JA PreventNCD
Joint Action Prevent Non-Communicable Diseases

Pilot 8.4.a: Implementation of the Epicost model in EU

Stefano Guzzinati – Alessandra Andreotti

Veneto Cancer Registry

Azienda Zero, Padua

JA PreventNCD T8.3 & T8.4 Meeting

Rome, Tuesday 5th November 2024

Co-funded by
The European Union

Background

JA PreventNCD

- The idea is **to extend at European level the Italian experience of the EPICOST study**, which consists of the evaluation of the economic impact of cancer on the Italian national health system, on the basis of individual level information according to a phase of care approach.

- This Pilot will **apply the EPICOST model** to at least 3 European countries participating at the JA

Co-funded by
The European Union

Summary description of pilot 8.4.a

JA PreventNCD

- A model focused on **Cancer registry data** which allows to estimate the amount of people living with a cancer diagnosis (prevalent cases) and to classify them into 3 phases of care (initial, monitoring and final) reflecting different patterns of care, is proposed.

- By **linking individual data** on cancer diagnoses and life status follow-up to **administrative data** (hospital admissions, ambulatory services, drug prescriptions, other sources) profiles of health care direct cost are estimated, in each phase of the disease.

Co-funded by
The European Union

JA PreventNCD

Joint Action Prevent Non-Communicable Diseases

The Italian case study

Co-funded by
The European Union

Data sources (1)

JA PreventNCD

- The study includes data from different sources: **population-based Cancer Registries (CR)**, Hospital Discharge database (HD), Outpatient Services database (OPS), Drug Prescriptions database (DP), other sources.

- **Data on cancer patients are provided by CRs**, data on health care services are provided by the other administrative sources.

Co-funded by
The European Union

Data sources (2)

JA PreventNCD

There are **different levels of harmonization of claims** among Regions, according to the type of health care service:

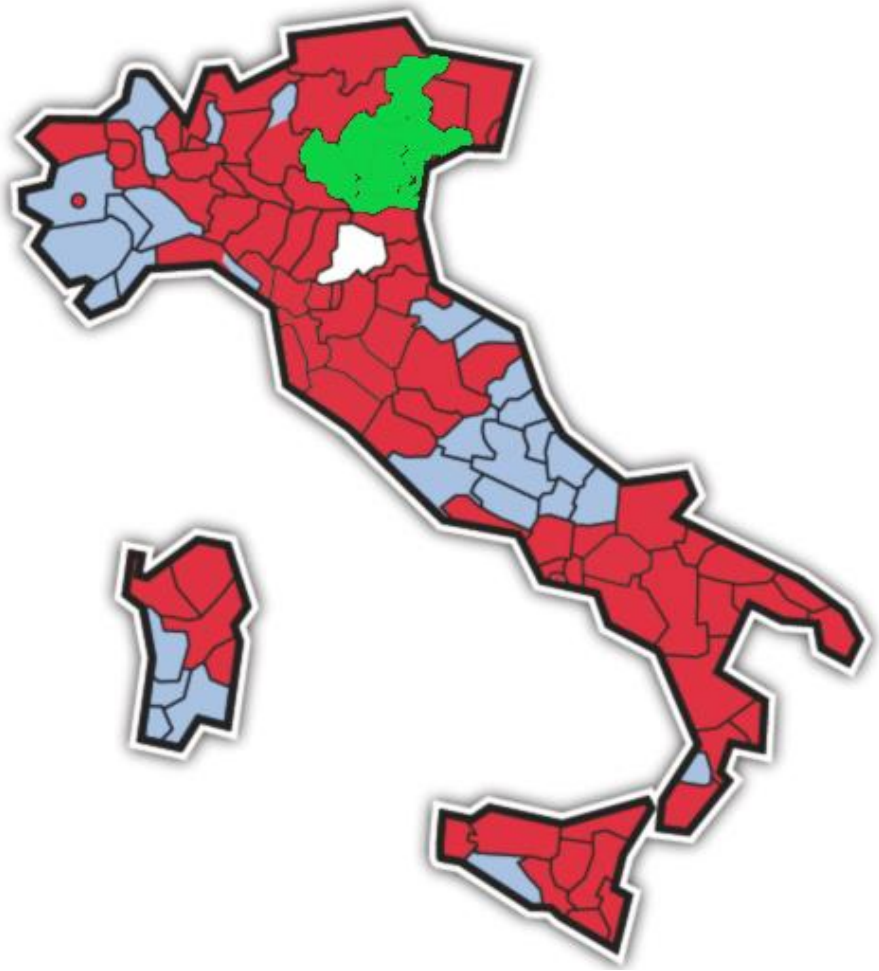
- **Hospital admission claims** may diverge from the price set by the Ministry of Health
- **Outpatient claims** are defined at regional level, and may vary greatly among Regions
- **Drugs prescribed** for treatment at home, available in territorial pharmacy, have the same price over the whole Italian territory
- **Other sources** (Integrated Home Care, Local Residential Care Facilities, Hospice,…)

