

PHIRI

Population Health Information
Research Infrastructure

PHIRI Use Cases –measuring the impact of COVID-19 on population health

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www.phiri.eu



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Research Use Cases on COVID-19 – Objectives

4 real life research use cases measuring the impact of COVID-19 on population health



Direct and indirect determinants of COVID-19 infection and outcomes in vulnerable population groups with reference to inequalities



COVID-19 related delayed care in breast cancer patients



The impact of COVID-19 on perinatal health and perinatal health inequalities



COVID-19 related changes in population mental health

Demonstrate how a broad variety of data (e.g. administrative and survey data) can be reused in a distributed way across Europe:

- a) **Conduct research** through use cases of immediate relevance on the consequences of the COVID-19 pandemic on European population health
- b) **Pilot activities** for the benefits and added value of a federated research infrastructure by bringing together data from different European countries



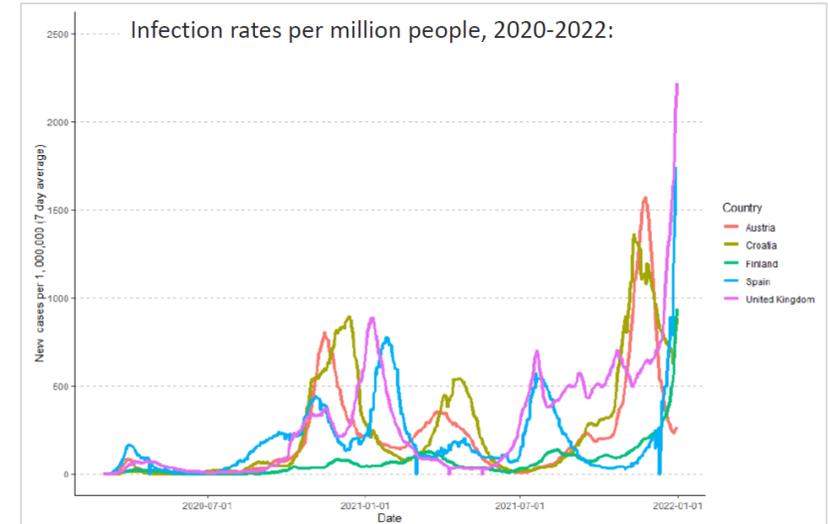
Research Use Cases on COVID-19 – Results



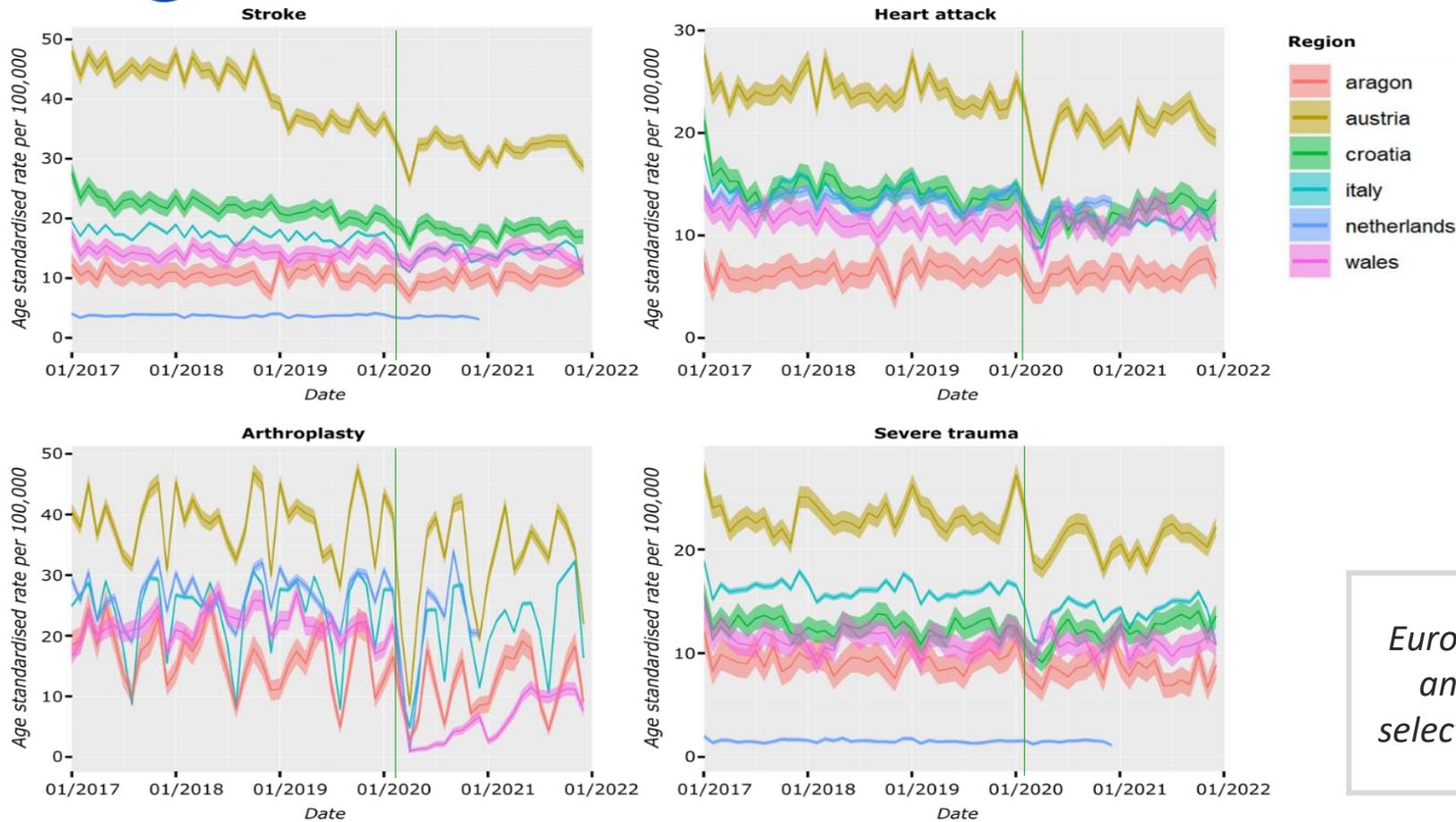
Has the COVID19 pandemic changed existing patterns of non-COVID-19 health care utilisation for (vulnerable) populations within and between countries?

- Heart attack and strokes (Cohort 1)
- Hip and knee replacements (Cohort 2)
- Serious trauma admissions (Cohort 3)

	Associated entity in ERD	Label (var_label)	Name (var_concept)	Classification/Encoding	Units	Format	Description
basics	patient	patient_id	patient identifier	private key ciphering function	none	string	patient pseudonymized identifier
	patient	sex	sex				
	patient	age_nm	age	none	years	integer	patient's age as of 2019-01-01
	observation period	period	[time period]	none	month	integer	natural month
cohort 1	heart event	acute_event_heart	major vascular event - heart attack	ICD10:I21			
	date heart event	date_event_heart	date - heart attack	date	date_DMY_nr	YYYY-mm-dd	
	stroke event	acute_event_stroke	major vascular event - stroke	I60-I64			
	date stroke event	date_event_stroke	date - stroke		date_DMY_nr	YYYY-mm-dd	
cohort 2	procedure	ttm_type_cd	type of treatment	types of treatment referred	none	integer	type of treatment received by the patient
	procedure	surgery_elective_hip	elective surgery, hip joint replacement	OPCS codes in UK W37-W39			
	procedure	surgery_elective_knee	elective surgery, knee joint replacement	OPCS codes in UK W40-W42			
cohort 3	condition	acute_event_trauma	hospital admission for trauma based on	ICD10: S720, S721, S722, S723,	none	string	Based on scientific analysis by New
	Date of event	date_event	date of admission	date	date_DMY_nr	YYYY-mm-dd	date of admission
optional	Optional:						
	patient	educ_cd	highest completed education level	quintile or top/bottom	quintiles	integer	patient's highest completed education
	patient	socecon_lvl_cd	socioeconomic level	quintile or top/bottom	quintiles	integer	patient's socioeconomic level (quintile)
	patient	country_cd	country (residence)	ISO3166	none	string	patient's country of residence
	patient	district_cd	district (residence)	e.g. Eurostat NUTS	none	string	
patient	country_origin_cd	country (origin)	ISO3166	none	string	patients' country of origin (country of	



Research Use Cases on COVID-19 – Results



European age-standardised rates (solid lines) and the 95% CI (shaded area) across four selected forms of HCU in six European regions.



Research Use Cases on COVID-19 – Results



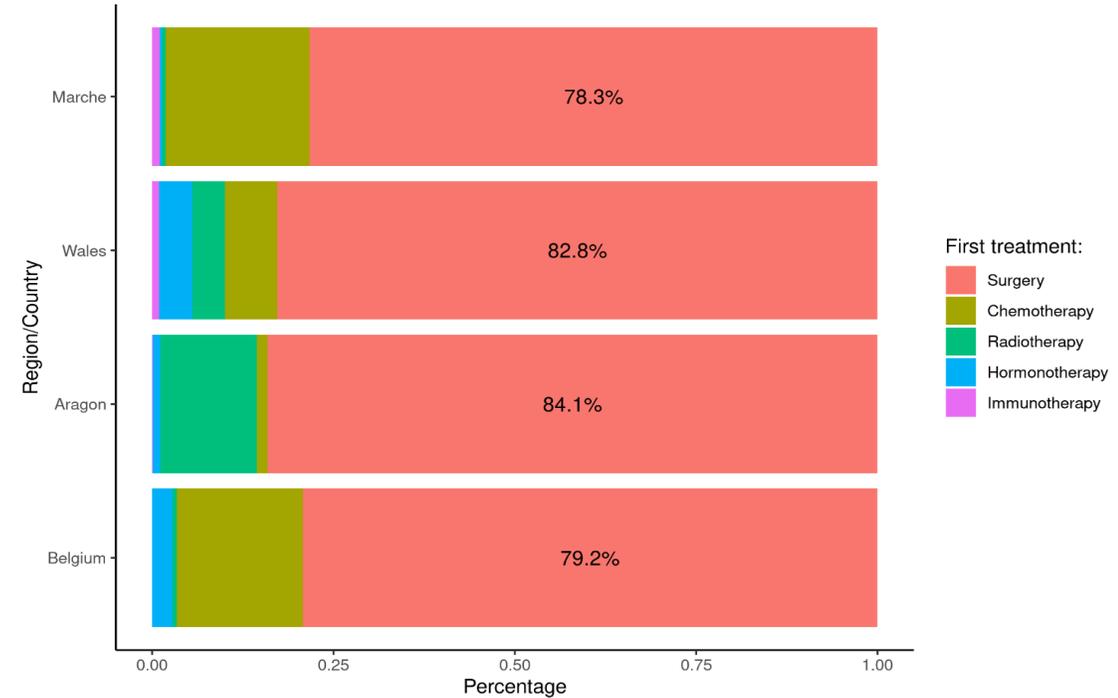
Was there any delay in the treatment of breast cancer patients associated with the COVID-19 pandemic?

