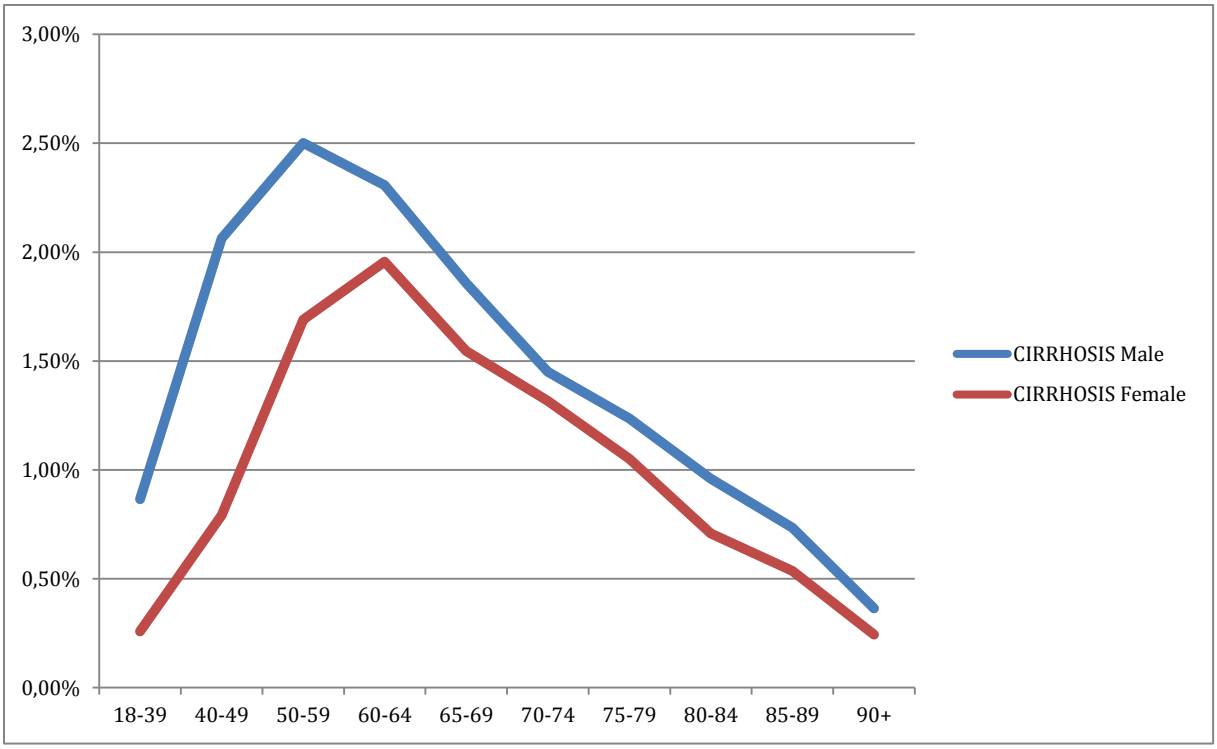
COPD Female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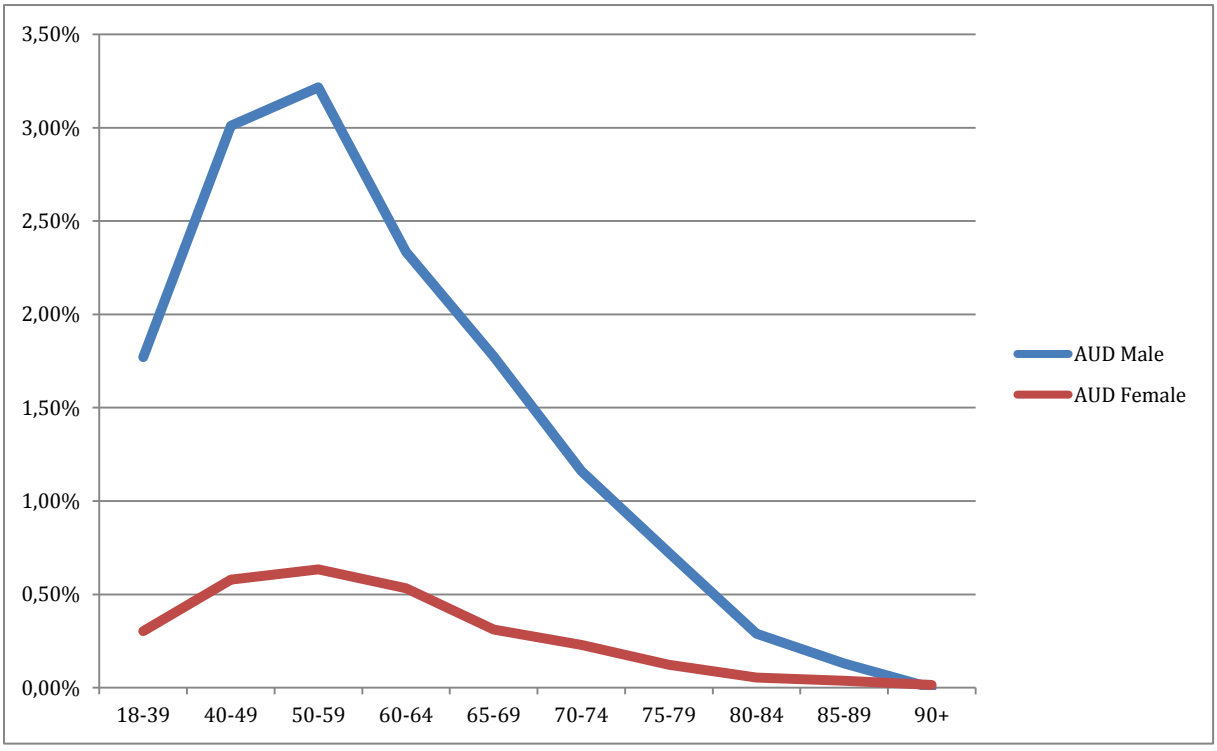
CIRRHOSIS Female