Co-funded by
The European Union

The Veneto Tumour Registry (VTR)

JA PreventNCD

- Born in **late ’80**, covers about **5 million of inhabitants.**
- **Principal sources:** **pathology reports**, hospital discharge records, death certificates, diagnostic radiology reports, patients’ clinical records



Co-funded by
The European Union

Cancer registry database

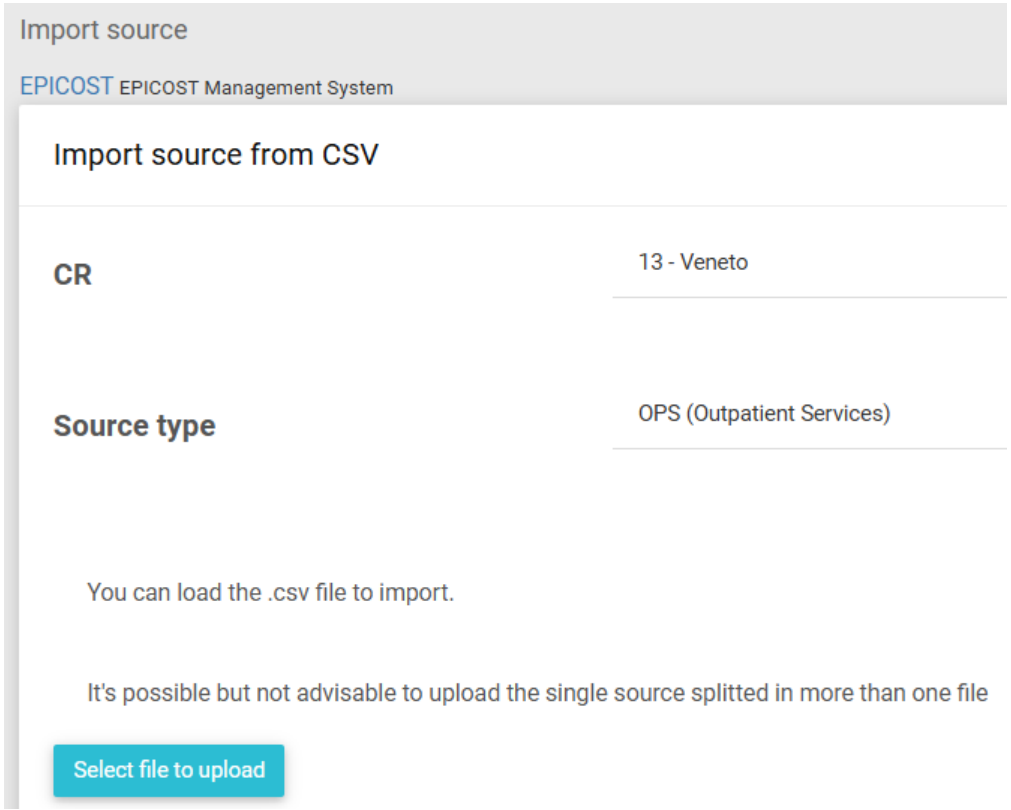
JA PreventNCD

- CRs collect data on **all cancer diagnoses** occurring in the population resident in the area covered by cancer registration.
- Information collected for all cases: date of birth, gender, municipality of residence, follow-up status, date of diagnosis, microscopic confirmation, topographical and morphological codes (ICD-O-3); for selected sites: stage at diagnosis, molecular subtype.
- For each type of health care service (hospitalization, outpatient service, drug prescription, etc.), information is collected at **individual level** and includes, in accordance with the European data protection law, an **anonymous personal identification code** used for the record linkage with the CR database, in order to trace all services provided to a single patient in a given period of time and to select those services related to the index cancer.

