

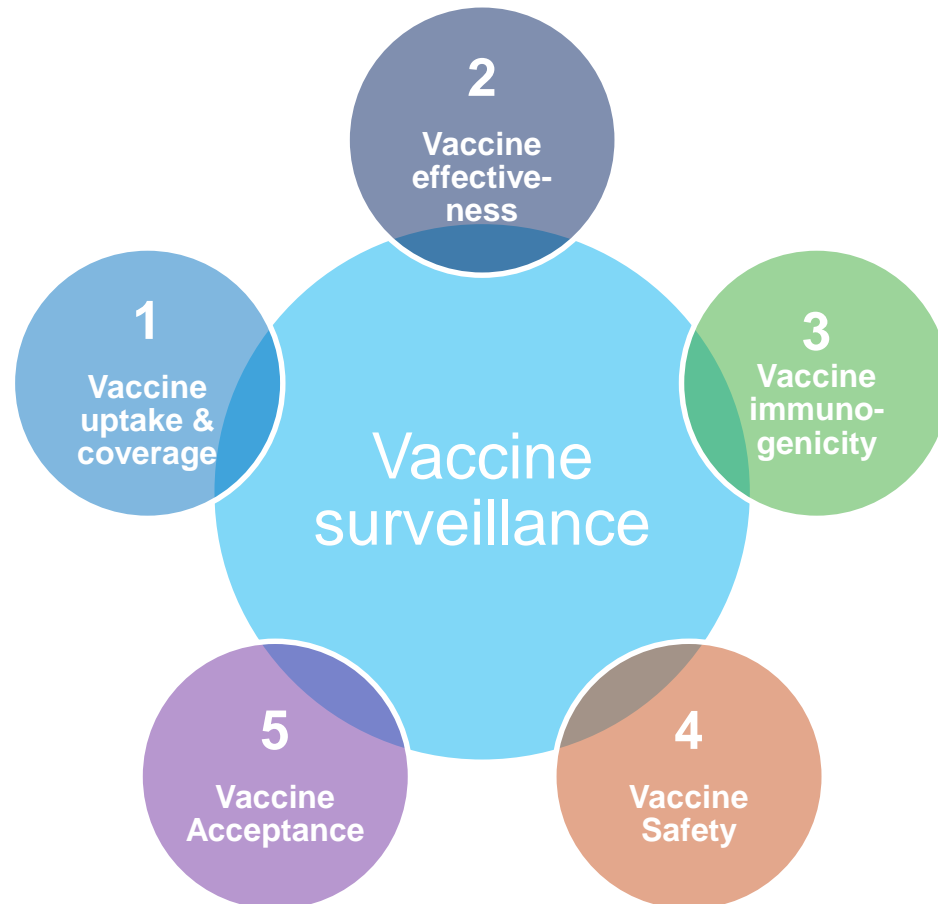
COVID-19 VACCINE SURVEILLANCE IN BELGIUM: THE LINK-VACC PROJECT

Seminar Infectious Diseases
19 May 2022

Joris van Loenhout

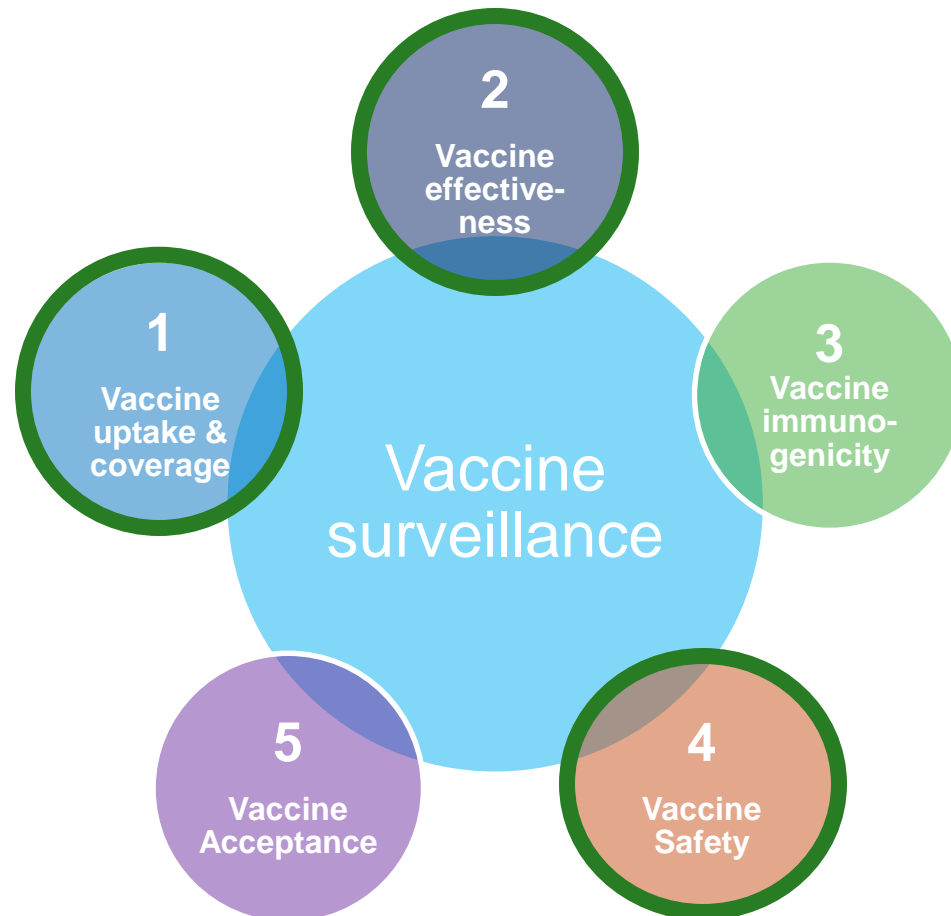
Background

- All COVID-19 vaccines approved for use in Belgium have been evaluated in clinical trials for safety, immunogenicity, and vaccine efficacy
- Nevertheless, in the post-marketing phase that follows vaccine registration, 5 pillars of surveillance remain indispensable



Background

- Sciensano set up the **LINK-VACC** project:
“**Linking of registries for COVID-19 vaccine surveillance**”



LINK-VACC Project

Context: HealthCare sector overloaded since the beginning of the pandemic

Aim: Avoid a new prospective data collection

Proposal: Link existing databases, to create a prospective cohort of COVID-19 vaccinated persons and allow the monitoring of the pillars of surveillance

Added value: Access to systematically collected, well-defined data in existing national health registries

LINK-VACC scopes

1

Vaccine uptake & coverage

- By age, gender, geographical region, vaccine brand
- By target group (HCW, nursing homes, pseudopathologies)
- By socio-economic and socio-demographic indicators

2

Breakthrough infections

- Breakthrough cases = COVID-19 confirmed cases occurring in vaccinated individuals
- Calculating incidence rates
- Identifying characteristics associated with breakthrough infections

3

Vaccine effectiveness

- Measuring vaccine effectiveness (VE) against laboratory-confirmed SARS-CoV-2 infection / hospitalization
- VE by target group, age, gender, risk-group, vaccine brand
- Correcting for relevant confounders (e.g. co-morbidities)