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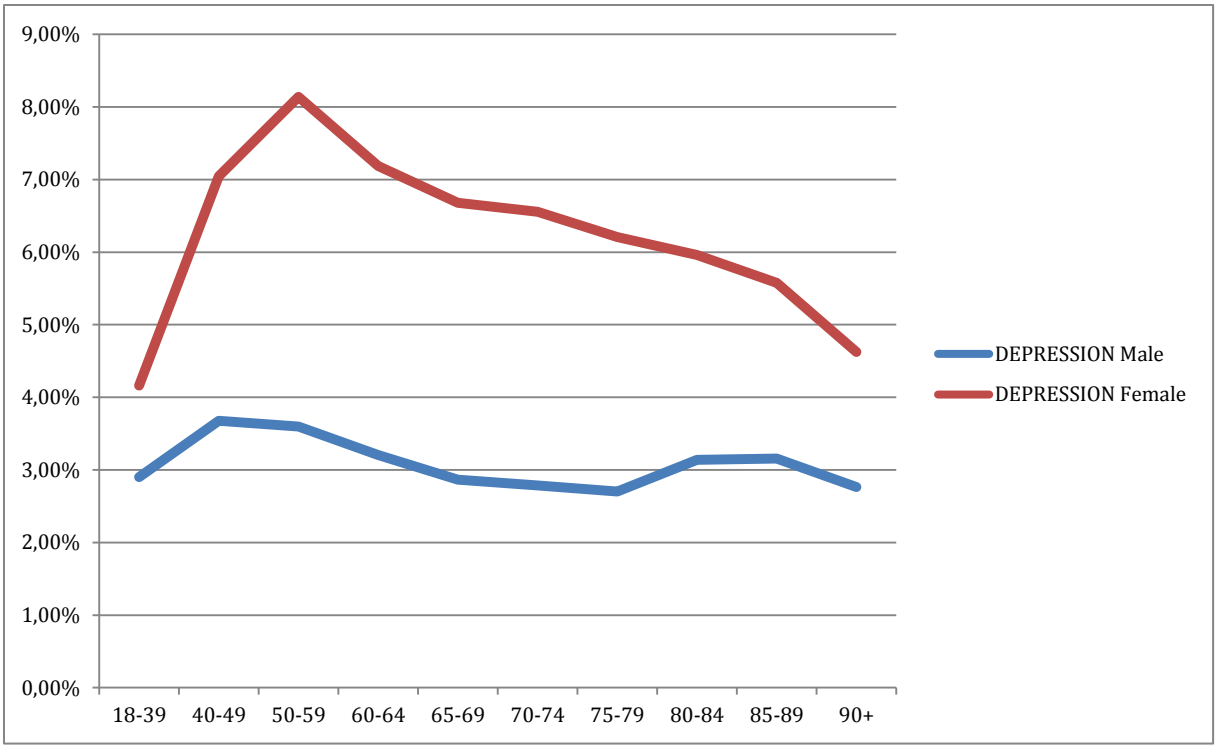
AUD Male
AUD Female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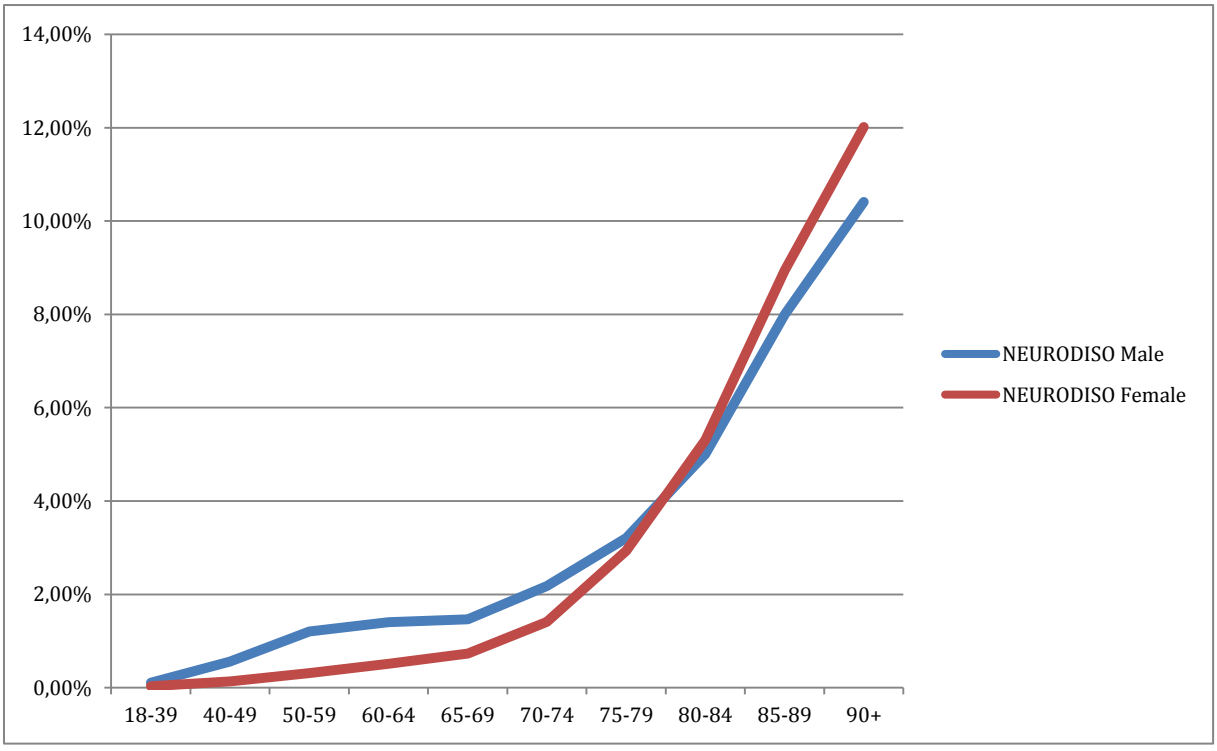
90+