Co-funded by
The European Union

Data standardisation (protocol)

JA PreventNCD



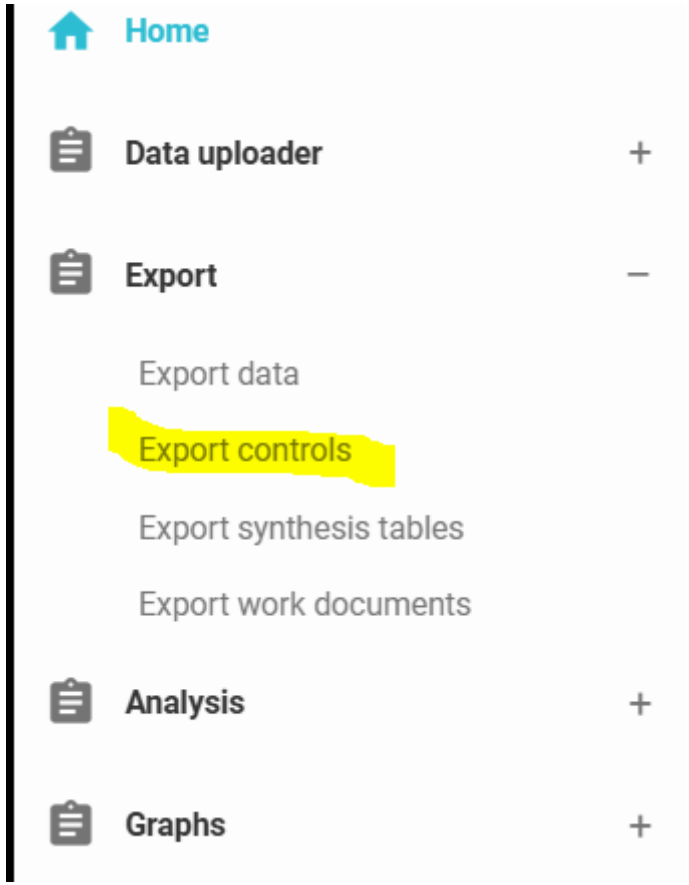
OUTPATIENT CLAIMS	
Variable name in the DB	**Variable description**
IDENTIFICATION CODE OF PATIENT	Unique Identification Code of the Patient (ID-Patient)
YEAR	year of ambulatory service
Local Health Unit of residence	Local area within the region
BRANCH	macro-category of service: i.e. diagnostic imaging, oncology, neurology, rihabilitation, ...)
citizenship	citizenship
EXEMPTION CODE	code of the exemption, used for patient having no or reduced co-payment
DATE OF DELIVERY	complete date of the ambulatory service (dd/mm/yyyy)
DATE OF BIRTH	complete date of birth (dd/mm/yyyy)
DATA of report	date of registration
TOTAL AMOUNT	total amount (in Euros) of the ambulatory service claimed for reimbursement
TICKET (euro)	total amount in Euros of co-payment
NUMBER OF PRESCRIPTION	number of claims (=1)
PRESCRIPTION CODE (ICD-9CM)	type of health care service classified according to ICDO9-CM
QUANTITY	Number of services included in the prescription (=1 except for multiple services combined)
REGIME OF EROGATION	variable needed to manage reimbursement
REPEATABILITY	variable needed to manage reimbursement
SEX	sex
HEALTHCARE SUPPLY STRUCTURE	Code identifying the ambulatory
DELIVERY TYPE	variable needed to manage reimbursement

Cancer site of interest: Colon rectum and female Breast

Co-funded by
The European Union

Quality checks

JA PreventNCD



Source type	FLAG/CR	Veneto CR	
	Consistency errors	N	%
CR	1 (duplicate case)	0	0%
CR	2 (site-sex error)	304	2%
CR	3 (birth/incidence/follow up date non consistency)	0	0%
CR	4 (multiple tumours)	14853	75%
CR	5 (time difference between tumour < 5 years)	4681	24%
CR	6 (non prevalent cases)	32	0%
CR	Total	19870	100%

Co-funded by
The European Union

Cost calculation

JA PreventNCD

Costs are expressed in Euro and are **defined** as the **direct** expenditure paid by the Regional Health Authority to the health care provider's claims (hospitals, ambulatories, pharmacies) as reimbursement of the **services provided to a cancer patient**.

A hospital discharge

with one of these Main diagnoses (ICD-9-CM):

153.6 Malignant neoplasm of ascending colon; 153.3 Malignant neopl. of sigmoid colon;153.4 Malignant neopl. of cecum

153.1 Malignant neopl. of transverse colon;153.2 Malignant neopl. of descending colon;154.1 Malignant neoplasm of rectum

AND one of these Main procedures:

45.73 Open and other right hemicolectomy; 45.75 Open and other left hemicolectomy

45.76 Open and other sigmoidectomy; 54.21 Laparoscopy

has a DRG (Italian version n. 24) code = 570 MAJOR SMALL AND LARGE BOWEL PROCEDURES WITHOUT CC/MCC

with a Total amount = **13729.72 euro**

A Hospice care:

with main diagnosis icd9=154 (malignant neoplasm of rectum) from 02/03/2018 to 04/03/2018 (date of death):