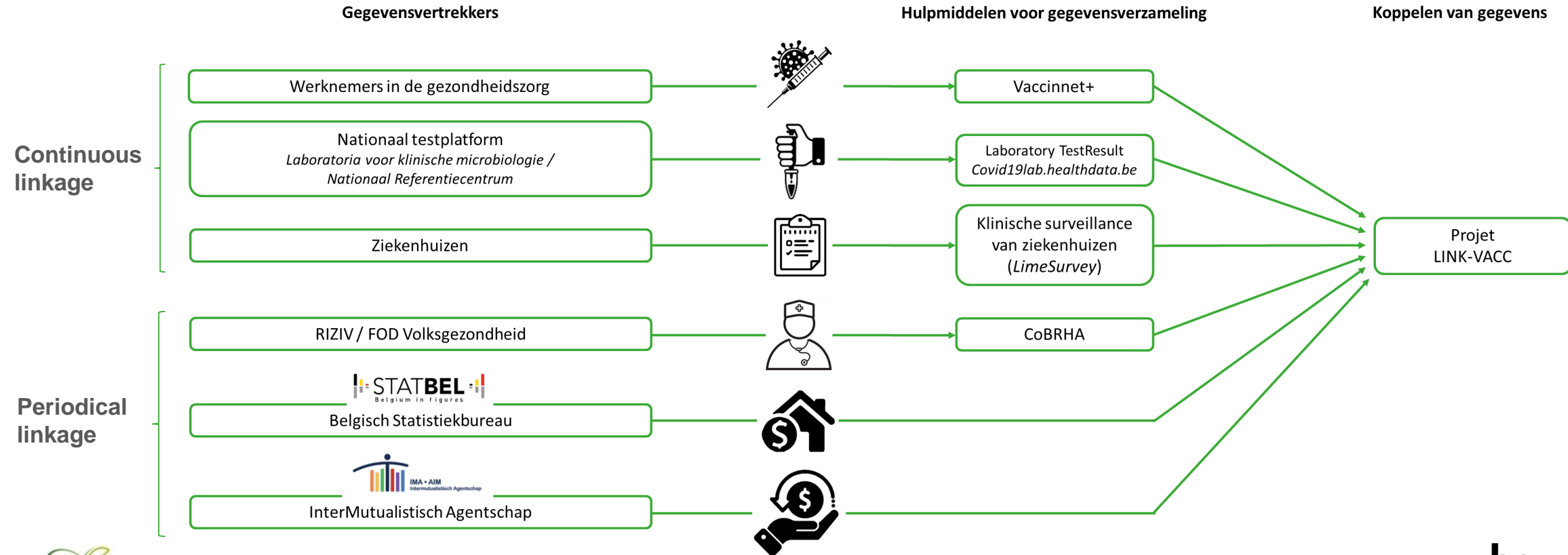
4

Vaccine Safety

- In support of AFMPS/FAGG
- Identification of clustering of breakthrough cases, as possible safety signal
- *Detection of probably cases of Vaccine-Associated Enhanced Disease (VAED)*

LINK-VACC data sources

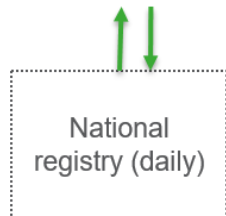
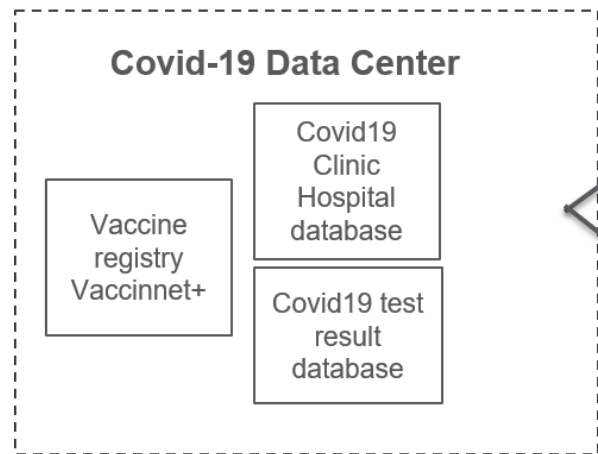
LINKED DATABASES



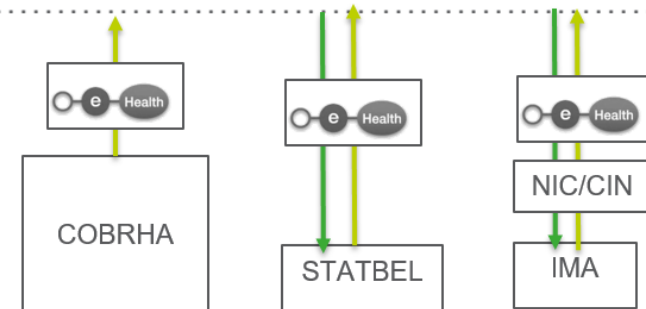
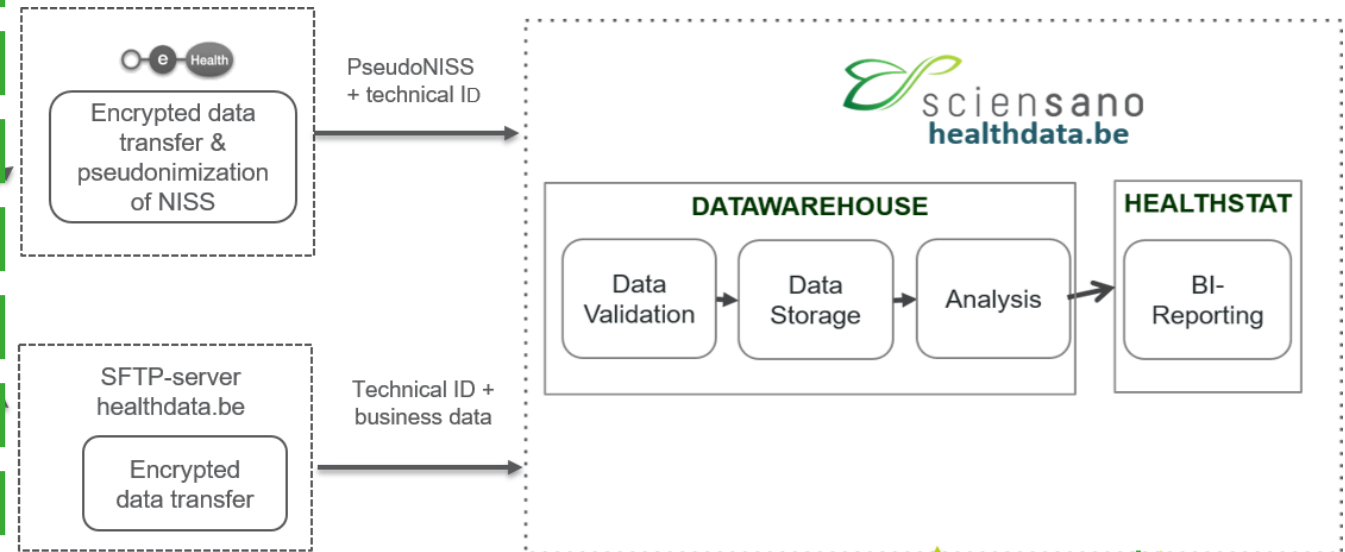
Dataflow organization & GDPR

DATABASES TO LINK

COVID-19 Healthdata warehouse
Personal information in clear



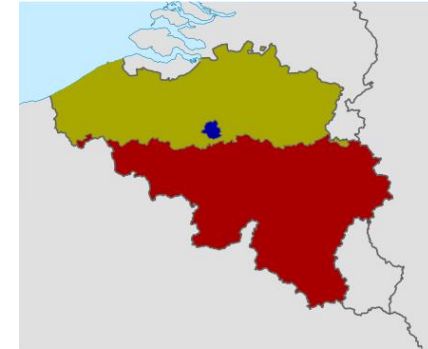
Healthdata warehouse : research environment
Pseudonymised data





VACCINNET+ : National vaccine registry

- Existing tool developed by *Kind & Gezin*, an organization of the Flemish Government
- Vaccine ordering and registration system
- Extension of this application to whole Belgium in the context of COVID-19
- Registration of all **COVID-19 vaccine administrations**