DEPRESSION Male
DEPRESSION Female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NEURODISO Male
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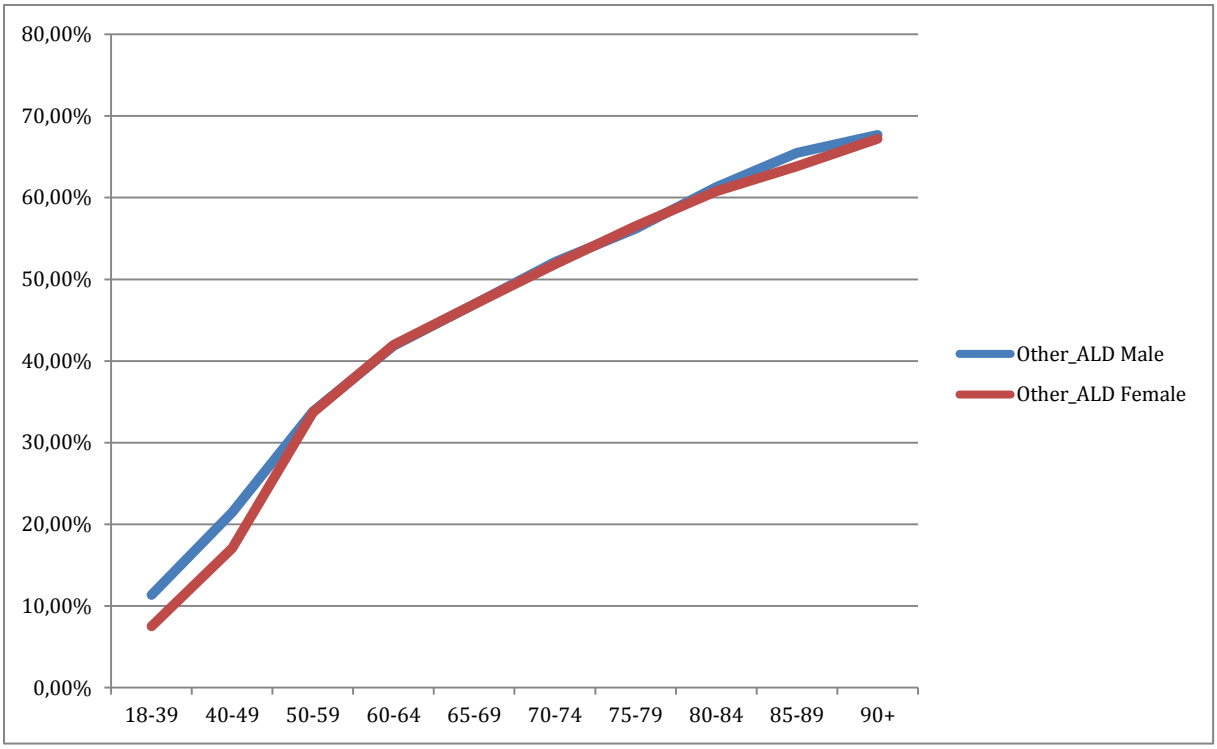