3 days with a **daily fare** of 210 euro/day → Total cost = **630 euro**

Co-funded by
The European Union

JA PreventNCD
Joint Action Prevent Non-Communicable Diseases

The methodology of Epicost in details

Co-funded by
The European Union

STUDY DESIGN

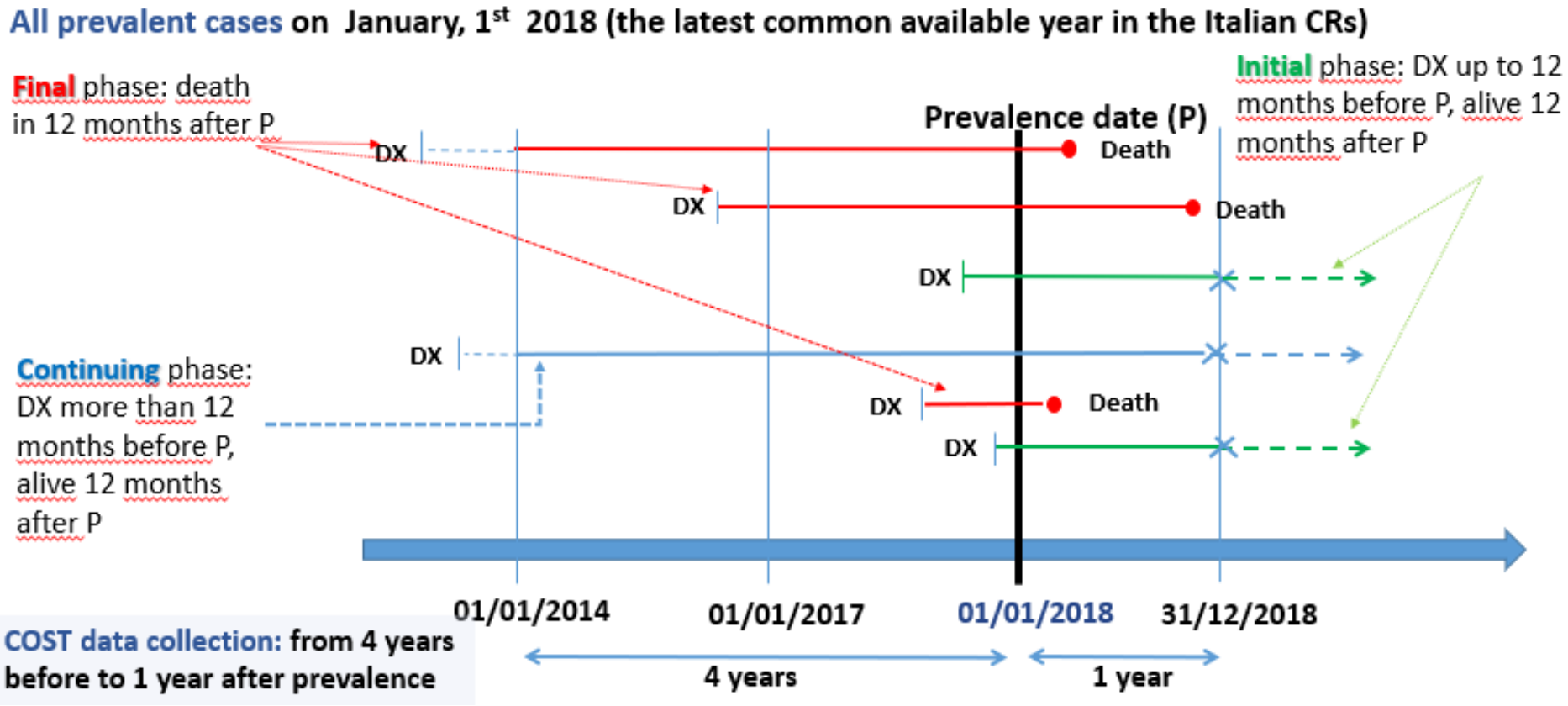
JA PreventNCD

1. Prevalence-based approach (cross-sectional study): estimate yearly costs of all cancer patients alive at a certain prevalence date
2. Phase-of-care decomposition: by time since diagnosis (initial, continuing, final)
3. Linkage of data sources: each **prevalent** case in a CR is associated with his/her cancer-related **events** (hospitalization; ambulatory services; drug prescriptions) performed within the NHS and related **direct** costs
4. Cost profile estimation: direct cost related to cancer care in one year for each phase of the disease, stratified by any covariate affecting type/cost of treatment