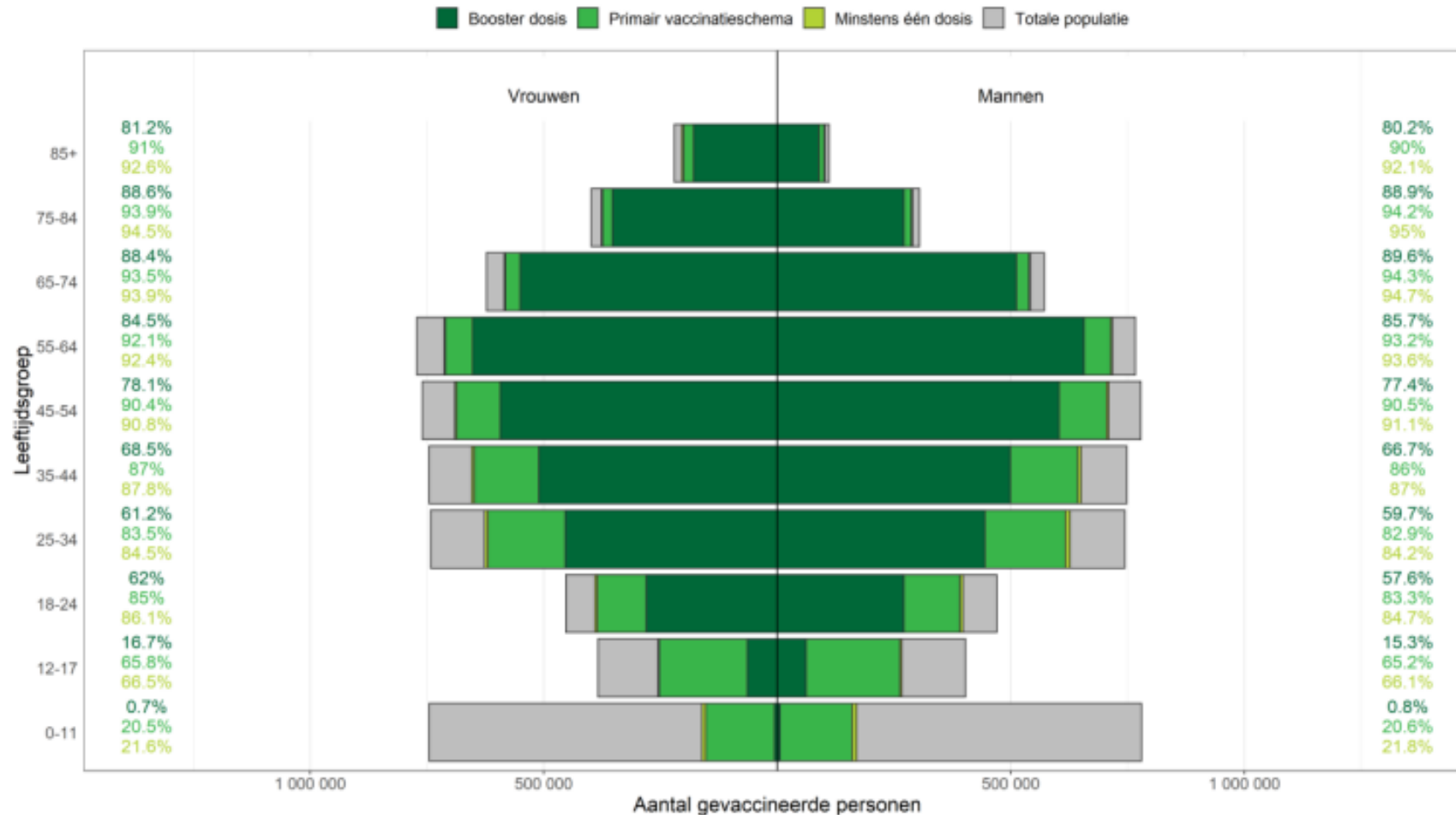


OUTPUTS

- Identification of patients vaccinated against COVID-19 (age, sex, postal code)
- Information about the received vaccine (brand, lot number, date of vaccination, ...)
 - Surveillance of vaccine coverage

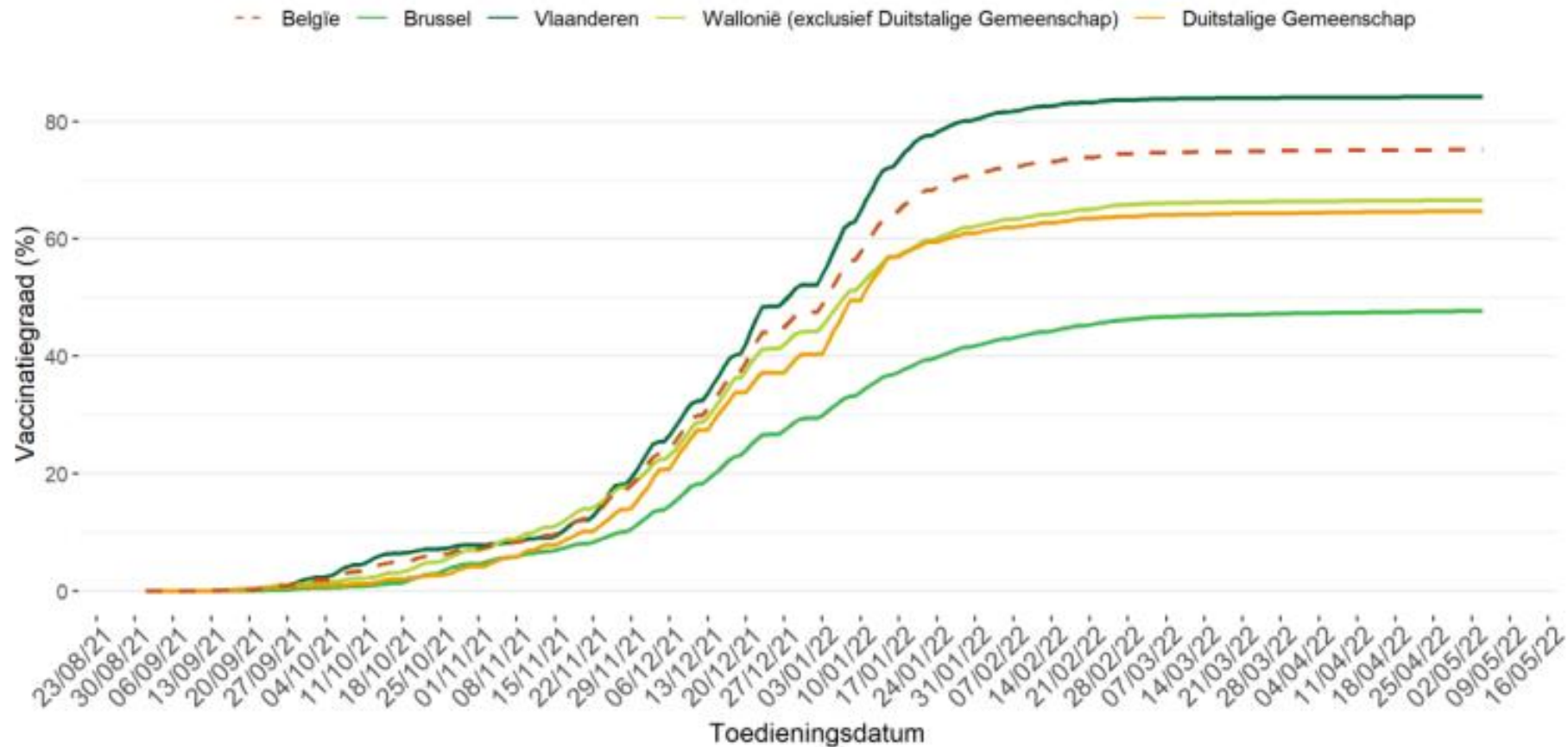
Example output: Vaccination coverage per gender and age groups in Belgium

Data of 3 May 2022
Source Vaccinnet +



Example output: Booster coverage by region / community

Data of 3 May 2022
Source Vaccinnet +



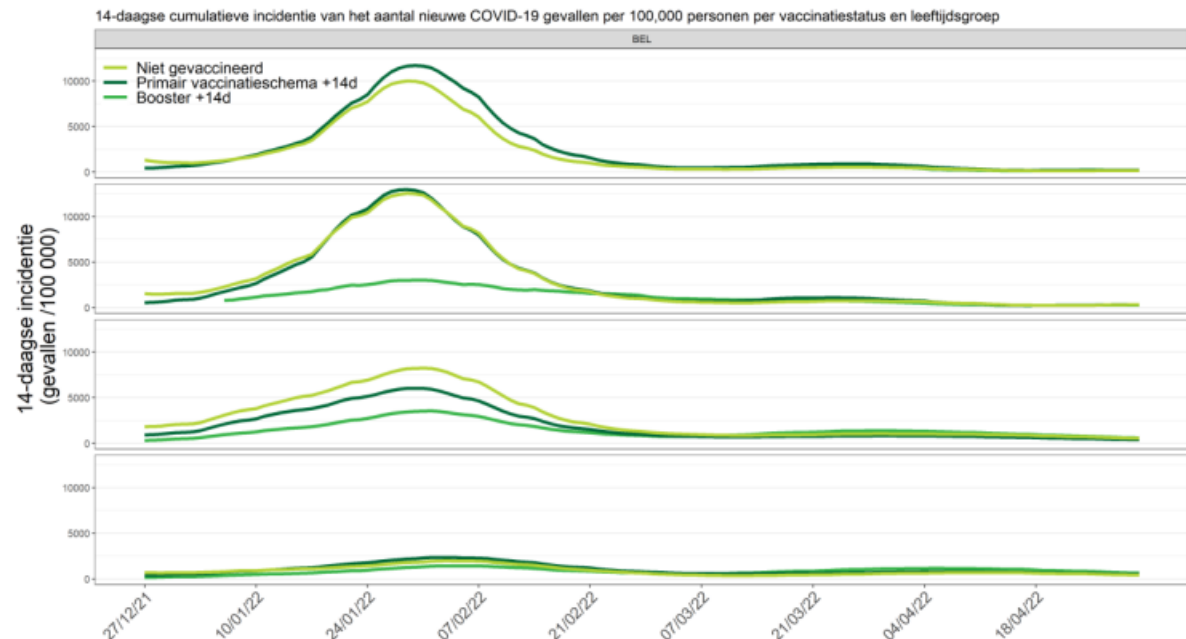


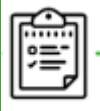
Laboratory test results: COVID-19 health database

- Data on **patients tested for COVID-19**
- Information on test prescriptions, test results (including rapid tests), symptoms, variant, suspected false negatives and false positives.