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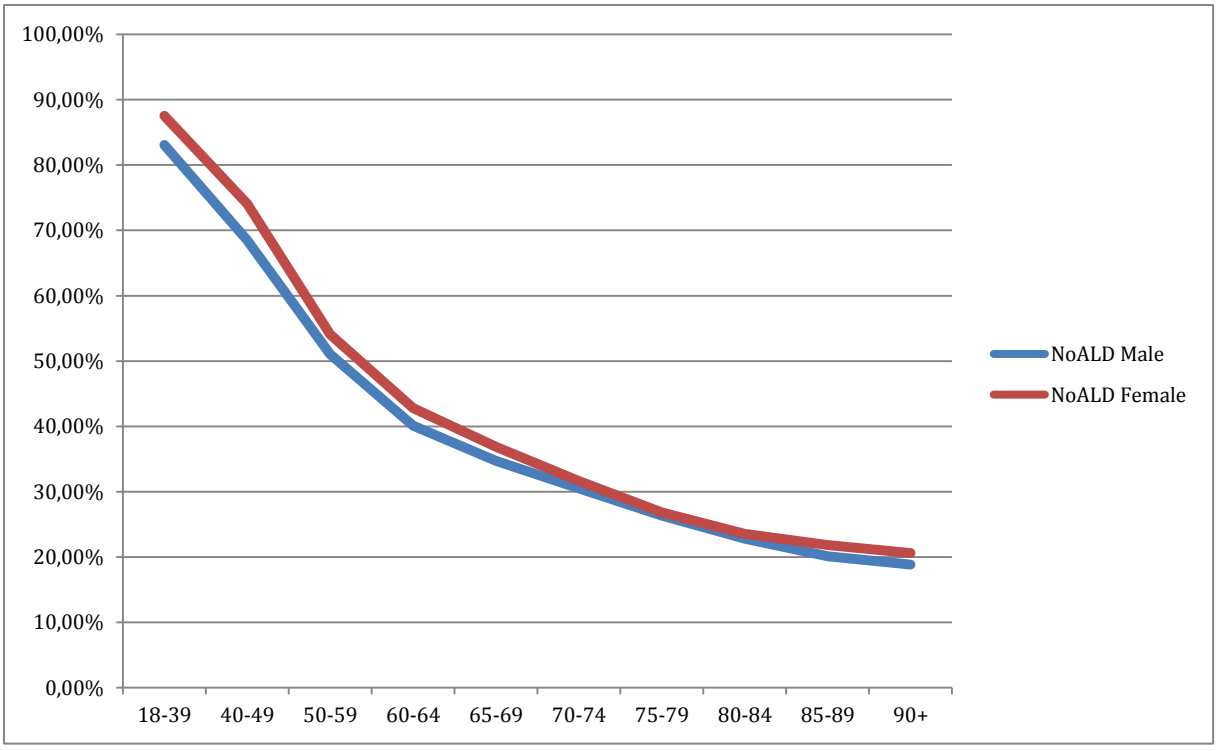
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90+
NoALD Male
NoALD Female