Co-funded by
The European Union

1. CROSS-SECTIONAL COHORT BY POC

JA PreventNCD

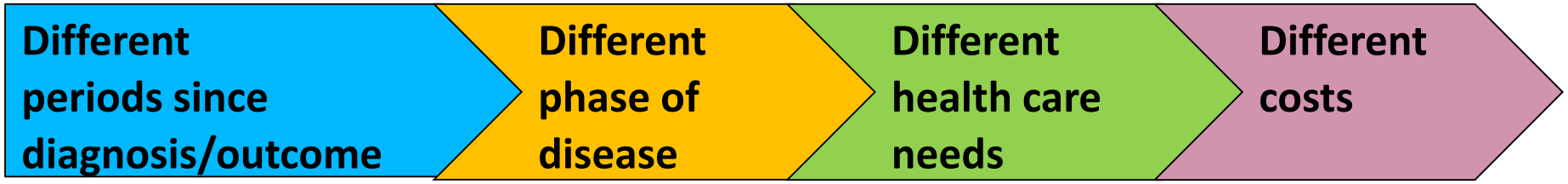


Cost are measured on a **12 months period** around the prevalence date.

Co-funded by
The European Union

2. PHASE-OF-CARE APPROACH

JA PreventNCD



- **Initial** phase (12 months after diagnosis): diagnostic procedures, first course therapy

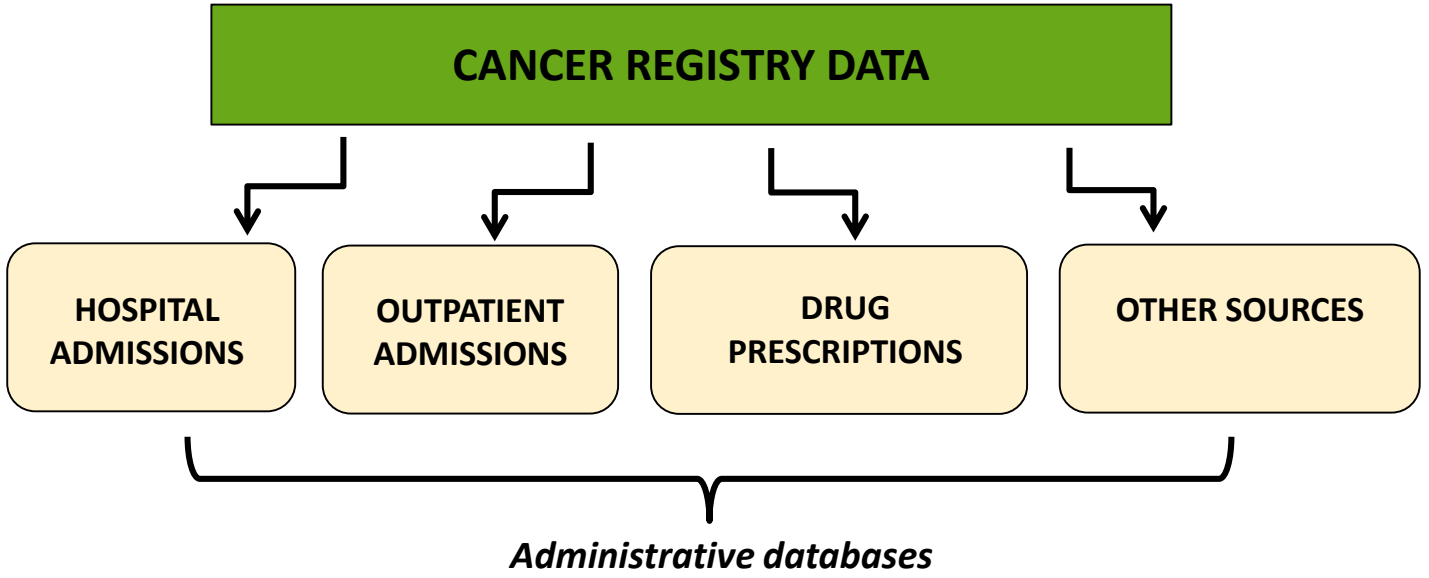
- **Continuing** phase (between initial and final): made of a *mixture of patients* with different clinical characteristics and patterns of care: some patients are fully recovered (cured); some others experience relapses; other patients live in chronic conditions.

- **Final** phase (up to 12 months before death): palliative care

Co-funded by
The European Union

3. LINKAGE OF DATA SOURCES

JA PreventNCD



1. Associate each prevalent case with events and costs in each administrative database
2. Select cancer-related events: treatments/procedures/prescriptions

Co-funded by
The European Union

4. COST PROFILE ESTIMATION (1)

JA PreventNCD

Front Public Health. 2022 Sep 21:10:974505. doi: 10.3389/fpubh.2022.974505. eCollection 2022.