OUTPUTS

- Identification of breakthrough cases, calculation of cumulative incidence by vaccination status
- Test-negative case control study for vaccine effectiveness





Hospitalisations: two monitoring systems

- **Surge Capacity Surveillance (SCS)**

- Mandatory questionnaire filled out daily by all Belgian hospitals regarding the number of COVID-19 hospitalisations

OUTPUTS

- Assess the impact of vaccination on the severity of the infection → hospitalisation / ICU admission

CHALLENGES

- Aggregated data without national number of patients so cannot be linked to Vaccinnet+, instead vaccination status / age group is asked for

- **Clinical Hospital Surveillance (CHS)**

- Questionnaire on clinical data of hospitalized patients with a confirmed COVID-19 diagnostic

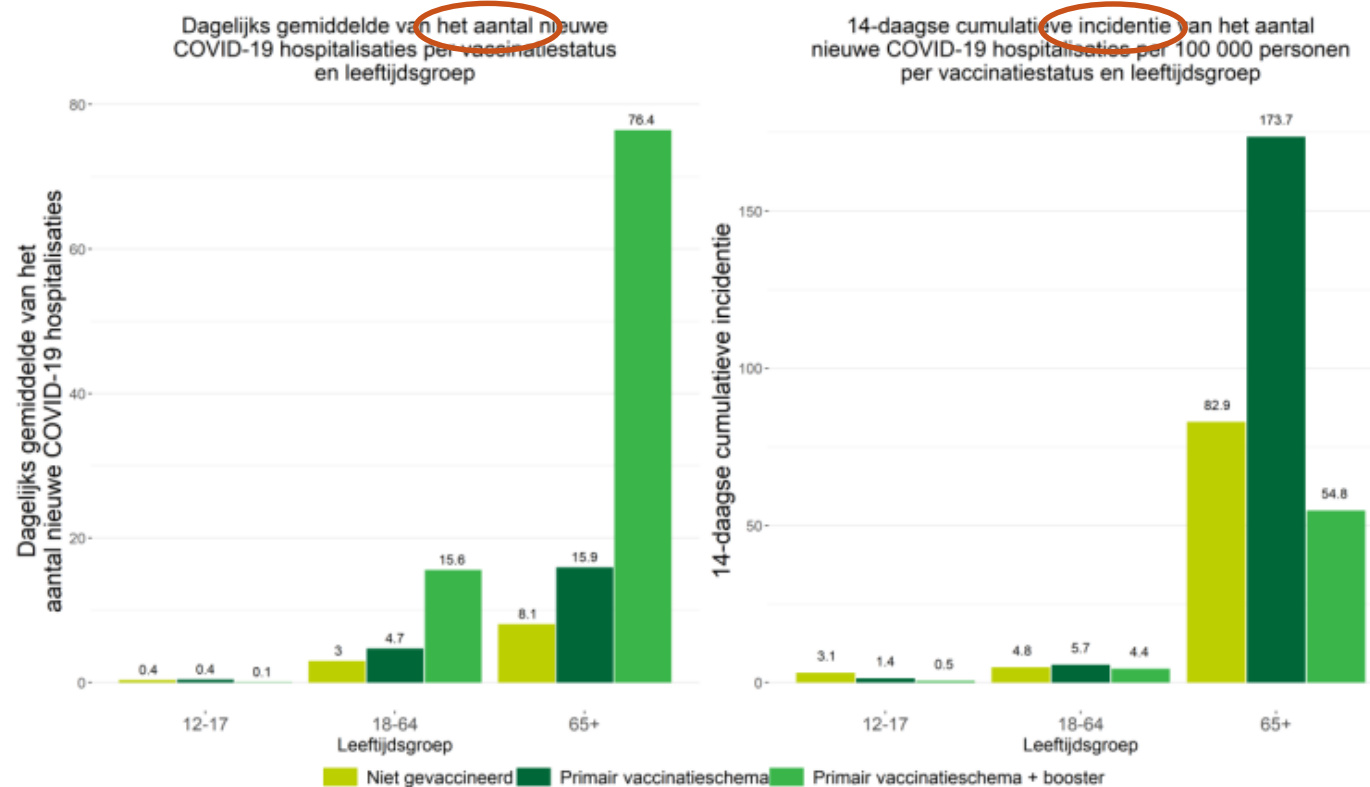
OUTPUTS

- Identification and characterization of hospitalized breakthrough cases, vaccine effectiveness

CHALLENGES

- Non-exhaustive : participation rate varying (not mandatory)
- Data received with delay (3-4 weeks)

Example output: Number of hospitalisations in vaccinated versus unvaccinated persons



Absolute numbers versus incidence!

Data from 18 April to 1 May 2022. Source = SCS & Vaccinnet+

Leeftijdscategorie	Relatieve reductie van het risico op hospitalisatie (niet-gecorrigeerd)		
	Primair vaccinatieschema t.o.v. ongevaccineerd	Boosterdosis t.o.v. ongevaccineerd	Boosterdosis t.o.v. primair vaccinatieschema
12-17	55 %	Niet aantoonbaar	Niet aantoonbaar
18-64	Niet aantoonbaar	9 %	22 %
65+	Niet aantoonbaar	34 %	68 %

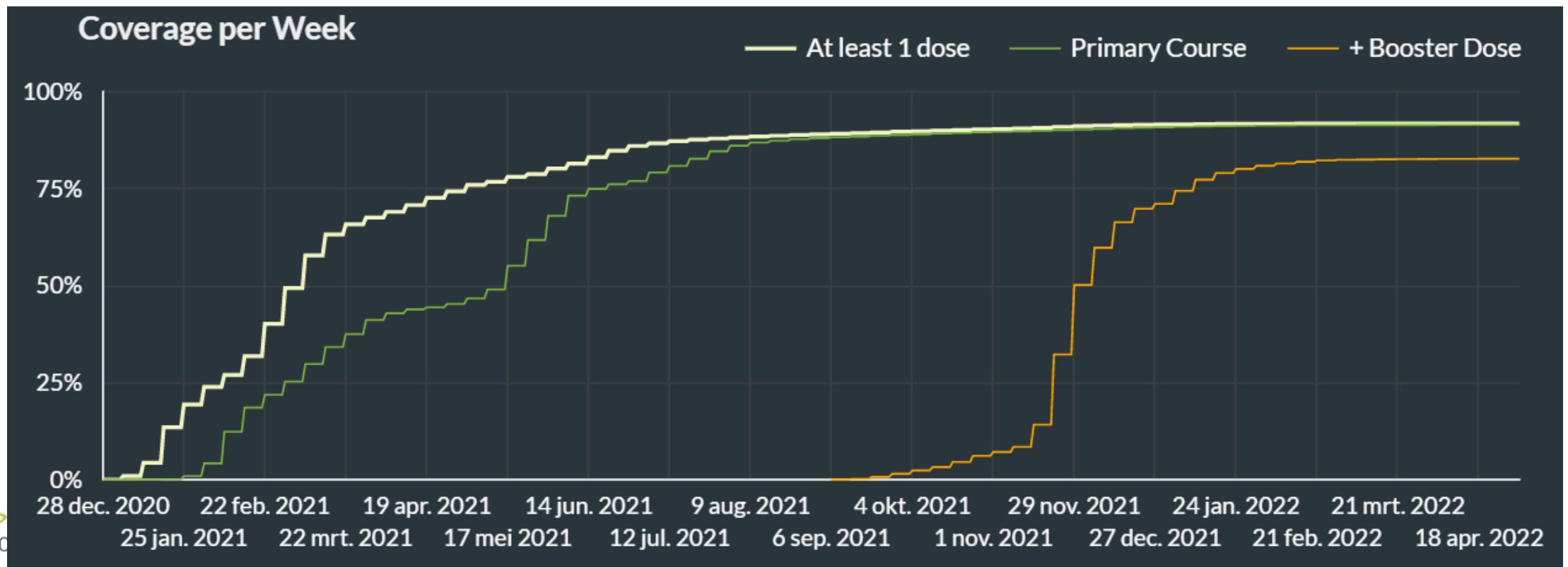


CoBRHA = Common Base Registry for Healthcare Actors

Data allowing identification of **healthcare workers**

OUTPUTS

- Determination of vaccination coverage among healthcare workers





Demographic / clinical characteristics data sources

- **InterMutualist Agency (IMA) database**

Data on reimbursed care and medicines of citizens insured in our country:

- Pseudopathologies (as comorbidities)
- Nursing home resident status
- Medications (eg immunosuppresiva)

- **STATBEL : the Belgian Statistical Office**

Socio-economic information (family composition, nationality/origin, employment status, income, ...)