Data hubs participation: N = 4

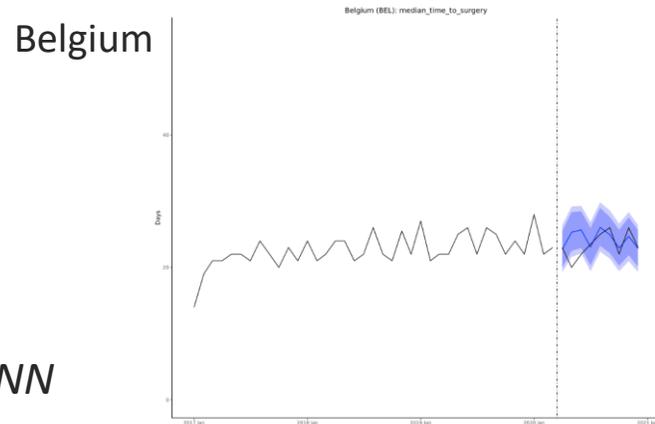
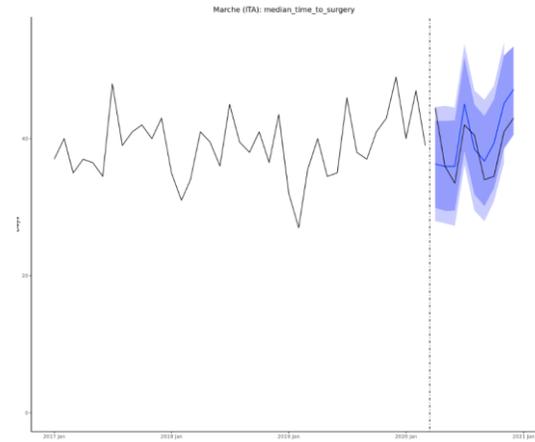
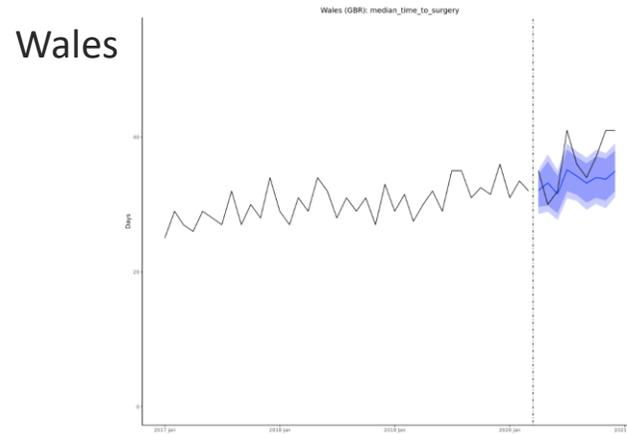
Aragon (AR, Spain), Wales (WA, United Kingdom),
Belgium (BE), Marche (MA, Italy)



Percentages of first treatment reported by country



Research Use Cases on COVID-19 – Results



Forecast, 39 observations, NN



Research Use Cases on COVID-19 – Results



Were population indicators of maternal and newborn health affected by the pandemic/lockdown?

Stillbirth (baby born without signs of life)

- 3-4 per 1000 births (15-18,000 babies per year in Europe)
- High health and psychological burden for parents, costs for families and society

Preterm birth (birth before 37 weeks of gestation)

- Affects about 350,000 births per year in Europe, few effective prevention strategies
- Principal cause of infant death
- Long-term neurodevelopment impairment and other health problems among survivors

>29 million births,
>2M preterm births
100K stillbirths
37K neonatal deaths

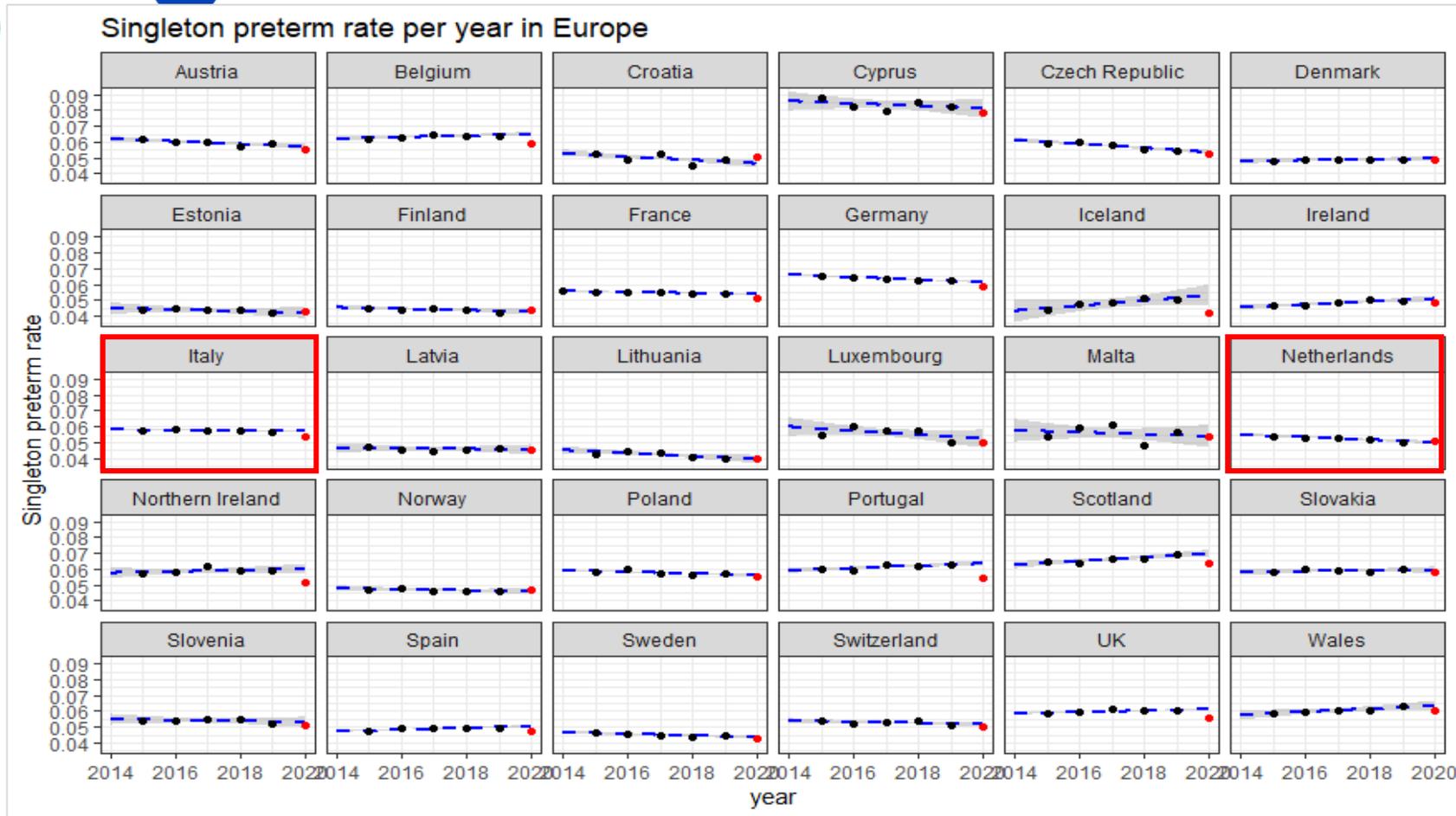
Implementation of PHIRI protocol

- Implemented successfully protocol
- Not yet implemented protocol

29 countries



Research Use Cases on COVID-19 – Results



Pooled estimate

RR=0.96 (0.96 to 0.98) = 4% decrease in preterm birth

High heterogeneity

$I^2 = 77.5\%$ (proportion of total variation in effect estimate due to between-study heterogeneity)

Range of effects = 10% decrease in preterm birth to moderate increase of 3 to 4%.