Cancer cost profiles: The Epicost estimation approach

Silvia Francisci [1], Guilia Capodaglio [2], Anna Gigli [3], Cristina Mollica [4], Stefano Guzzinati [5]

Example for colon cancer in Veneto Region (Incidence: 2014-2017 - Prevalence: 01/01/2018)

Annual average cost by POC and source

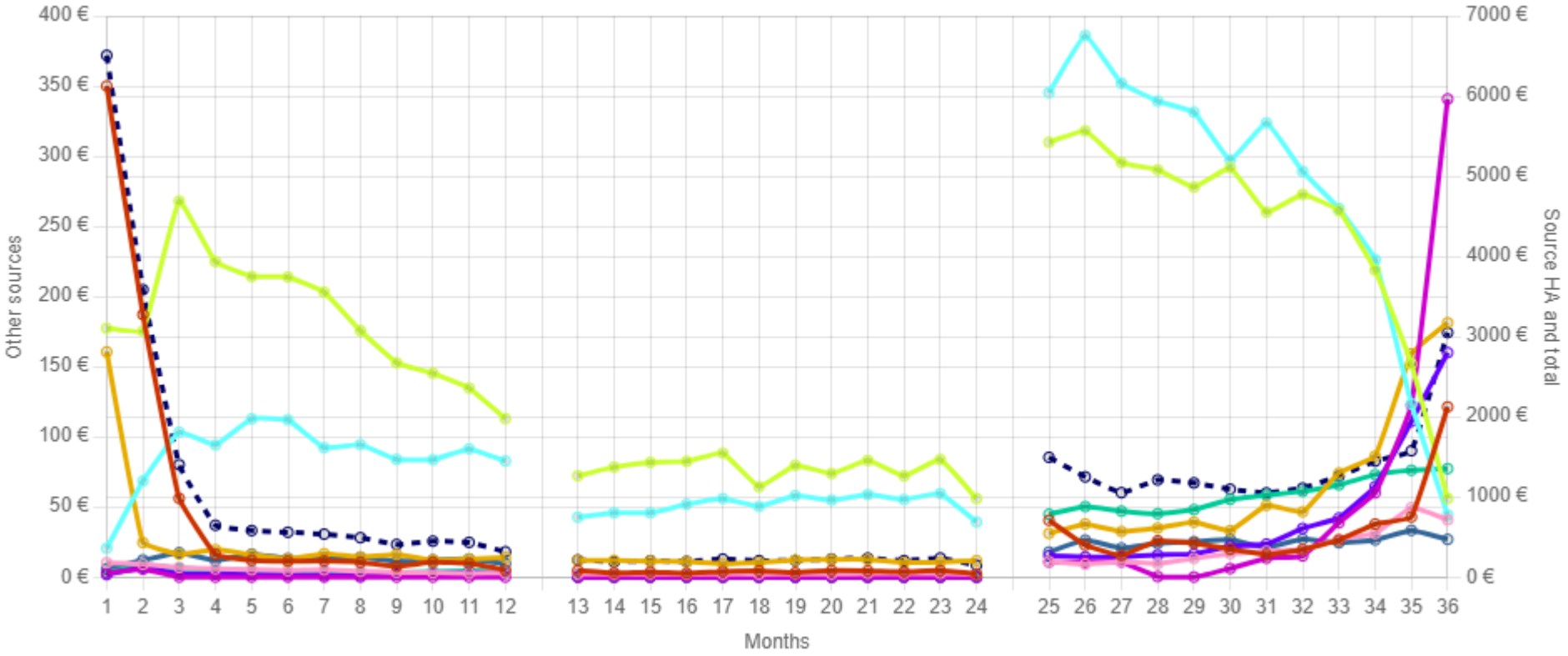
Phase	HA	OPS	DP	HD	HSP	IHC	ER	LRC	MD	Total
Initial	12728	2197	64	1032	9	30	347	52	149	**16607**
Continuos	783	918	28	618	0	0	136	0	0	**2482**
Final	7481	2941	268	3231	694	571	849	714	302	**17052**