Table 15 : Prevalences of FRESHER-modelled NCDs in EHIF claim file population augmented with census, by age and gender

		20-39	40-49	50-59	60-64	65-69	70-74	75-79	80-84
STROKE	Male	0,07%	0,34%	1,34%	3,14%	4,92%	5,78%	8,29%	9,67%
	Female	0,04%	0,22%	0,70%	1,48%	2,53%	3,37%	5,64%	7,20%
HD	Male	0,15%	1,44%	5,31%	10,25%	14,45%	17,00%	23,46%	27,27%
	Female	0,07%	0,58%	2,53%	5,32%	8,93%	11,24%	17,71%	20,87%
CANCER	Male	0,01%	0,15%	0,57%	1,64%	2,65%	3,22%	4,39%	4,77%
	Female	0,07%	0,68%	1,74%	2,62%	3,34%	3,23%	4,00%	3,79%
DIABETES	Male	0,62%	2,67%	6,86%	11,51%	15,17%	13,31%	15,73%	14,35%
	Female	0,51%	1,85%	5,68%	11,36%	15,63%	14,97%	18,40%	17,05%
CKD	Male	0,06%	0,23%	0,47%	0,91%	1,50%	2,14%	3,94%	5,55%
	Female	0,06%	0,16%	0,31%	0,50%	0,87%	1,30%	2,38%	3,20%
COPD	Male	0,28%	0,94%	2,44%	4,63%	5,90%	6,93%	8,96%	9,42%
	Female	0,27%	0,96%	1,99%	2,85%	3,34%	3,49%	3,94%	3,79%
CIRRHOSIS	Male	0,49%	1,38%	1,74%	1,84%	1,67%	1,22%	1,20%	0,94%
	Female	0,19%	0,68%	1,39%	1,69%	1,46%	1,11%	1,02%	0,67%
AUD	Male	1,00%	2,01%	2,23%	1,87%	1,60%	0,97%	0,70%	0,28%
	Female	0,22%	0,49%	0,52%	0,46%	0,29%	0,19%	0,12%	0,05%
DEPRESSION	Male	1,63%	2,46%	2,49%	2,56%	2,58%	2,34%	2,62%	3,08%
	Female	3,11%	6,01%	6,68%	6,21%	6,31%	5,55%	6,02%	5,64%
NEURODISO	Male	0,06%	0,37%	0,84%	1,12%	1,32%	1,83%	3,11%	4,91%
	Female	0,02%	0,11%	0,26%	0,44%	0,69%	1,19%	2,84%	5,03%
Other_ALD	Male	6,36%	14,37%	23,45%	33,44%	42,26%	43,75%	54,41%	60,12%
	Female	5,46%	14,59%	27,66%	36,26%	44,34%	43,86%	54,81%	57,58%
NoALD	Male	90,53%	45,80%	35,40%	32,05%	31,26%	25,59%	25,52%	22,37%
	Female	90,85%	63,19%	44,39%	37,00%	34,83%	26,76%	26,03%	22,33%