Countries with stronger effects: Portugal – Belgium – UK – Spain – Italy – France

Countries with no effects: Nordic and Baltic countries, Netherlands

Research Use Cases on COVID-19 – Results

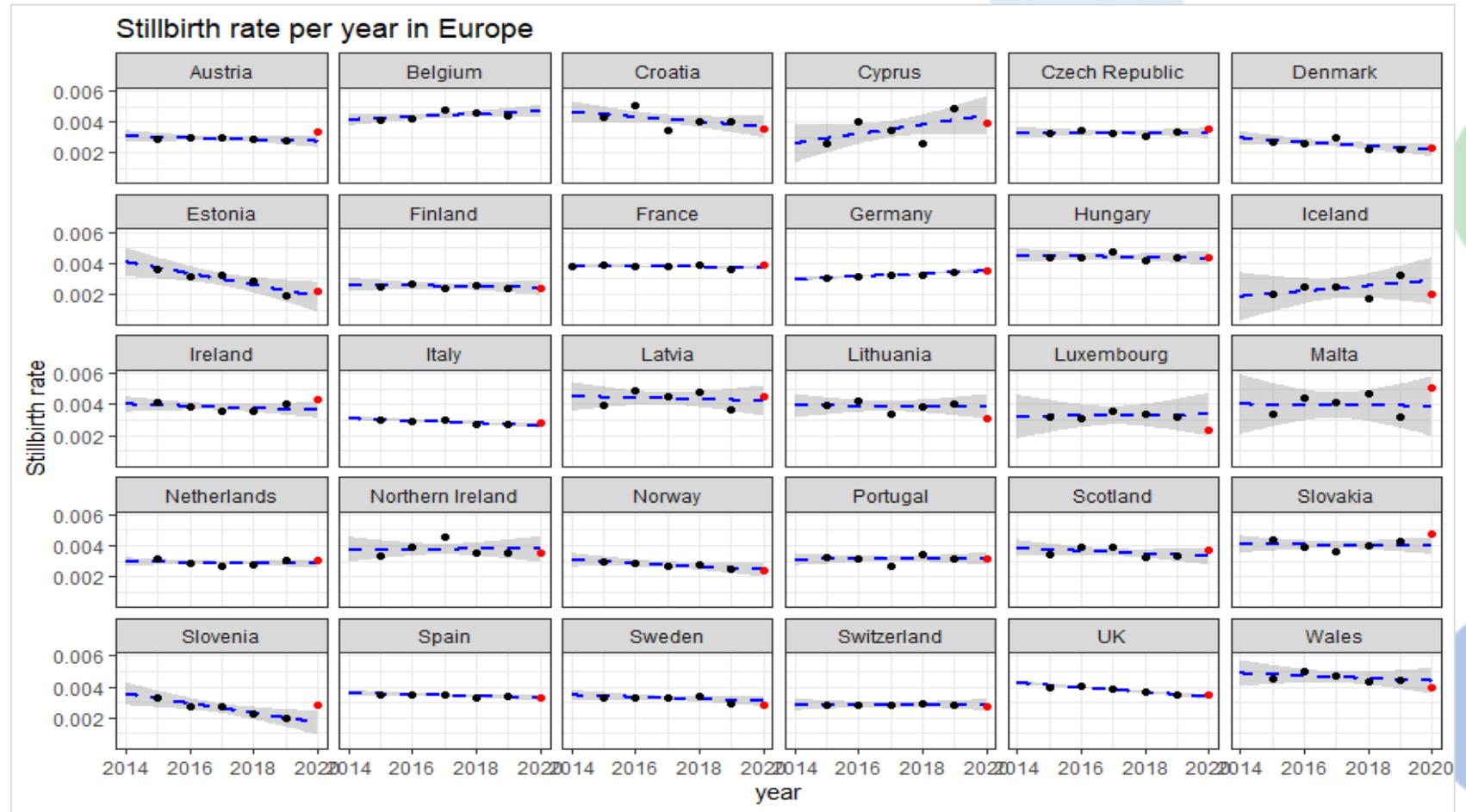
Estimate of pooled effect

RR=1.05 (1.02 to 1.08) = 5% increase in stillbirth

Lower heterogeneity

$I^2 = 20.3\%$ (proportion of total variation in effect estimate due to between-study heterogeneity)

Range of effects = No decreases significant / Austria higher stillbirth rates



Research Use Cases on COVID-19 – Results



Has the mental health status (depression/anxiety) of the general population changed during the COVID-19 pandemic?

Table 3: Proportion of respondents reporting having negative feelings by age and gender, EU27 (%)

		Summer 2020			Spring 2021		
		Tense	Lonely	Depressed	Tense	Lonely	Depressed
Men	18–34 years	34	25	21	46	35	34
	35–49 years	30	21	19	41	31	32
	50+ years	22	18	15	28	26	23
Women	18–34 years	45	30	28	52	38	40
	35–49 years	38	22	27	49	34	39
	50+ years	24	18	17	35	30	29

Notes: Green = lowest value, red = highest value. All differences between the two time periods are statistically significant. Any discrepancies between the figures in the text and table are due to rounding.

Results from 7 data hubs:

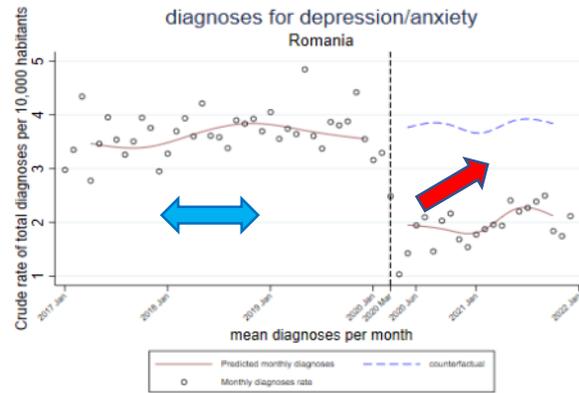
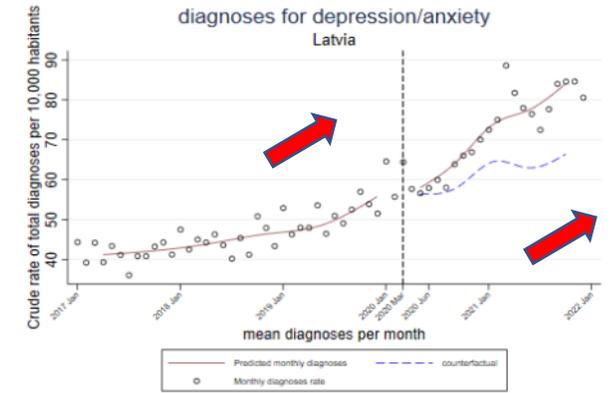
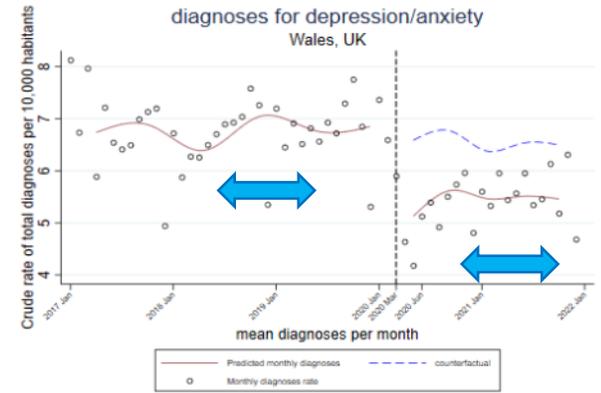
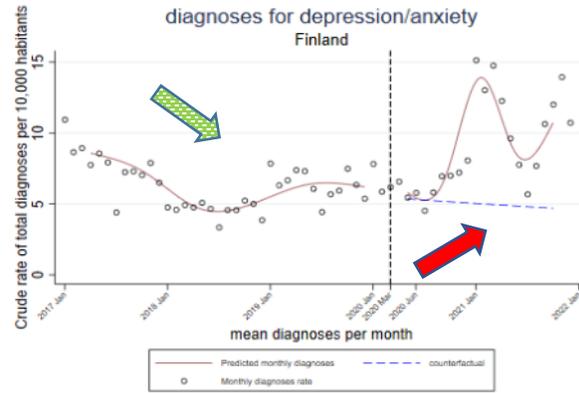
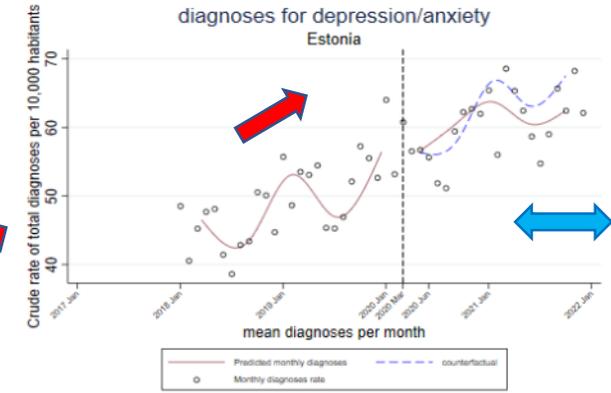
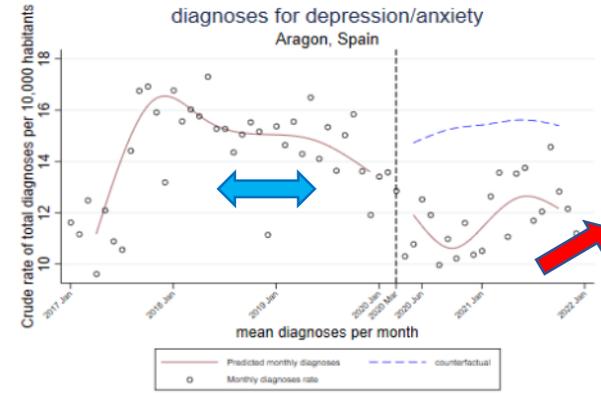
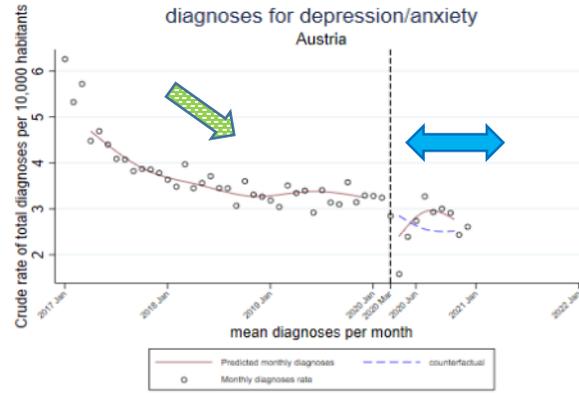
- Aragon (IACS)
- Austria
- Croatia
- Estonia
- Finland
- Romania
- Wales



Source: Living, working and COVID-19 e-survey data. Mental health and trust decline across EU as pandemic enters another year. EuroFound, 2021.