OUTPUTS

- Differences in vaccine uptake by pseudopathology (IMA) socio-economic and -demographic groups (STATBEL)
- Effect modifiers/bias correction for vaccine effectiveness study

Challenges LINK-VACC project

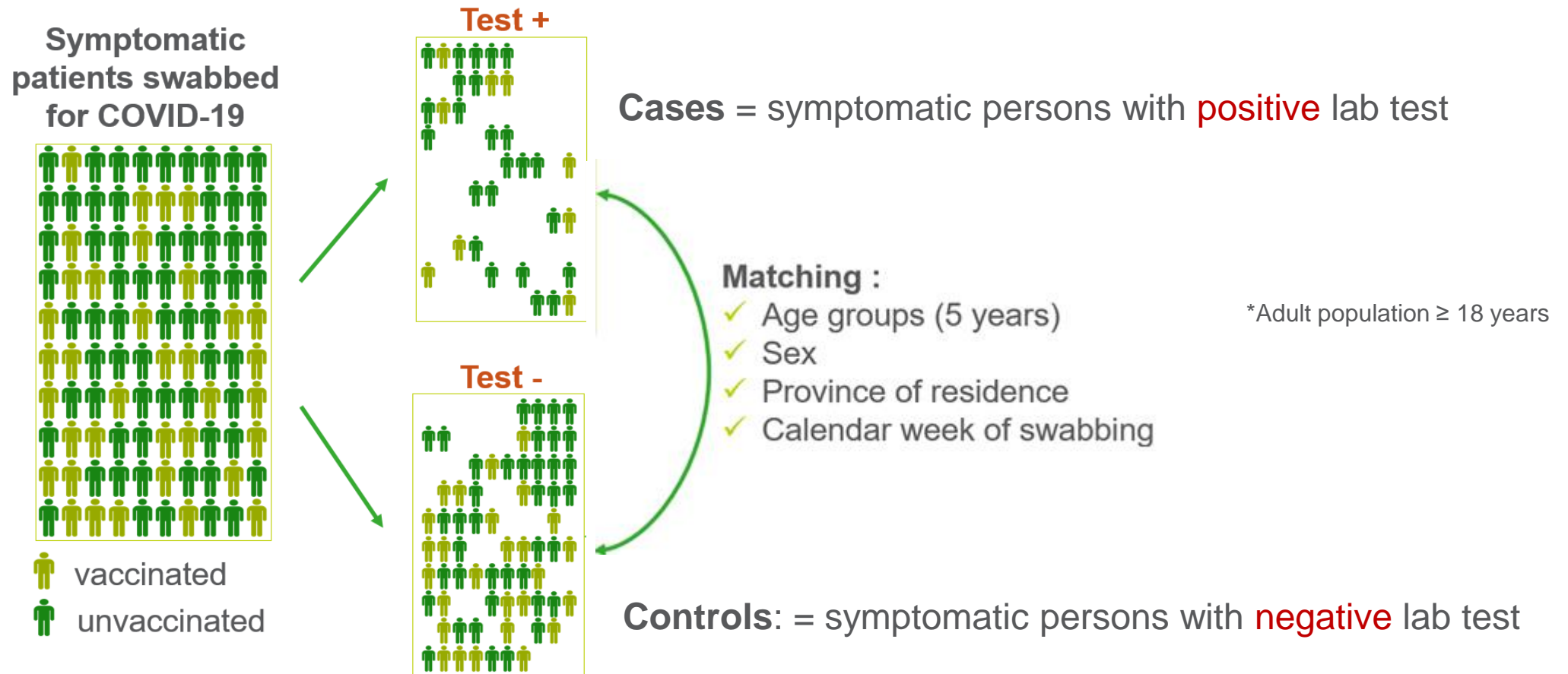
- Linkage at individual level: need for a **unique identifier**
 - Limitation to databases containing national registry number of the patient
- **Various databases owners** (internal versus external databases)
 - Dataflow organisation (time consuming)
- Some data received with a **delay**
 - Varies: 3-4 weeks for clinical hospital surveillance to 1-2 years for IMA data
 - Real-time data needed to provide scientific advice to guide public health policy
- Use of **personal information**
 - Respect GDPR rules
 - Data pseudonymisation: separation of secured environment and research environment

VACCINE EFFECTIVENESS

**CHARACTERISATION OF
BREAKTHROUGH INFECTIONS**

Vaccine Effectiveness against symptomatic infection

Test-negative case-control design



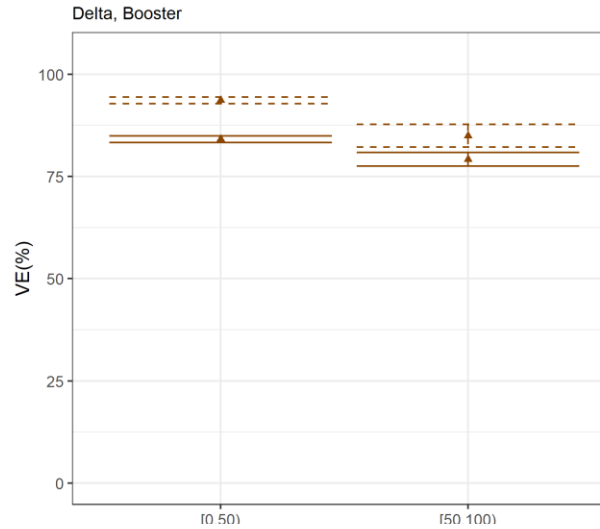
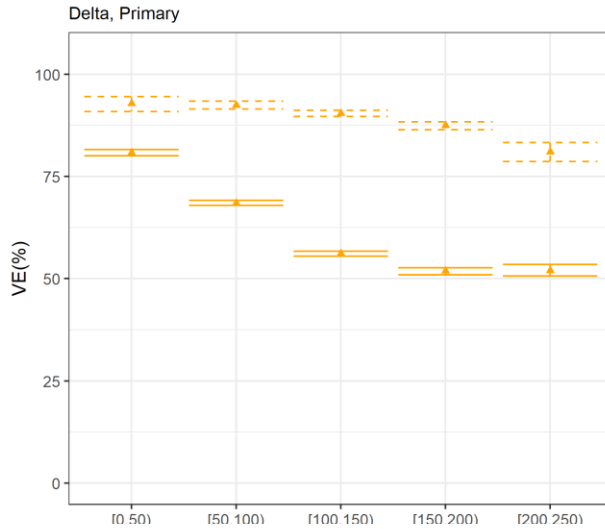
Vaccine Effectiveness during Delta & Omicron

Primary vaccination

Booster vaccination

--- VE Hospitalization
 — VE Symptomatic infection

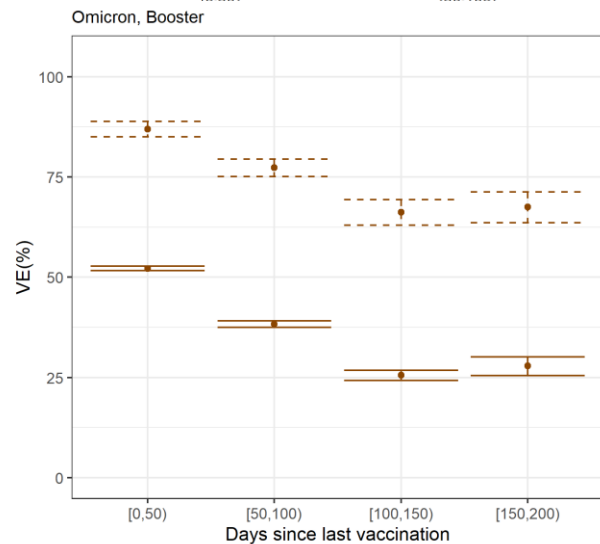
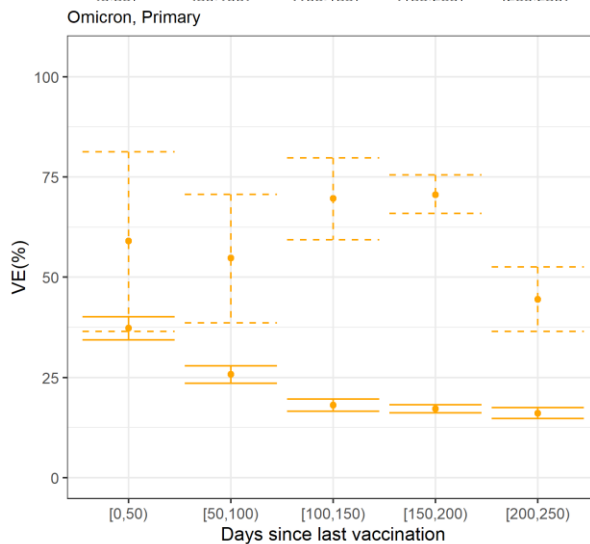
Delta VOC
 15/07/21 – 06/12/21