Cost

Sample 1 : Overall studied population

		EHIF claim file reimbursement cost			Corrected expenditure (for estimate)		
	Age group	**TOTAL**	**MEAN**	**SD**	**TOTAL**	**MEAN**	**SD**
MALE	18-39	29 753 725	266	2 211	39 176 781	350	2 954
	40-49	21 089 178	360	1 869	27 824 241	475	2 501
	50-59	33 350 293	570	2 274	44 152 413	755	3 049
	60-64	22 530 643	802	2 728	29 844 903	1 063	3 651
	65-69	21 576 760	984	3 001	28 600 431	1 305	4 021
	70-74	22 587 083	1 145	3 169	29 959 993	1 519	4 252
	75-79	18 502 975	1 185	3 202	24 527 464	1 571	4 285
	80-84	11 339 120	1 133	3 043	15 015 110	1 500	4 072
	85-89	4 628 269	1 000	2 586	6 118 121	1 322	3 446
	90+	1 027 650	748	1 883	1 355 142	986	2 520
FEMALE	18-39	49 903 781	355	1 228	65 786 574	468	1 639
	40-49	28 408 335	373	1 478	37 251 141	489	1 963
	50-59	37 984 429	476	1 727	49 757 623	624	2 297
	60-64	22 985 763	565	1 996	30 152 055	742	2 657
	65-69	21 694 481	638	1 857	28 461 647	837	2 472
	70-74	26 320 221	755	2 226	34 601 370	993	2 971
	75-79	27 653 154	834	2 211	36 433 239	1 099	2 960
	80-84	19 888 461	779	1 992	26 157 118	1 024	2 661
	85-89	10 976 600	693	1 911	14 417 764	911	2 556
	90+	3 612 915	550	1 251	4 740 906	721	1 675

		Estimated prescribed medicine reimbursement cost			Estimated OOP for prescribed medicine		
	Age group	**TOTAL**	**MEAN**	**SD**	**TOTAL**	**MEAN**	**SD**
MALE	18-39	6 429 282	57	508	2 993 774	27	235
	40-49	4 573 693	78	429	2 161 370	37	206
	50-59	7 309 468	125	522	3 492 652	60	258
	60-64	4 975 864	177	627	2 338 396	83	304
	65-69	4 781 819	218	689	2 241 851	102	341
	70-74	5 016 628	254	728	2 356 281	119	367
	75-79	4 106 430	263	736	1 918 059	123	355
	80-84	2 506 175	250	699	1 169 815	117	337
	85-89	1 016 919	220	594	472 933	102	275
	90+	222 981	162	432	104 511	76	205
FEMALE	18-39	10 878 108	77	282	5 004 685	36	130
	40-49	6 120 900	80	339	2 721 905	36	153
	50-59	8 164 219	102	396	3 608 975	45	182
	60-64	4 953 827	122	458	2 212 464	54	213
	65-69	4 681 462	138	426	2 085 703	61	198
	70-74	5 708 913	164	511	2 572 236	74	243
	75-79	6 006 167	181	508	2 773 918	84	252
	80-84	4 292 494	168	457	1 976 163	77	216
	85-89	2 352 257	149	439	1 088 908	69	210
	90+	765 598	116	287	362 393	55	138