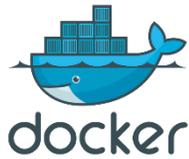


Diagnoses of depression or anxiety



- Decreasing trend
- Increasing trend
- Stable trend

Research Use Cases on COVID-19 – Achievements



Help desk supported use case deployment by **45 Tickets, 278 Emails and 27 Meetings**



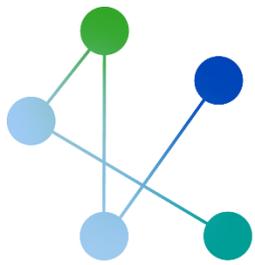
In **14 data hubs**, the PHIRI-app Docker is already deployed and tested

In **15 data hubs**, data is mobilized and (ready to be) analyzed in a distributed manner



13 published releases of PHIRI WP6 and WP7 on ZENODO

Special Issue in the European Journal of Public Health



PHIRI

Population Health Information
Research Infrastructure

What do population health researchers need to reuse sensitive individual level data? How can the PHIRI federated approach help?

Enrique Bernal-Delgado, IACS, ES
Martin Thissen, RKI, DE



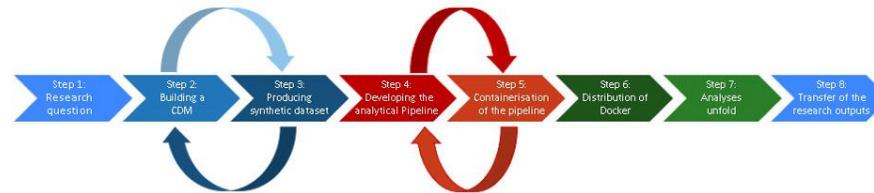
The issue

... when reusing data, particularly RWD, from multiple sites and multiple datasets

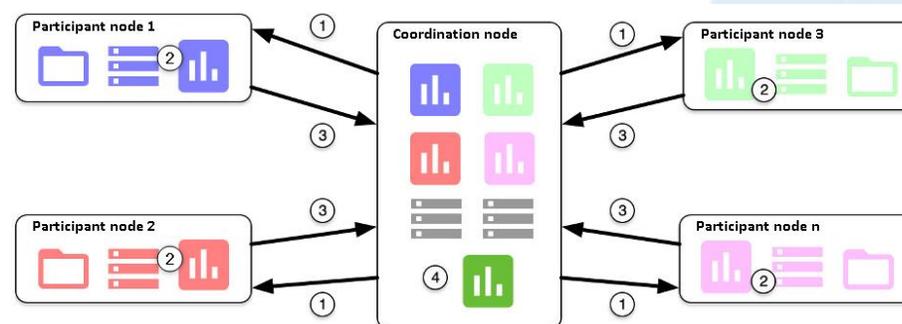
- Uneven data management capacity
- Poor harmonisation in data collection
- Poor standardisation in curation
- Poor datasets integration
- Quality issues in reuse
- Legal & ethical requisites – purpose, minimisation
- DPO sensitivity – risk aversion to reuse
- Uneven technical skills

The approach

- Data-visiting principle – “code meets data”
- Strict methodological workflow (LOST)



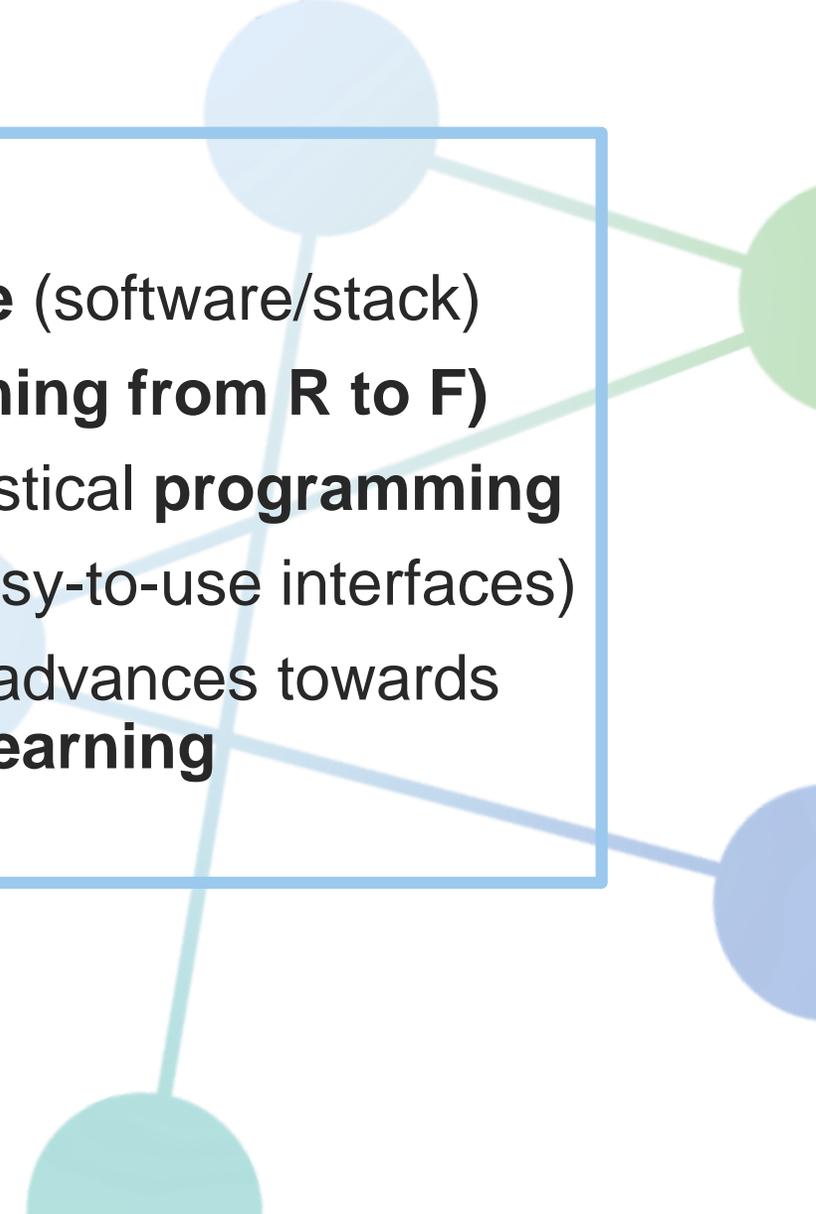
- Computational architecture



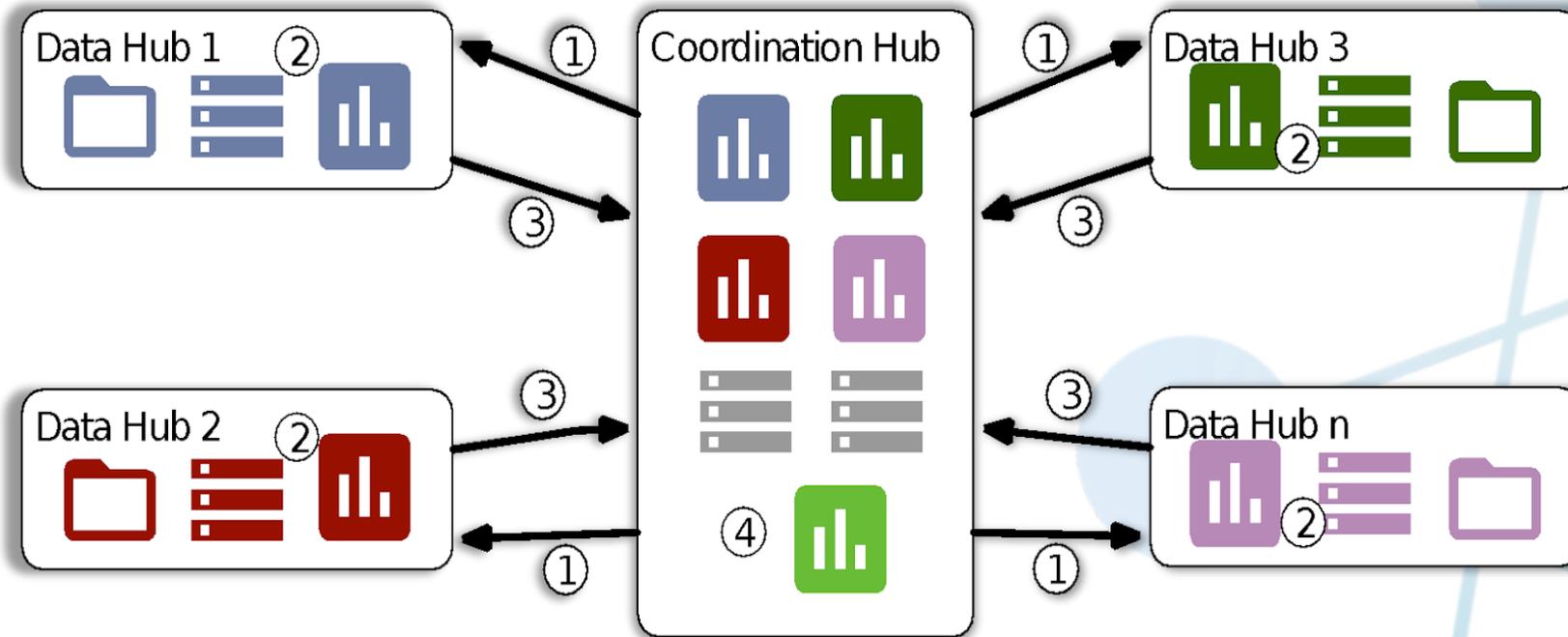


The principles

- **Research Question**
- **Secondary use**
- **Sensitive Health Data**
- Common Data Model (**CDM**)
- Security & **privacy by design**
- Enabling **rapid-cycle** analyses
- Aligned with HealthData@EU

- **Federated**
 - **Open source** (software/stack)
 - **FAIR** (stemming from R to F)
 - **Literate statistical programming**
 - **Usability** (easy-to-use interfaces)
 - Aligned with advances towards **Federated Learning**
- 