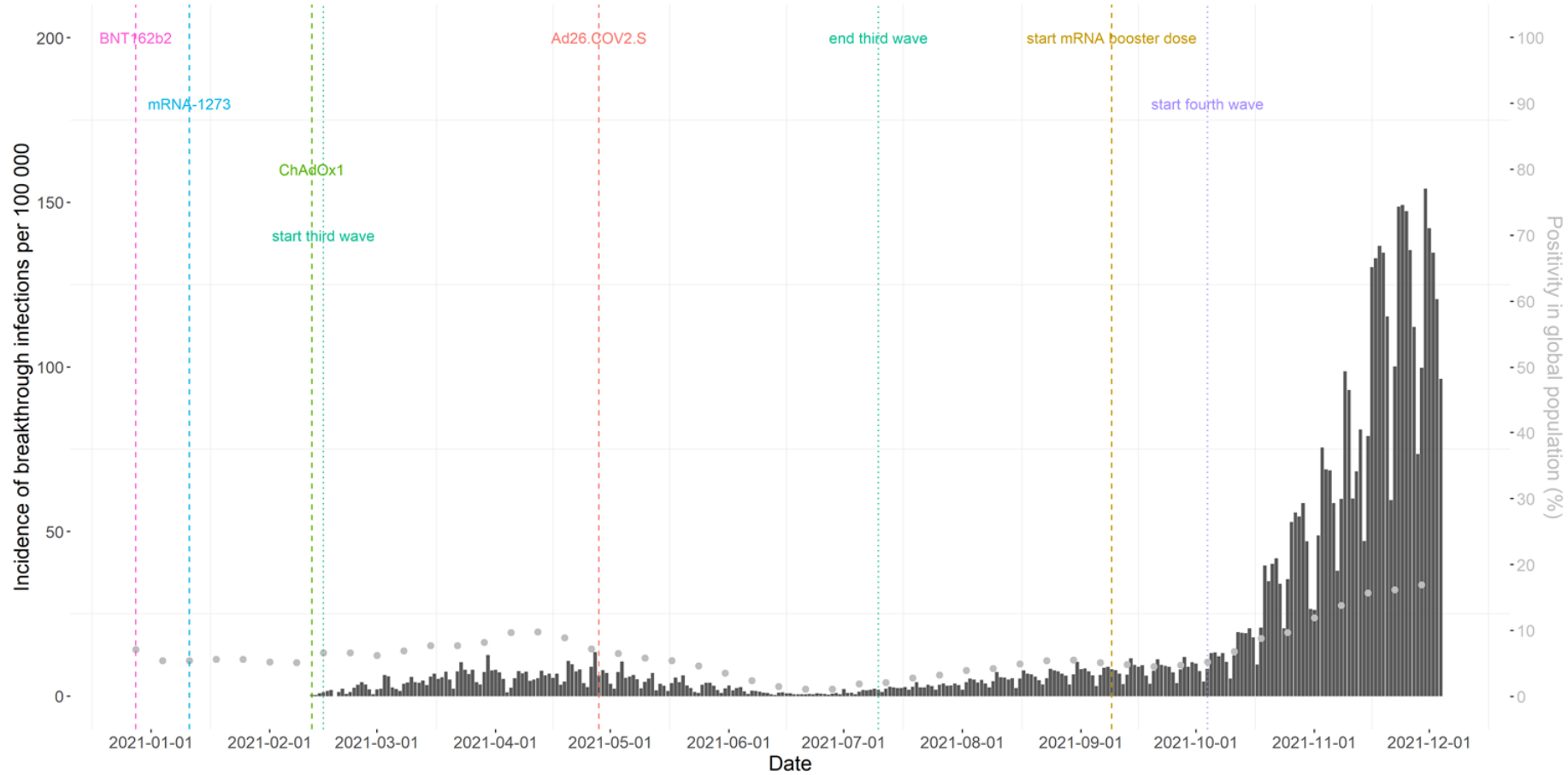
Source = Vaccinnet+, LTR & CHS

T. Braeye et al. Submitted in
 Eurosurveillance, available as preprint

Omicron VOC
 03/01/22 – 14/04/22



Daily incidence of breakthrough infections per date



Breakthrough infection = COVID-19 infection after at least 14 days after last vaccine dose

Figure 2: Daily incidence of breakthrough infections per 100 000 persons during 2021 among fully vaccinated persons (bars) and the weekly positivity rate in the global population (dots).

Factors associated with breakthrough infection

- Prospective cohort study of adults in Belgium
- Methods:
 - Characterization of breakthrough infections by demographic/clinical characteristics and incidence per 100 person-years
 - Multivariable COX proportional hazard analysis to compare the HR of a breakthrough infection

Factor	Hazard ratio (95%)	p-value
Age (per 10 years increase)	0.88 (0.88-0.88)	<0.001
Male sex	0.99 (0.98-0.99)	<0.001
Brand primary vaccine (ref: BNT162b2)		
mRNA-1273	0.68 (0.67-0.69)	<0.001
ChAdOx1	1.68 (1.66-1.69)	<0.001
Ad26.COVS.2	1.54 (1.52-1.56)	<0.001
Healthcare worker	0.60 (0.60-0.61)	<0.001
Prior COVID-19 infection	0.23 (0.23-0.24)	<0.001
Received booster	0.44 (0.43-0.45)	<0.001
Background positivity rate	1.33 (1.32-1.33)	<0.001
High frequent testing profile	3.87 (3.82-3.92)	<0.001

Thematic reports and papers in peer-reviewed journals



THEMATISCH VERSLAG :

VACCINATIEGRAAD EN
EPIDEMIOLOGISCHE IMPACT VAN DE
COVID-19-VACCINATIECAMPAGNE
IN BELGIË



THEMATISCH RAPPORT :

SURVEILLANCE VAN COVID-19
VACCINATIE BIJ ZORGVERLENERS IN
BELGIË



THEMATISCH RAPPORT :

SURVEILLANCE VAN DE COVID-19
VACCINATIE IN BELGISCHE
WOONZORGCENTRA



Vaccine effectiveness against onward transmission of SARS-CoV2-infection by variant of concern and time since vaccination, Belgian contact tracing, 2021



Toon Braeye^{a,*}, Lucy Catteau^a, Ruben Brondeel^a, Joris A.F. van Loenhout^a, Kristiaan Proesmans^a, Laura Cornelissen^a, Herman Van Oyen^{a,c}, Veerle Stouten^a, Pierre Hubin^a, Matthieu Billuart^a, Achille Djiena^b, Romain Mahieu^c, Naima Hammami^d, Dieter Van Cauteren^a, Chloé Wyndham-Thomas^a



Article

Incidence and Risk Factors of COVID-19 Vaccine Breakthrough Infections: A Prospective Cohort Study in Belgium

Veerle Stouten^{1,*}, Pierre Hubin¹, Freek Haarhuis¹, Joris A. F. van Loenhout¹, Matthieu Billuart¹, Ruben Brondeel¹, Toon Braeye¹, Herman Van Oyen^{1,2}, Chloé Wyndham-Thomas¹ and Lucy Catteau¹



Short communication

Vaccine effectiveness against infection and onwards transmission of COVID-19: Analysis of Belgian contact tracing data, January-June 2021



Toon Braeye^{a,*}, Laura Cornelissen^a, Lucy Catteau^a, Freek Haarhuis^a, Kristiaan Proesmans^a, Karin De Ridder^a, Achille Djiena^b, Romain Mahieu^c, Frances De Leeuw^c, Alex Dreuw^d, Naima Hammami^e, Sophie Quoilin^a, Herman Van Oyen^a, Chloé Wyndham-Thomas^a, Dieter Van Cauteren^a