Sample 2 : Population with at least one FRESHER-modelled NCD

		EHIF claim file reimbursement cost			Corrected expenditure (for estimate)		
	Age group	TOTAL	MEAN	SD	TOTAL	MEAN	SD
MALE	18-39	5 952 917	746	3 760	7 917 711	992	5 028
	40-49	8 276 915	923	3 831	11 014 715	1 228	5 131
	50-59	19 728 463	1 206	3 629	26 272 661	1 606	4 872
	60-64	15 438 128	1 465	3 989	20 520 696	1 948	5 342
	65-69	15 297 045	1 649	4 015	20 332 343	2 192	5 386
	70-74	16 573 106	1 823	4 071	22 037 167	2 424	5 471
	75-79	14 280 864	1 781	4 089	18 970 863	2 366	5 475
	80-84	9 045 307	1 657	3 879	12 005 191	2 200	5 192
	85-89	3 617 905	1 380	3 078	4 792 624	1 829	4 099
	90+	804 124	1 028	2 320	1 063 292	1 360	3 106
FEMALE	18-39	6 305 411	768	2 735	8 330 791	1 014	3 644
	40-49	8 809 307	921	3 253	11 544 013	1 206	4 308
	50-59	17 553 708	980	3 002	23 025 715	1 286	3 989
	60-64	12 781 916	1 020	2 984	16 804 467	1 341	3 971
	65-69	13 225 743	1 084	2 619	17 387 117	1 425	3 483
	70-74	17 044 649	1 199	2 981	22 456 757	1 580	3 981
	75-79	19 411 332	1 266	2 905	25 653 092	1 673	3 894
	80-84	14 780 564	1 159	2 591	19 503 329	1 530	3 461
	85-89	8 062 560	984	2 097	10 625 123	1 296	2 808
	90+	2 679 218	802	1 553	3 533 752	1 058	2 080

		Estimated prescribed medicine reimbursement cost			Estimated OOP for prescribed medicine		
	Age group	TOTAL	MEAN	SD	TOTAL	MEAN	SD
MALE	18-39	1 320 883	165	865	643 910	81	406
	40-49	1 835 842	205	881	901 958	101	430
	50-59	4 393 083	269	834	2 151 115	132	422
	60-64	3 447 308	327	917	1 635 260	155	450
	65-69	3 419 921	369	923	1 615 378	174	465
	70-74	3 709 198	408	936	1 754 863	193	483
	75-79	3 192 396	398	940	1 497 603	187	457
	80-84	2 015 692	369	892	944 193	173	432
	85-89	801 075	306	708	373 645	143	328
	90+	176 184	225	533	82 984	106	254
FEMALE	18-39	1 386 729	169	629	638 651	78	293
	40-49	1 937 270	202	748	797 436	83	333
	50-59	3 848 338	215	690	1 623 670	91	317
	60-64	2 800 580	224	686	1 221 971	98	321
	65-69	2 896 674	237	602	1 264 701	104	281
	70-74	3 743 817	263	685	1 668 291	117	330
	75-79	4 267 588	278	668	1 974 172	129	337
	80-84	3 233 664	254	596	1 489 101	117	283
	85-89	1 750 475	214	482	812 088	99	236
	90+	578 299	173	357	276 235	83	173

Sample 3 : Population without NCD (no FRESHER-modelled NCD and no other ALD)

		EHIF claim file reimbursement cost			Corrected expenditure (for estimate)		
	Age group	TOTAL	MEAN	SD	TOTAL	MEAN	SD
MALE	18-39	16 615 944	179	1 900	21 751 708	234	2 538
	40-49	7 903 747	197	723	10 344 171	258	965
	50-59	7 448 497	249	1 021	9 764 402	327	1 364
	60-64	3 571 739	317	1 074	4 694 144	417	1 434
	65-69	2 929 913	385	1 404	3 856 669	507	1 875
	70-74	2 686 131	447	1 979	3 541 135	589	2 643
	75-79	1 655 193	402	1 214	2 176 880	529	1 621
	80-84	853 073	374	909	1 120 129	491	1 214
	85-89	293 047	315	1 318	383 614	412	1 760
	90+	52 830	204	475	68 305	264	634
FEMALE	18-39	36 404 941	296	898	47 937 908	389	1 199
	40-49	14 003 633	248	648	18 350 804	325	865
	50-59	11 315 656	263	792	14 792 756	343	1 058
	60-64	4 900 160	281	1 103	6 401 076	368	1 472
	65-69	3 707 543	295	863	4 841 986	386	1 151
	70-74	3 562 099	323	996	4 653 724	422	1 330
	75-79	3 020 275	340	980	3 944 264	443	1 308
	80-84	1 708 482	284	761	2 221 103	369	1 016
	85-89	847 743	245	700	1 097 954	318	934
	90+	262 170	193	634	337 328	249	846