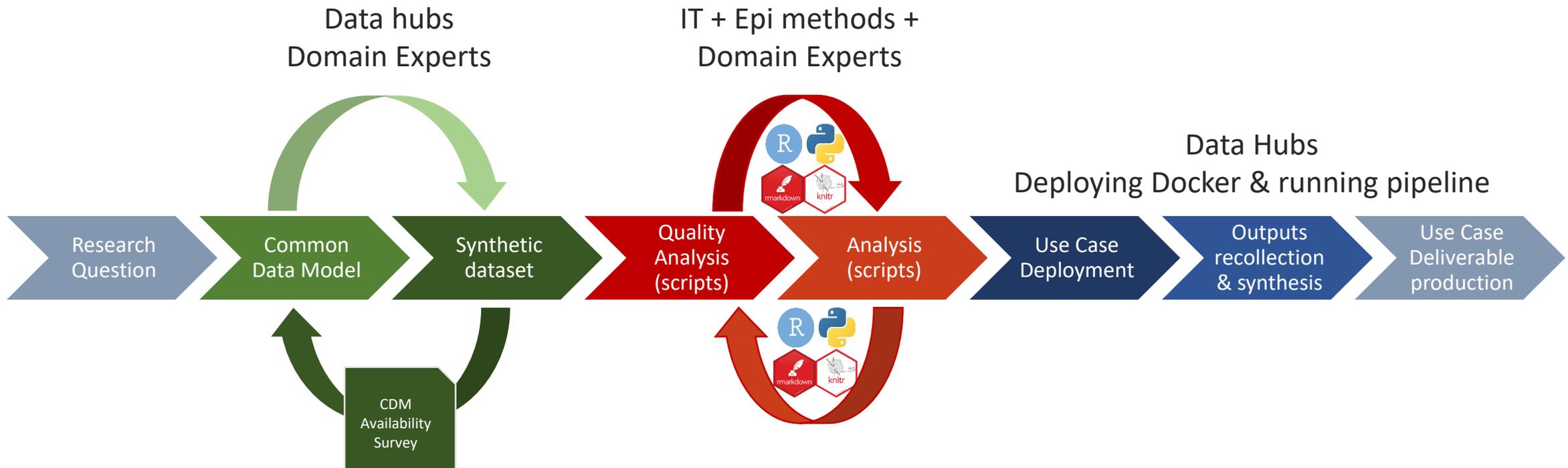
Federated architecture



Federated, secondary use, “codes meets data” strong reliance on interoperability



Strict workflow enabling LOST interoperability



Orchestration of research query and deployment

Synthetic dataset

PHIRI Federated Analysis Application (Docker)

Common Data Model

Synthetic Dataset

Quality Analysis (scripts)

Analysis (scripts)

Outputs recollection & synthesis

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	patient_id	ttn_type_cd	age_nm	time_dx_to_surgery_nm	time_dx_to_radiotherapy_nm	time_dx_to_chemotherapy_nm	time_dx_to_hormonotherapy_nm	time_dx_to_immunotherapy_nm	period	socecon_lvl_cd	country_cd	country_origin_cd	hospital_id	
2	1	1	59	21	NA	NA	NA	4	1	0	ESP	ESP	20	
3	2	2	60	13		15	NA	6	21	0	ESP	ESP	27	
4	3	2	54	53		2	NA	104	20	0	ESP	ESP	68	
5	4	5	51	6		3	NA	18	8	0	ESP	ESP	98	
6	5	3	72	NA	NA		1	NA	33	11	0	ESP	ESP	67
7	6	2	59		1	0	NA	NA	13	17	0	ESP	ESP	89
8	7	4	52	1	NA		NA	10	21	17	0	ESP	ESP	90
9	8	2	67	0		17	NA	NA	0	10	0	ESP	ESP	45
10	9	5	51	28		41	0	NA	2	33	1	ESP	ESP	5
11	10	2	57	1		53	NA	NA	0	11	0	ESP	ESP	88
12	11	5	58	53		16	7	NA	96	19	0	ESP	ESP	68
13	12	4	49	4	NA	NA		10	15	22	0	ESP	ESP	57
14	13	4	36	20	NA	NA		6	3	12	0	ESP	ESP	16
15	14	1	52	19	NA	NA		NA	8	7	0	ESP	ESP	17
16	15	4	64	0	NA	NA		1	13	22	0	ESP	ESP	13
17	16	4	46	116	NA	NA		107	61	27	0	ESP	ESP	75
18	17	1	65	3	NA	NA		NA	7	5	0	ESP	ESP	80
19	18	5	50	5		2	4	NA	12	14	0	ESP	ESP	54
20	19	4	42	10	NA	NA		4	52	29	0	ESP	ESP	40
21	20	5	68	32		2	93	NA	0	2	0	ESP	ESP	33
22	21	2	51	0		14	NA	NA	0	31	0	ESP	ESP	39
23	22	3	54	NA	NA		14	NA	0	21	0	ESP	ESP	94
24	23	3	44	NA	NA		37	NA	4	22	1	ESP	ESP	12
25	24	4	61	76	NA	NA		222	33	31	0	ESP	ESP	16
26	25	4	71	0	NA	NA		0	6	9	1	ESP	ESP	51
27	26	2	70	2		0	NA	NA	15	20	0	ESP	ESP	3
28	27	1	67	38	NA	NA		NA	35	32	0	ESP	ESP	90
29	28	5	56	81		319	9	NA	81	20	0	ESP	ESP	69
30	29	4	58	4	NA	NA		5	37	6	0	ESP	ESP	50
31	30	1	52	91	NA	NA		NA	178	1	0	ESP	ESP	41
32	31	5	57	0		1	0	NA	1	10	0	ESP	ESP	38
33	32	3	57	NA	NA		0	NA	2	21	0	ESP	ESP	92
34	33	1	47	92	NA	NA		NA	0	10	0	ESP	ESP	89
35	34	2	75	12		30	NA	NA	7	12	0	ESP	ESP	42
36	35	3	55	NA	NA		9	NA	2	20	0	ESP	ESP	75
37	36	5	43	38		72	22	NA	6	18	0	ESP	ESP	67
38	37	2	44	76		59	NA	NA	0	29	0	ESP	ESP	66
39	38	2	55	11		15	NA	NA	0	20	0	ESP	ESP	87

Data quality assessment

PHIRI Federated Analysis Application (Docker)

Common Data Model

Synthetic dataset

Quality Analysis (scripts)

Analysis (scripts)

Outputs recollection & synthesis

PHIRI delayed_ttm_breast_cancer

Using Python's Pandas Profiling API

Overview

Overview Warnings 13 Reproduction

Dataset statistics

Number of variables	13
Number of observations	19356
Missing cells	42583
Missing cells (%)	16.9%
Total size in memory	3.8 MiB
Average record size in memory	208.0 B

Overview Warnings 13 Reproduction

Warnings

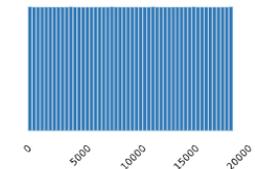
country_cd has constant value "ESP"	Constant
country_origin_cd has constant value "ESP"	Constant
time_dx_to_surgery_nm has 3909 (20.2%) missing values	Missing
time_dx_to_radiotherapy_nm has 11585 (59.9%) missing values	Missing
time_dx_to_chemotherapy_nm has 11558 (59.7%) missing values	Missing
time_dx_to_hormonotherapy_nm has 15531 (80.2%) missing values	Missing
patient_id has unique values	Unique
time_dx_to_surgery_nm has 1960 (10.1%) zeros	Zeros
time_dx_to_radiotherapy_nm has 1003 (5.2%) zeros	Zeros
time_dx_to_chemotherapy_nm has 1653 (8.5%) zeros	Zeros
time_dx_to_hormonotherapy_nm has 656 (3.4%) zeros	Zeros
time_dx_to_immunotherapy_nm has 3063 (15.9%) zeros	Zeros
socecon_lv1_cd has 17421 (90.0%) zeros	Zeros

Variables

patient_id
Real number ($\mathbb{R}_{>0}$)

UNIQUE

Distinct	19356	Minimum	1
Distinct (%)	100.0%	Maximum	19356
Missing	0	Zeros	0
Missing (%)	0.0%	Zeros (%)	0.0%
Infinite	0	Negative	0
Infinite (%)	0.0%	Negative (%)	0.0%



Analytical workflows

PHIRI Federated Analysis Application (Docker)

Common Data Model

Synthetic dataset

Quality Analysis (scripts)

Analysis (scripts)

Outputs recollection & synthesis

```
Run Chunk | Run Above
16 ```{r load_libraries}
17 ## 3. Load required libraries ####
18 library(DBI)
19 library(dplyr)
20 library(htmlTable)
21 library(magrittr)
22 library(utis)
23 library(tidyverse)
24 library(kableExtra)
25 library(wrapr)
26 library(plyr)
27
28
29 ```
30
31
32 Run Chunk | Run Above
33 ```{r load_data}
34 con <- dbConnect(RSQLite::SQLite(), "/home/phiri/analysis-scripts/inputs/database/database.db")
35 df <- dbReadTable(con, "perinatal_health")
36
37
38
39 Run Chunk | Run Above
40 ```{r indicators}
41 indicator_names <- c()
42 n_per_year22<-df %>% filter(GA >= 22, VITAL != 4, VITAL!= 1, VITAL !=99) %>% group_by(year) %>% tally()
43 total_per_year22 <- df %>% filter(GA >= 22) %>% group_by(year) %>% tally()
44 n_per_year22$indicator <- "aa_22weeks"
45
46 n_per_year24<-df %>% filter(GA >= 24, VITAL != 4, VITAL!= 1, VITAL !=99) %>% group_by(year) %>% tally()
47 total_per_year24 <- df %>% filter(GA >= 24) %>% group_by(year) %>% tally()
48 n_per_year24$indicator <- "ab_24weeks"
49
50 n_per_year28<-df %>% filter(GA >= 28, VITAL != 4, VITAL!= 1, VITAL !=99) %>% group_by(year) %>% tally()
51 total_per_year28 <- df %>% filter(GA >= 28) %>% group_by(year) %>% tally()
52 n_per_year28$indicator <- "ac_28weeks"
```

Containerised solution ready for deployment

PHIRI Federated Analysis Application (Docker)

Common Data Model

Synthetic dataset

Quality Analysis (scripts)

Analysis (scripts)

Use Case Deployment

The screenshot displays the PHIRI Federated Analysis Application interface. At the top, the PHIRI logo (Population Health Information Research Infrastructure) is visible. The main content area is divided into four use case cards:

- USE CASE A: Vulnerable populations**
Has the COVID-19 pandemic changed existing patterns of non-COVID-19 health care utilisation and mortality for vulnerable populations within and between countries?
[CHECK THE DATA MODEL HERE!](#)
- USE CASE B: Delayed treatment in breast cancer**
Has there been any increase in surgical and/or co-adjuvant (i.e. radiotherapy, chemotherapy, immunotherapy) treatments delay in eligible women diagnosed of breast cancer, as a consequence of the COVID-19 crisis?
[CHECK THE DATA MODEL HERE!](#)
- USE CASE C: Perinatal health**
Focus on the indirect effects of the COVID-19 pandemic on maternal and newborn health with a focus on potential inequalities regarding non-deferrable healthcare needs and risks of adverse perinatal outcomes due to stress and social deprivation.
[CHECK THE DATA MODEL HERE!](#)
- USE CASE D: Mental health**
Has there been any increase in individuals with mental health risk factors or mental disease, as a consequence of the COVID-19 crisis? This case study will measure changes in population mental health and healthcare utilisation associated with the COVID-19 pandemic.
[CHECK THE DATA MODEL HERE!](#)

Below the use cases, there are two main sections under the heading "Application":

- Data mapping**
1) Select the Use Case you want to participate in and introduce your data for analysis. Data should be extracted from your health information systems following the requirements and specifications of the data model of the use case.
- General analysis**
2) Select the Use Case you want to participate in and launch the analysis provided by the Use Case coordinators. Analysis scripts are open source and can be audited by anyone.