Co-funded by
The European Union

4. COST PROFILE ESTIMATION (2)

JA PreventNCD

Monthly average cost by POC and source



Co-funded by
The European Union

JA PreventNCD

Joint Action Prevent Non-Communicable Diseases

Software and Methodologies

Co-funded by
The European Union

Software and methodologies adopted

JA PreventNCD

- List of cancer-correlated codes
- EPICOST management software
- R package

Co-funded by
The European Union

Cost measure

JA PreventNCD

- Two ways to measure the costs directly attributable to cancer:
  - **DIRECT METHOD**: specific **lists of correlated events**, drawn by a panel of expert clinicians and oncologists on the basis of clinical guidelines and current practice (international classifications: ICD9-CM, ATC).
  - **INDIRECT/CONTROL COHORT METHOD**: create a control cohort that matches the cancer cohort, cancer-related costs are estimated as the difference between the costs of the two cohorts. Control cohort method is more often used in literature, but access to information on non-cancer patients is required

Co-funded by
The European Union

Cancer-related costs in Epicost

JA PreventNCD

The European Journal of Health Economics
https://doi.org/10.1007/s10198-021-01327-8

ORIGINAL PAPER

Check for updates

A direct method for the identification of patterns of care using administrative databases: the case of breast cancer

Susanna Busco[1] · Andrea Tavilla[2] · Anna Gigli[3] · Tania Lopez[2] · Daniela Pierannunzio[2] · Sandra Mallone[2] · Stefano Guzzinati[4] · Giulia Capodaglio[5] · Francesco Giusti[6] · Catia Angiolini[7] · Silvia Francisci[2]

The **method consists of identifying lists** of procedures/interventions/drugs related to the tumour of interest, **drawn by a panel of expert clinicians and oncologists** on the basis of **clinical guidelines and current practice**.

Co-funded by
The European Union

Cancer-related costs in Epicost

JA PreventNCD

- This **direct method** represents a valid alternative to the matched control method in describing patterns of care and costs related to the entire disease pathway. It is particularly **suitable in case of cancer sites with complex patterns of care**, such as breast cancer.
- The **lists of codes developed here are based on international classification systems** and can be easily applicable to other countries.

However: the development of the cancer related lists is quite time consuming and requires the engagement of a panel of experts.

Co-funded by
The European Union

Cancer-related costs in Epicost

JA PreventNCD

- The availability of information from the **2ND release of the Epicost study**, make it possible to use an **indirect approach**: according to this proposal **the matched control group is composed by the patients before the diagnosis of cancer acting as their own controls** → a paper is in preparation
- There is **one list for each type of source**
- The **Italian list of cancer-correlated codes** will be available for this pilot study

Co-funded by
The European Union

EPICOST management software

JA PreventNCD

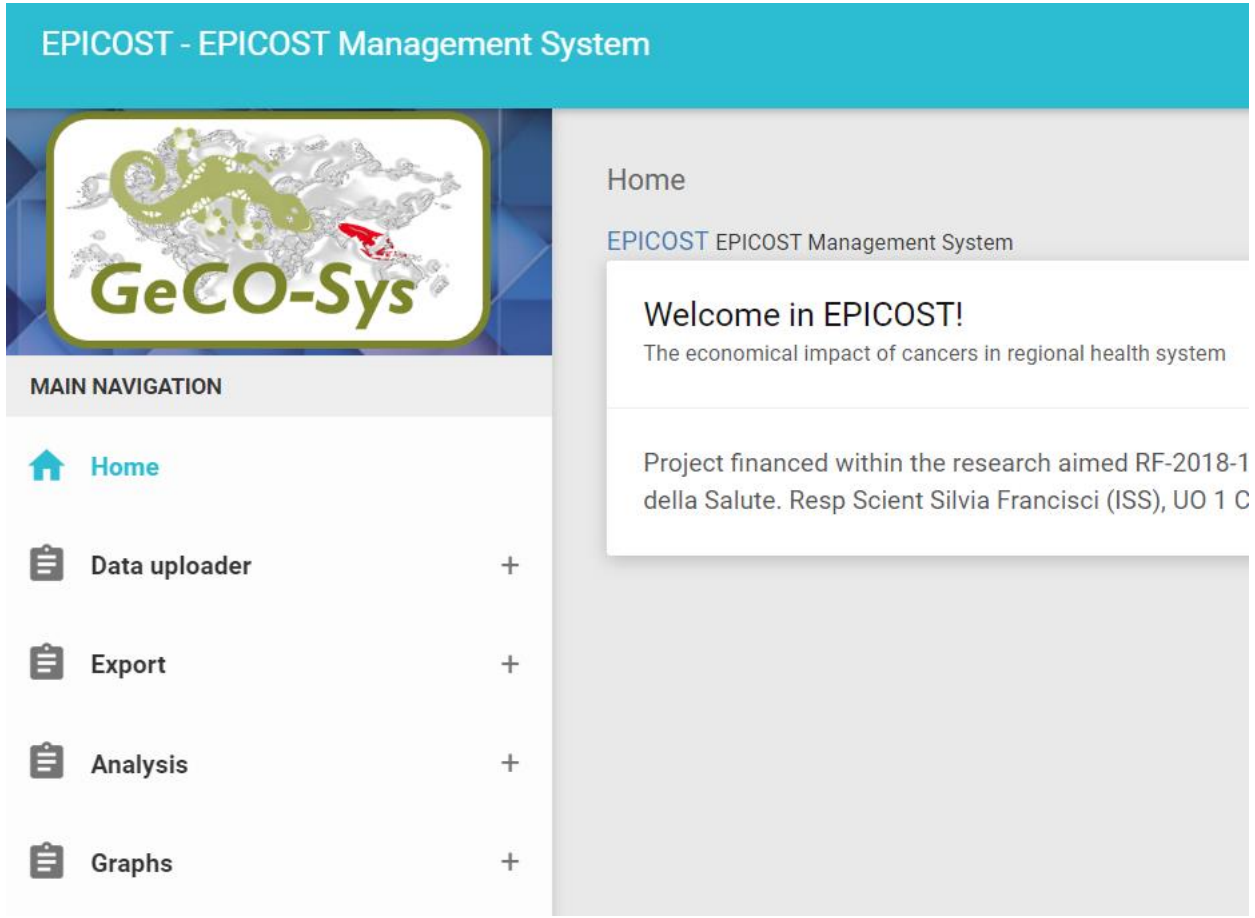
- It is a **Web-based tool**, and at present it is designed to account for **ITALIAN data only**: cancer registry and health care datasets
- To extend the Epicost model to **other EU countries** an adaptation of the upload and quality checks sessions is needed