		Estimated prescribed medicine reimbursement cost			Estimated OOP for prescribed medicine		
	Age group	TOTAL	MEAN	SD	TOTAL	MEAN	SD
MALE	18-39	3 517 647	38	437	1 618 118	17	201
	40-49	1 671 523	42	166	768 901	19	76
	50-59	1 586 236	53	234	729 669	24	108
	60-64	768 771	68	247	353 634	31	113
	65-69	634 764	83	323	291 992	38	148
	70-74	585 619	97	455	269 385	45	209
	75-79	357 320	87	279	164 367	40	128
	80-84	182 915	80	209	84 141	37	96
	85-89	62 032	67	303	28 535	31	139
	90+	10 599	41	109	4 876	19	50
FEMALE	18-39	7 899 292	64	206	3 633 674	30	95
	40-49	2 977 514	53	149	1 369 657	24	68
	50-59	2 381 575	55	182	1 095 525	25	84
	60-64	1 028 025	59	253	472 892	27	116
	65-69	777 016	62	198	357 427	28	91
	70-74	747 688	68	229	343 937	31	105
	75-79	632 869	71	225	291 120	33	103
	80-84	351 111	58	175	161 511	27	80
	85-89	171 377	50	161	78 834	23	74
	90+	51 478	38	145	23 680	17	67

Sample 4 : Population without FRESHER-modelled NCD

		EHIF claim file reimbursement cost			Corrected expenditure (for estimate)		
	Age group	TOTAL	MEAN	SD	TOTAL	MEAN	SD
MALE	18-39	23 800 808	229	2 039	31 259 070	301	2 723
	40-49	12 812 263	258	1 186	16 809 526	339	1 584
	50-59	13 621 830	323	1 361	17 879 752	424	1 817
	60-64	7 092 515	404	1 392	9 324 207	531	1 858
	65-69	6 279 715	497	1 795	8 268 088	654	2 397
	70-74	6 013 977	566	1 932	7 922 826	745	2 579
	75-79	4 222 111	556	1 629	5 556 600	732	2 175
	80-84	2 293 813	504	1 263	3 009 919	662	1 686
	85-89	1 010 365	504	1 618	1 325 497	661	2 160
	90+	223 527	378	939	291 850	493	1 253
FEMALE	18-39	43 598 370	329	1 061	57 455 783	434	1 417
	40-49	19 599 028	294	964	25 707 128	386	1 287
	50-59	20 430 721	330	1 068	26 731 907	432	1 425
	60-64	10 203 847	363	1 287	13 347 588	475	1 718
	65-69	8 468 739	388	1 170	11 074 530	508	1 562
	70-74	9 275 573	450	1 420	12 144 614	589	1 895
	75-79	8 241 822	463	1 237	10 780 146	605	1 651
	80-84	5 107 897	399	975	6 653 789	520	1 300
	85-89	2 914 040	382	1 631	3 792 641	497	2 178
	90+	933 697	289	747	1 207 154	373	997

		Estimated prescribed medicine reimbursement cost			Estimated OOP for prescribed medicine		
	Age group	TOTAL	MEAN	SD	TOTAL	MEAN	SD
MALE	18-39	5 108 399	49	469	2 349 863	23	216
	40-49	2 737 851	55	272	1 259 412	25	125
	50-59	2 916 385	69	313	1 341 537	32	144
	60-64	1 528 557	87	320	703 136	40	147
	65-69	1 361 899	108	412	626 473	50	190
	70-74	1 307 430	123	444	601 418	57	204
	75-79	914 034	120	374	420 456	55	172
	80-84	490 484	108	290	225 622	50	133
	85-89	215 844	108	372	99 288	49	171
	90+	46 797	79	216	21 527	36	99
FEMALE	18-39	9 491 379	72	244	4 366 034	33	112
	40-49	4 183 630	63	221	1 924 470	29	102
	50-59	4 315 881	70	245	1 985 305	32	113
	60-64	2 153 247	77	295	990 494	35	136
	65-69	1 784 788	82	268	821 003	38	123
	70-74	1 965 096	95	326	903 944	44	150
	75-79	1 738 578	98	284	799 746	45	130
	80-84	1 058 830	83	223	487 062	38	103
	85-89	601 782	79	375	276 820	36	172
	90+	187 300	58	171	86 158	27	79