The Docker logo is located in the bottom right corner of the interface.

Running local analyses and results devolution

PHIRI Federated Analysis Application (Docker)

Common Data Model

Synthetic dataset

Quality Analysis (scripts)

Analysis (scripts)

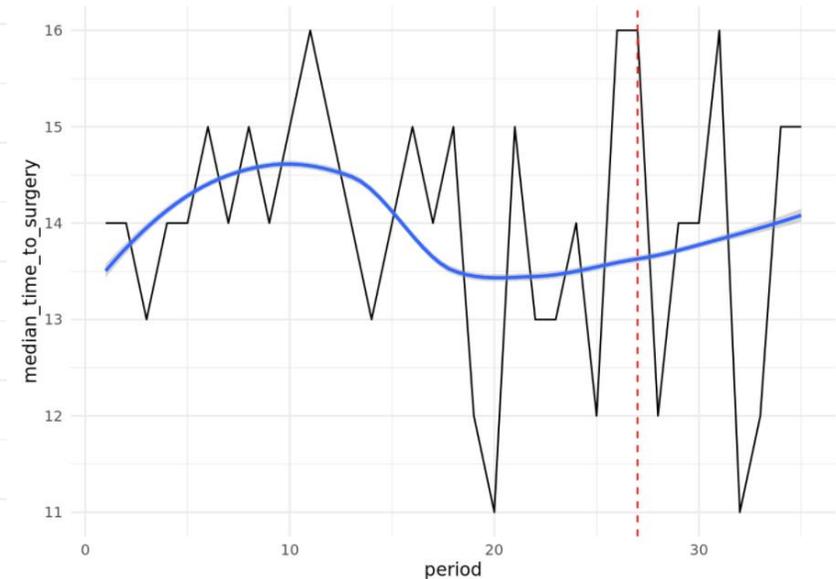
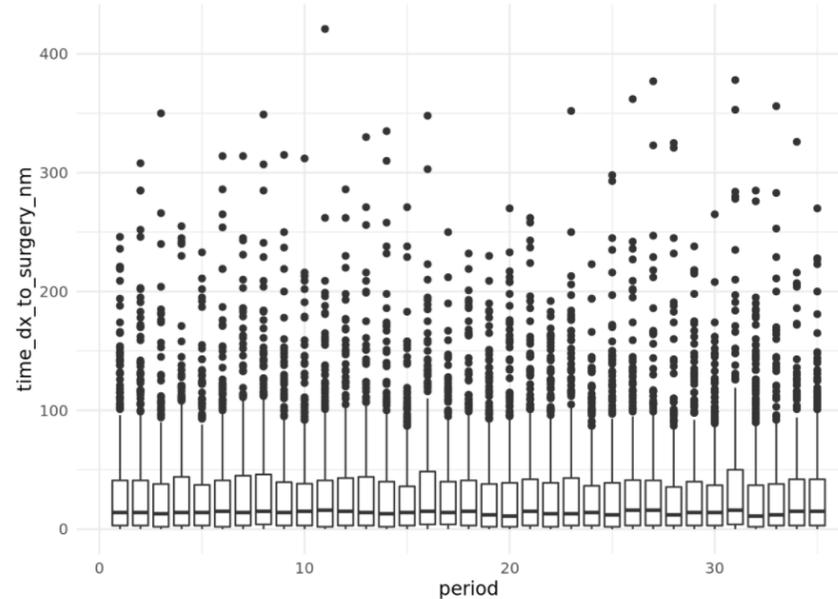
Outputs recollection & synthesis

Use Case B report example with synthetic data

Estupiñán-Romero, Francisco; González-Galindo, Javier; Bernal-Delgado, Enrique
16/6/2021

Exploratory Analysis (Local)

Distribution of times from diagnosis of breast cancer to treatment



Achievements

App for deployment

PHIRI
Population Health Information Research Infrastructure

USE CASE A
Vulnerable populations
How the COVID-19 pandemic changed existing patterns of non-COVID-19 health care utilization and mortality for vulnerable populations within and between countries?
[CHECK THE DATA MODEL HERE!](#)

USE CASE B
Delayed treatment in breast cancer
Has there been any increase in applied and/or no adjustment (i.e. radiotherapy, chemotherapy, immunotherapy) treatments due to a decline in access to breast cancer, as a consequence of the COVID-19 crisis?
[CHECK THE DATA MODEL HERE!](#)

USE CASE C
Perinatal health
Focus on the indirect effects of the COVID-19 pandemic on maternal and newborn health with a focus on potential inequalities regarding non-deliverable health care events and risks of adverse perinatal outcomes due to access and social deprivation.
[CHECK THE DATA MODEL HERE!](#)

USE CASE D
Medical health
Has there been any increase in individuals with mental health risk factors or mental disorders, as a consequence of the COVID-19 crisis? This case study will measure changes in population mental health and healthcare utilization associated with the COVID-19 pandemic.
[CHECK THE DATA MODEL HERE!](#)

Application

Data mapping

Select the use case you want to participate in and introduce your data to analyse. Data should be extracted from your health information systems. Following the requirements and specifications of the data model of the use case.

General analysis

Select the use case you want to participate in and watch the random generated by the Use Case coordinators. Analysis reports are sent weekly and can be updated by email.

Do it yourself

European Health Information Portal

HOME - SERVICES STYLE I - PHIRI DEMONSTRATORS

PHIRI WP5 USE CASE B (DEMONSTRATOR)

DESCRIPTIVE ANALYSIS

Interaction analysis of the distribution of user requests on their own use cases and on the general population of the demonstrators.

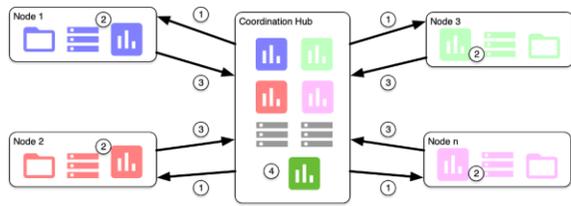
Figures 1: User requests by month and by use case.

Figures 2: Best cancer treatment standardized rates.

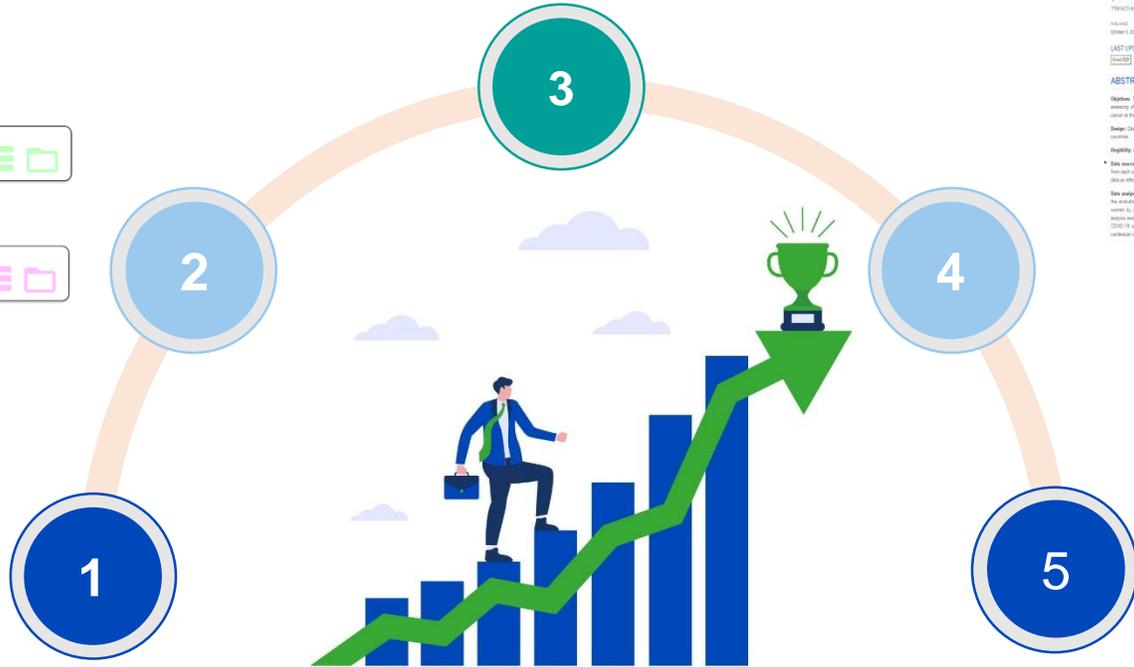
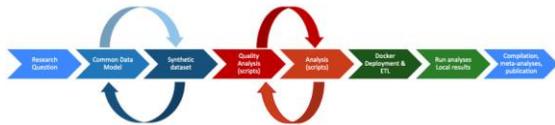
Figures 3: Best cancer treatment standardized rates by region.