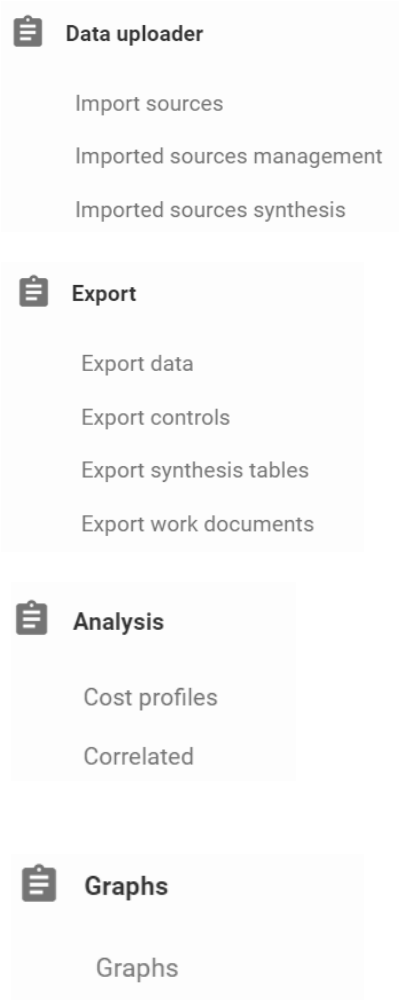
- **Privacy issues**/possible solutions:
  - CRs have access to a private area for uploading and data quality checks;
  - who analyze data can only extract aggregate data

Co-funded by
The European Union

EPICOST management software

JA PreventNCD





Co-funded by
The European Union

R package

JA PreventNCD

- The analyses performed by EPICOST software have been also implemented in **R**

- R is a **free of charge software** environment for statistical computing and graphics (https://www.r-project.org/)

- In order to overcome the **privacy issues** related to the exchange of data between JA partners, we are working on the implementation of an R package which could be shared between JA partners

Co-funded by
The European Union

Evaluation, possibility for scaling up & sustainability

JA PreventNCD

- The following **major challenges** have been faced in the feasibility assessment:
  - variability in population coverage of data sources and their temporal extension and consistency;
  - differences in the health system structure influencing the health data collection;
  - heterogeneity of classification systems and cost definitions;
  - legal issues, to access the data: Ethical Committee approval, Data Protection Impact Assessment, Specific Sharing Data Agreement.
- A **further effort** is still required in order to assure the **replicability** of the model by producing comparable health care costs indicators using common procedures and modeling.

Co-funded by
The European Union

JA PreventNCD

Thank you!

stefano.guzzinati@azero.veneto.it
alessandra.andreotti@azero.veneto.it

This document is part of a project that has received funding from the European Union's EU4Health programme under grant agreement No 101128032. The information reflects only the authors' view and the European Commission is not responsible for any use that may be made of the information it contains.