Acknowledgements

- LINK-VACC “Founders”
 - Chloé Wyndham Thomas
 - Lucy Catteau

- Current LINK-VACC Team
 - Veerle Stouten
 - Pierre Hubin
 - Matthieu Billuart
 - Léonore Nasiadka
 - Elias Vermeiren
 - Izaak Van Evercooren

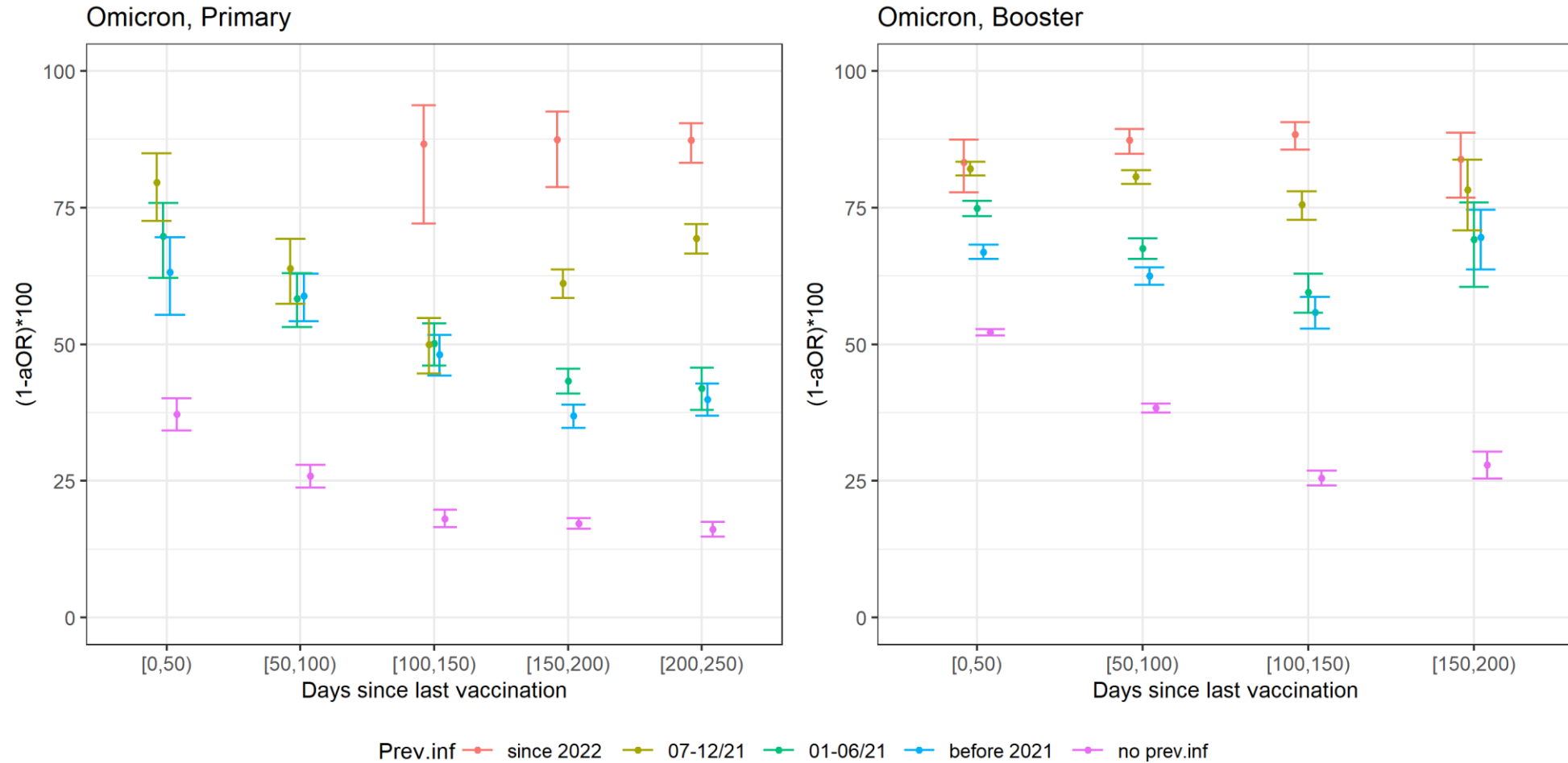
- Other collaborators in Sciensano

Contact

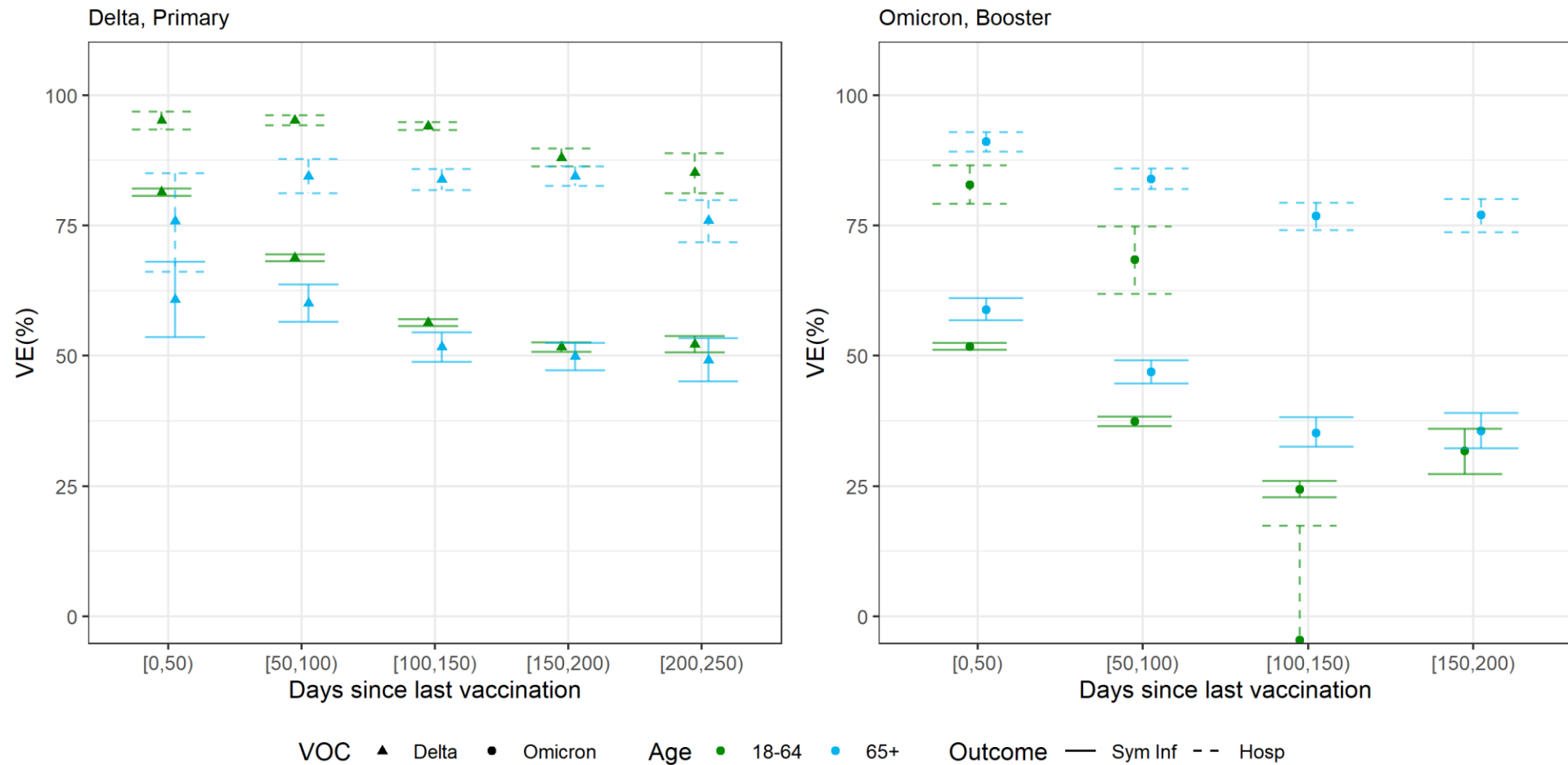
Dr. Joris van Loenhout
Joris.vanloenhout@sciensano.be