Figures 4: Best cancer treatment standardized rates by region.

Federated architecture



LOST pipeline for PICO-t



Others are using PHIRI

zer1000

BY-COVID - WP5 - Baseline Use Case: SARS-CoV-2 vaccine effectiveness assessment preliminary outputs from Aragon, Spain

94 views | 3 downloads

OpenAIRE

Publication date: May 12, 2023

DOI: 10.21203/3.10012000

Keywords: COVID-19, SARS-CoV-2, vaccine effectiveness, Aragon, Spain

Abstract: This article presents the preliminary results of the baseline use case (WP5) in the PHIRI project on SARS-CoV-2 (baseline) effectiveness assessment (SARS-CoV-2 infection in Aragon, Spain). Research Question: How effective have the SARS-CoV-2 vaccination programmes been in preventing SARS-CoV-2 infection? Intervention (exposure): COVID-19 vaccine(s) Exclusion: SARS-CoV-2 infection Outcome analysis: Vaccination schedule (type of vaccine)

Study Design: An observational retrospective longitudinal study to assess the effectiveness of the SARS-CoV-2 vaccine in preventing SARS-CoV-2 infection using routinely collected social, health and care data from several countries. A causal model was established using Directed Acyclic Graphs (DAGs) to map domain knowledge, theories and assumptions about the causal relationship between exposure and outcome. The DAG developed for the research question of interest is shown below.

Conduct definition: All people eligible to be vaccinated from 1 to 115 years old, included or not, at least one dose of a SARS-CoV-2 vaccine (one part of the available vaccine) being or not a person SARS-CoV-2 infection.

Inclusion criteria: All people vaccinated with at least one dose of the COVID-19 vaccine (any available brands) in an actual residence. Any person eligible to be vaccinated from 1 to 115 years old, included with available diagnosis (irrespective of the type of test) for SARS-CoV-2 infection (COVID-19) during the period of study.

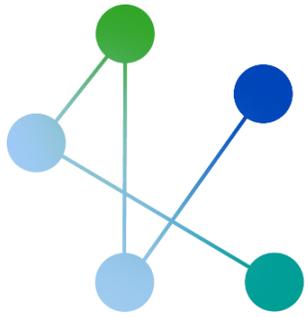
Exclusion criteria: People not eligible for vaccine from 1 to 115 years old, included.

Study period: From the date of the first documented SARS-CoV-2 infection in each country to the most recent date in which data is available at the time of analysis (up to 30-06-2022), depending on the country.

Outcome: Time from primary vaccination to confirmed SARS-CoV-2 infection.

These outputs correspond with the interactive reports of each main step of the analytical pipeline described in 'Methods' and their associated analyses have been produced using routinely collected data from public health and the national health system in the region of Aragon (Spain) with population coverage (~1.3 million lives).

The scripts implementing the statistical analyses in the analytical pipeline are available on GitHub, with additional documentation supporting the development and implementation of the baseline use case.



PHIRI

Population Health Information
Research Infrastructure

Thank you for your attention

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Martin Thissen, RKI, DE

ROBERT KOCH INSTITUT

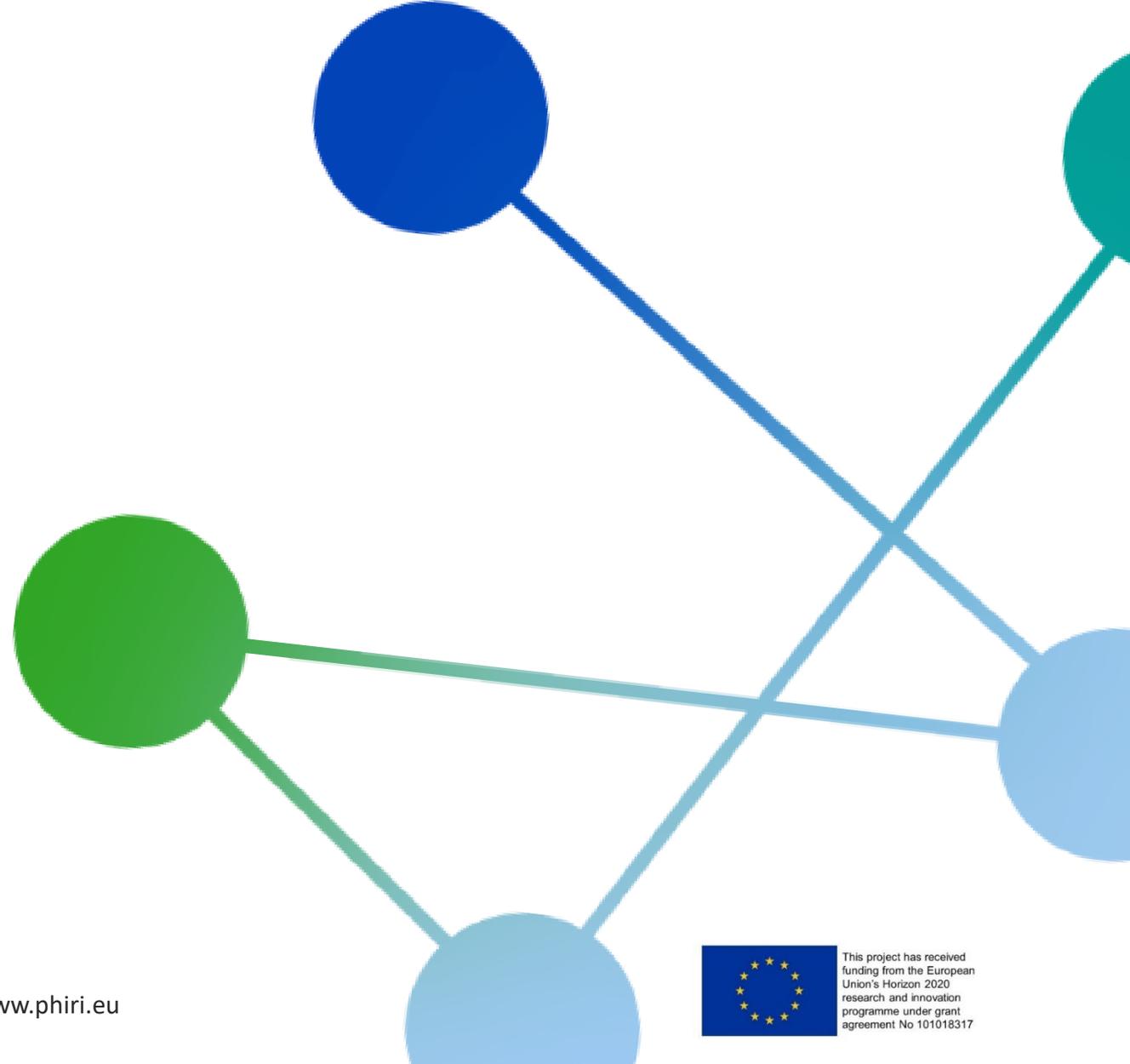


Instituto Aragonés de
Ciencias de la Salud

www.phiri.eu



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PHIRI Federated Analysis Application (Docker) User Interface Tutorial

PHIRI
Population Health Information
Research Infrastructure

USE CASE A
Vulnerable populations
Has the COVID19 pandemic changed existing patterns of non-COVID-19 health care utilisation and mortality for vulnerable populations within and between countries?
[CHECK THE DATA MODEL HERE!](#)

USE CASE B
Delayed treatment in breast cancer
Has there been any increase in surgical and/or co-adjuvant (i.e. radiotherapy, chemotherapy, immunotherapy) treatments delay in eligible women diagnosed of breast cancer, as a consequence of the COVID19 crisis?
[CHECK THE DATA MODEL HERE!](#)

USE CASE C
Perinatal health
Focus on the indirect effects of the COVID-19 pandemic on maternal and newborn health with a focus on potential inequalities regarding non-deferrable healthcare needs and risks of adverse perinatal outcomes due to stress and social deprivation.
[CHECK THE DATA MODEL HERE!](#)

USE CASE D
Mental health
Has there been any increase in individuals with mental health risk factors or mental disease, as a consequence of the COVID19 crisis? This case study will measure changes in population mental health and healthcare utilisation associated with the COVID-19 pandemic.
[CHECK THE DATA MODEL HERE!](#)

Application

Data mapping
1) Select the Use Case you want to participate in and introduce your data for analysis. Data should be extracted from your health information systems following the requirements and specifications of the data model of the use

General analysis
2) Select the Use Case you want to participate in and launch the analyses provided by the Use Case coordinators. Analyses scripts are open source and can be audited by anyone.

PHIRI Federated Analysis Application (Docker) User Interface

The screenshot displays the PHIRI Federated Analysis User Interface. On the left is a navigation menu with the following items: Home, Data mapping, General analysis, Process control, and Outputs retrieval. A large green arrow points from the 'Data mapping' menu item to the first step of the application process. The main content area is titled 'Application' and contains four numbered steps, each with a 'GO' button and a 'CHECK THE DATA MODEL HERE!' warning box above it.

Application

- 1 Data mapping**
1) Select the Use Case you want to participate in and introduce your data for analysis. Data should be extracted from your health information systems following the requirements and specifications of the data model of the use case in which you want to participate.
GO
- 2 General analysis**
2) Select the Use Case you want to participate in and launch the analyses provided by the Use Case coordinators. Analyses scripts are open source and can be audited by anyone.
GO
- 3 Process control**
3) Monitors the operation of each step (i.e. introducing and loading data, performing the analyses, etc.) and stop the process in case of any issue or difficulty is observed during their execution.
GO
- 4 Outputs retrieval**
4) Retrieve your outputs once the analyses have run successfully. Outputs from the analysis may include interactive reports (in HTML format), the DQA report of the data analysed (in HTML format) and aggregated data files to share for the federated analysis for each use case.
GO

Data quality analysis

Data Quality Assessment (DQA)
This application will produce by default a brief data quality assessment (DQA) of the datasets introduced for analysis by each participant partner. The DQA report can be retrieved in the 'Outputs' menu as a HTML document. The DQA report (see screenshot below) will include basic statistic information on each variable according to the data model required for conducting the analysis in each Use Case for you to check any quality issues with your data.

PHIRI Federated Analysis Application (Docker) User Interface

PHIRI
Population Health Information
Research Infrastructure

USE CASE A
Vulnerable populations
Has the COVID19 pandemic changed existing patterns of non-COVID-19 health care utilisation and mortality for vulnerable populations within and between countries?
[CHECK THE DATA MODEL HERE!](#)

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Delayed treatment in breast cancer
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Perinatal health
Focus on the indirect effects of the COVID-19 pandemic on maternal and newborn health with a focus on potential inequalities regarding non-deferrable healthcare needs and risks of adverse perinatal outcomes due to stress and social deprivation.
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USE CASE D
Mental health
Has there been any increase in individuals with mental health risk factors or mental disease, as a consequence of the COVID19 crisis? This case study will measure changes in population mental health and healthcare utilisation associated with the COVID-19 pandemic.
[CHECK THE DATA MODEL HERE!](#)

Application

Data mapping
1) Select the Use Case you want to participate in and

General analysis
2) Select the Use Case you want to participate in and launch

datamodel_vuln....zip

Mostrar todo

You can access all the common data model specification for each use case directly inside the app



PHIRI Federated Analysis Application (Docker) User Interface

Use case	Number of records	Date of loading	Actions
Delayed ttm breast cancer	19356	2021-06-17 14:07:30	⌵
Perinatal health	0		⌵
Mental health	1000	2021-06-16 11:58:51	⌵
Vulnerable populations (Heart attack and strokes)	0		⌵
Vulnerable populations (Hip and knee replacements)	0		⌵
Vulnerable populations (Severe trauma)	0		⌵

Rows per page: 10 1-6 of 6 < >

Mapper

Use case selector

Use case selector

Use case requirements

Please be strict with the coding of the name and extension of the data files to be uploaded for analysis.

File upload

To participate in a use case, you select the use case you want to participate in using the 'Use Case Selector'. This informs the application of the right syntactic and quality assessments to perform on the input data to check compliance with the specific use case data model



PHIRI Federated Analysis Application (Docker) User Interface

Mental health 1000 2021-06-16 11:58:51

Vulnerable populations (Heart attack and strokes) 0

Vulnerable populations (Hip and knee replacements) 0

Vulnerable populations (Severe trauma) 0

Rows per page: 10 1-6 of 6

Mapper

Use case selector

Delayed ttm breast cancer

Use case requirements

Please be strict with the coding of the name and extension of the data files to be uploaded for analysis.

File upload

Select file breast_cancer_ttm_delays_synthetic_dataset_v2.0.csv

Include exploratory data analysis (EDA).

Number of errors

-

See detail Download log

Load data

Once you select the use case, you can load your input data selecting the file from your system and clicking on the 'Load data' button

PHIRI Federated Analysis Application (Docker) User Interface

Mental health	1000	2021-06-16 11:58:51	
Vulnerable populations (Heart attack and strokes)	0		
Vulnerable populations (Hip and knee replacements)	0		
Vulnerable populations (Severe trauma)	0		

Rows per page: 10 1-6 of 6

Mapper

Use case selector

Delayed ttm breast cancer

Use case requirements

Please be strict with the coding of the name and extension of the data files to be uploaded for analysis.

File upload

Select file breast_cancer_ttm_delays_synthetic_dataset_v2.0.csv

Include exploratory data analysis (EDA).

Load data

Number of errors

-

See detail Download log

The PHIRI app checks whether your input data syntactically complies with the specifications of the data model for the use case you selected before and if it does not comply, it produces an error log file with information on the registers (lines) and variables (columns) that are not compliant for you to check and correct

PHIRI Federated Analysis Application (Docker) User Interface

Mental health 1000 2021-06-16 11:58:51

Vulnerable populations (Heart attack and strokes) 0

Vulnerable populations (Hip and knee replacements) 0

Vulnerable populations (Severe trauma) 0

Rows per page: 10 1-6 of 6

Mapper

Use case selector

File	Line	Message
aggregated_output_2021-06-17_11_17_39_delayed_ttm_breast_cancer.csv		ERROR - The header does not exist or is not correct.

Rows per page: 10 1-1 of 1

CLOSE

File upload

Select file aggregated_output_2021-06-17_11_17_39_delayed_ttm_breast_cancer.csv

Include exploratory data analysis (EDA).

Number of errors

1

See detail Download log

Load data

You can review the syntactic errors within the PHIRI app or download the error log

PHIRI Federated Analysis Application (Docker) User Interface

General analysis

Use case selector

Delayed ttm breast cancer

Description of the analysis

Has there been any increase in surgical and/or co-adjuvant (i.e. radiotherapy, chemotherapy, immunotherapy) treatments delay in eligible women diagnosed of breast cancer, as a consequence of the COVID19 crisis?

Analysis

Please, be aware that this process may take several minutes depending on the Use Case.

Launch analysis

Next step if there are no syntactic errors will be to 'Launch' the analysis.

The PHIRI app automatically launches the Data Quality Analysis in the background upon mapping the data without errors but you have to explicitly launch the analysis.



As you can be participating in multiple use cases, the PHIRI app enables you to map several data inputs (one per use case) and select for which use case you want to launch the analysis.

Use the 'Use case selector' in the 'General Analysis' tab to select the use case you want to run and click on the 'Launch analysis' button

PHIRI Federated Analysis Application (Docker) User Interface

General analysis

Use case selector

Delayed ttm breast cancer

Description of the analysis

Has there been any increase in surgical and/or co-adjuvant (i.e. radiotherapy, chemotherapy, immunotherapy) treatments delay in eligible women diagnosed of breast cancer, as a consequence of the COVID19 crisis?

Analysis

Please, be aware that this process may take several minutes depending on the Use Case.

Process is running

The 'Launch analysis' button will change to 'Process is running' while the analysis is running. The PHIRI app will produce several messages for you to know when the analysis are done or in case of an issue.

PHIRI Federated Analysis Application (Docker) User Interface

Active processes

Name	Start time	Use case	Actions
Analysis	14:34	Delayed ttm breast cancer	⊙

Rows per page: 10 1-1 of 1 < >

In any case, you can control the analysis process in the 'Process control' tab by 'killing/stopping' a process at any time – for instance, if a process takes to long.

PHIRI Federated Analysis Application (Docker) User Interface

Active processes

Name	Start time	Use case	Actions
Analysis	14:34	Delayed ttm breast cancer	⊙

Rows per page: 10 1-1 of 1

Are you sure you want to stop it?

CANCEL STOP

PHIRI Federated Analysis Application (Docker) User Interface

General analysis

Use case selector

Delayed ttm breast cancer

Description of the analysis

Has there been any increase in surgical and/or co-adjuvant (i.e. radiotherapy, chemotherapy, immunotherapy) treatments delay in eligible women diagnosed of breast cancer, as a consequence of the COVID19 crisis?

Analysis

Please, be aware that this process may take several minutes depending on the Use Case.

Process is running

PHIRI Federated Analysis Application (Docker) User Interface

General analysis

Use case selector

Delayed ttm breast cancer

Description of the analysis

Has there been any increase in surgical and/or co-adjuvant (i.e. radiotherapy, chemotherapy, immunotherapy) treatments delay in eligible women diagnosed of breast cancer, as a consequence of the COVID19 crisis?

Analysis

Please, be aware that this process may take several minutes depending on the Use Case.

Launch analysis

Once the analysis are done you can go to the 'Outputs retrieval' tab to check and download your outputs



PHIRI Federated Analysis Application (Docker) User Interface

Name	Date	Time	Use Case	Actions
EDA	2021-06-16	09:38:06	mental_health	
aggregated_output	2021-06-17	13:13:15	delayed_ttm_breast_cancer	
report	2021-06-17	13:13:15	delayed_ttm_breast_cancer	
aggregated_output	2021-06-17	14:36:57	delayed_ttm_breast_cancer	
report	2021-06-17	14:36:57	delayed_ttm_breast_cancer	

Rows per page: 10 1-5 of 5



PHIRI Federated Analysis Application (Docker) User Interface

The screenshot displays the 'Reports' section of the PHIRI application. A table lists several reports, with the first row highlighted in red. A confirmation dialog box is overlaid on the table, asking 'Are you sure you want to delete it?' with 'CANCEL' and 'DELETE' options. A green arrow points to the 'DELETE' button. A red prohibition sign is visible to the right of the table.

Name	Date	Time	Use Case	Actions
EDA	2021-06-16	09:38:06	mental_health	
aggregated_output	2021-06-17	13:13:15	delayed_ttm_breast_cancer	
report	2021-06-17	13:13:15	delayed_ttm_breast_cancer	
aggregated_output	2021-06-17	14:36:57	delayed_ttm_breast_cancer	
report	2021-06-17	14:36:57	delayed_ttm_breast_cancer	

Are you sure you want to delete it?

[CANCEL](#) [DELETE](#)

PHIRI Federated Analysis Application (Docker) User Interface

Name	Date	Time	Use Case	Actions
EDA	2021-06-16	09:38:06	mental_health	⬇️ 🗑️
aggregated_output	2021-06-17	13:13:15	delayed_ttm_breast_cancer	⬇️ 🗑️
report	2021-06-17	13:13:15	delayed_ttm_breast_cancer	⬇️ 🗑️
aggregated_output	2021-06-17	14:36:57	delayed_ttm_breast_cancer	⬇️ 🗑️
report	2021-06-17	14:36:57	delayed_ttm_breast_cancer	⬇️ 🗑️

Rows per page: 10 1-5 of 5

aggregated_out...csv report_2021-0...html

PHIRI Federated Analysis Application (Docker)

- PHIRI app demo available at phiri.iacs.es
- Help-Desk
 - Technical/Implementation support:
 - To: festupinnan.iacs@aragon.es

THANKS!



Replicating a use case in a federated research infrastructure

https://github.com/cienciadedatosysalud/tutorial_cdmb_EUPHA

https://github.com/cienciadedatosysalud/by-covid_baseline-use-case_EUPHA