RESERVE SLIDES

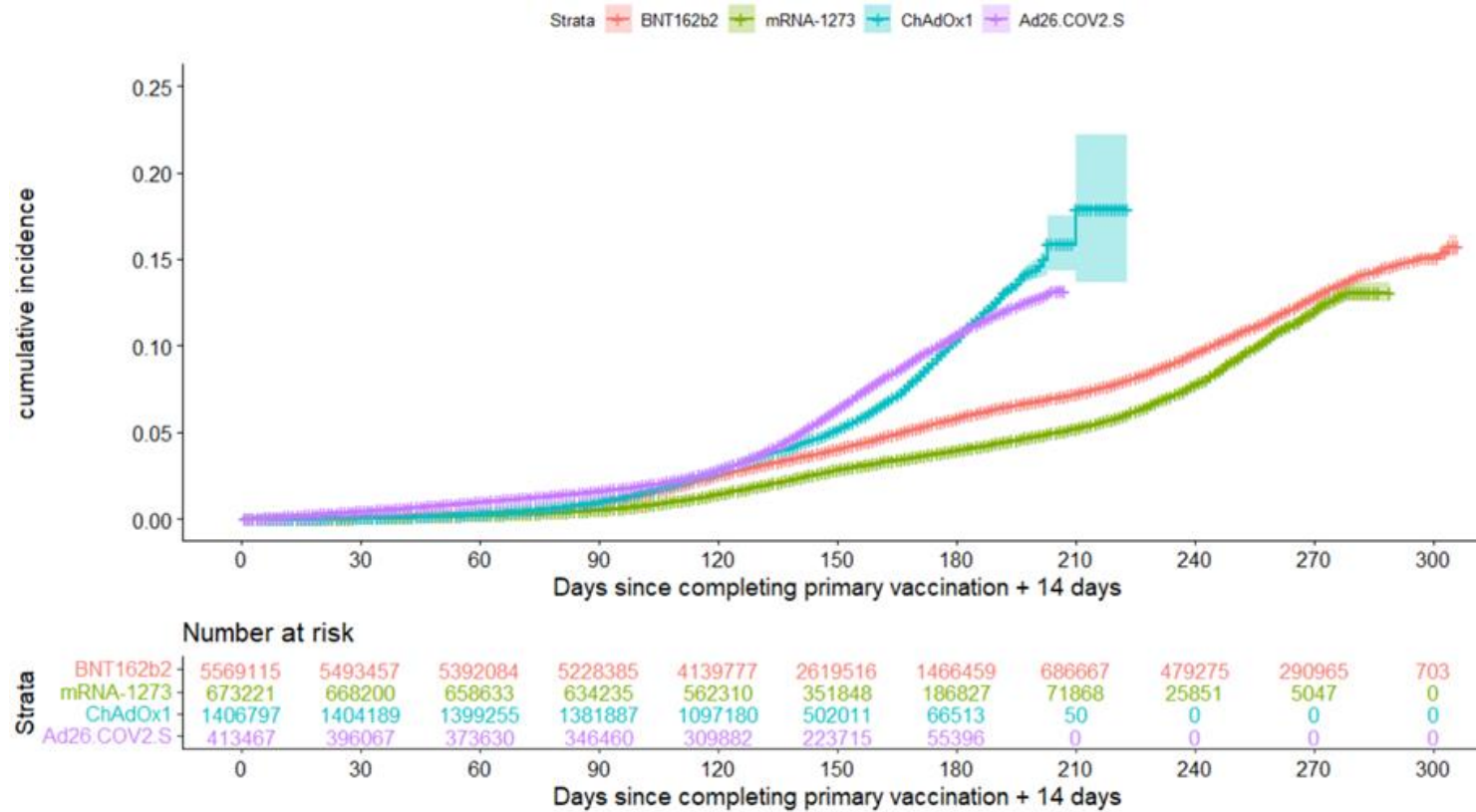
Hybrid immunity against infection



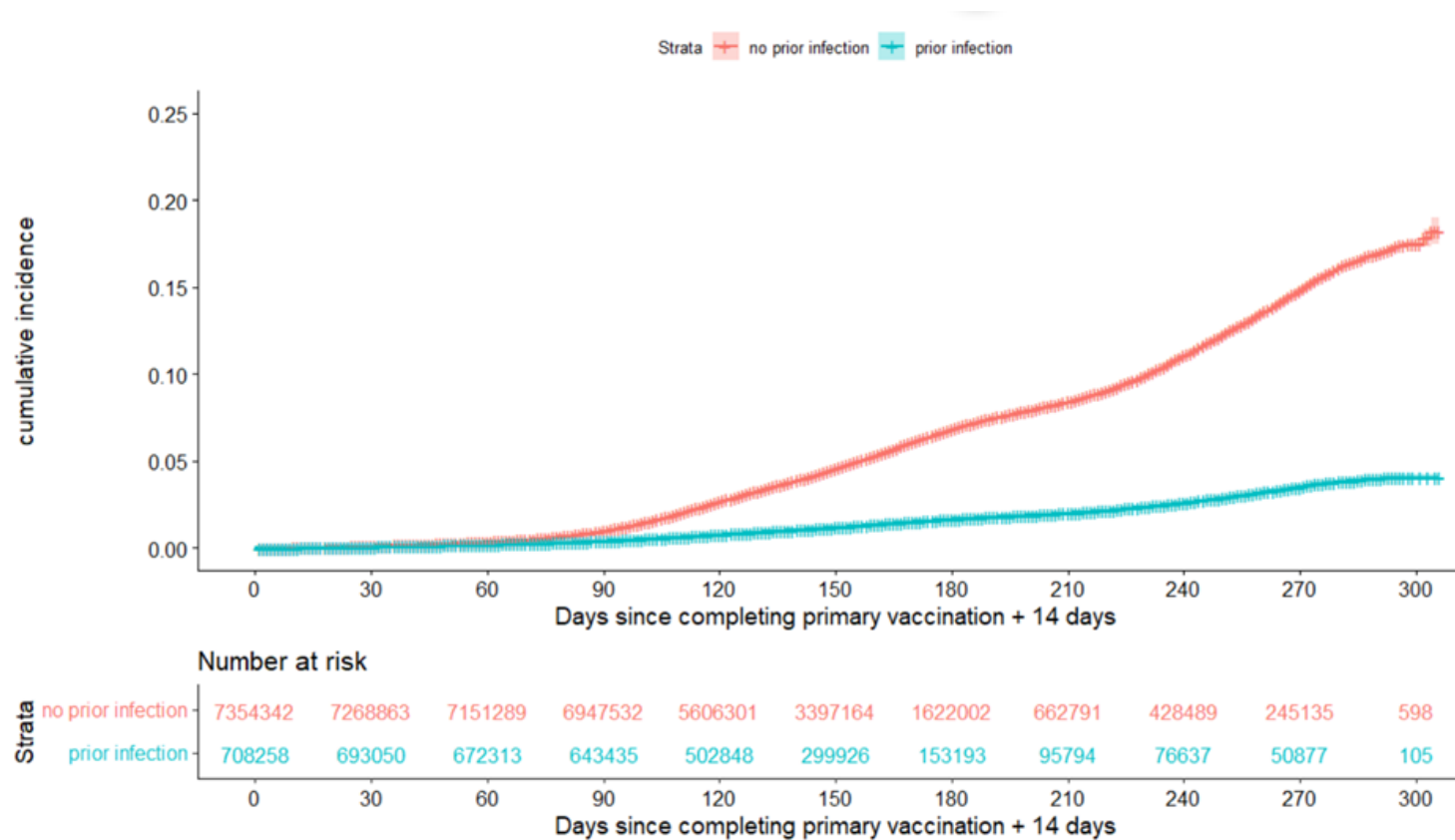
VE against infection and hospitalization by age group



Higher cumulative incidence for adenoviral based vaccines



Higher cumulative incidence for persons with prior COVID-19 infection



LINK-VACC output until now

TR = Thematic Report / A = Article

1

Vaccine uptake & coverage

Published:

- Vaccination in nursing homes (TR)
- Vaccination among healthcare workers (TR)
- Vaccination coverage & impact primary schedule (TR)

In progress:

- Coverage by type of pseudopathology (TR) / coverage among children (TR)
- Socio-economic and -demographic determinants of vaccination status (A)

2

Breakthrough infections

Published:

- Characteristics of breakthrough infections (A)

In progress:

- Averted deaths due to vaccination campaign using WHO model (A)

3

Vaccine effectiveness

Published:

- Vaccine effectiveness against infection and onward transmission by vaccine brand and by variant of concern (A x 2)

Submitted:

- Vaccine effectiveness against infection / hospitalisation, during delta/omicron (A)

4

Vaccine Safety

- Ongoing collaboration with FAGG/AFMPS on monitoring of safety signals by identifying breakthrough cases/clusters