Data is the new gold:
Information flow during the 2014-2016 Ebola outbreak and the Coronavirus outbreak

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Pillars of epidemics response

1. Treating sick patients
2. Community engagement
3. Safe burial
4. Surveillance
    1. Information management

Outline

Epidemics, pandemics, and information flow

- A blood sample is not a person
- What's behind the R_0?
- Garbage In, Garbage Out (GIGO)
- Infrastructure of data flow, data security,
  → who owns the data
- The example of COVID19 cases and contact tracing in Geneva

A blood sample is not a person

Labs provide the results of each test.

- The quality of the tube's tag is crucial
- An example with Ebola, a week in January 2015
  - CDC (US): 82 cases
  - WHO: 51 cases
- What happened
  - Same source of data
  - Different algorithms

Different algorithm for date of onset

CDC used

- if dead (StatusAsOfCurrentDate), dateOnset=date of death-4
- if dead and no date of death, dateOnset=SampleTest-5
- if dead and no date of death and no SampleTest, dateOnset=date Report-4
- if alive and no dateOnset, dateOnset=DateReport-4
- if alive and no dateOnset and no DateReport, dateOnset=SampleTest-7
- if missing StatusAsOfCurrentDate and no dateOnset, dateOnset=DateReport-4
- if missing StatusAsOfCurrentDate and no dateOnset no DateReport, dateOnset=SampleTest-6
- if DateOnset < 01/05/2015 (May 1st 2015), dateOnset=DateReport-4

WHO used:

- if DateOnset is missing, DateOnset=dateReport-4
- if DateOnset and dateReport are missing, dateOnsest=DateDeath-5

We suggest that the procedure for imputing DateOnset should be decided as a policy by the leads of CDC and WHO teams.

Different algorithms for district

District name (DistrictRes or DistrictOnset variables):

these district names are entered using various spelling resulting in more than 70 different values

- CDC used: district of onset, and correct the spelling.
- WHO used: district of residence and if missing, districtRes=districtOnset.

What's behind the R_0?

$$\mathcal{R}_0 \propto \left(\frac{\text{infection}}{\text{contact}}\right) \cdot \left(\frac{\text{contact}}{\text{time}}\right) \cdot \left(\frac{\text{time}}{\text{infection}}\right)$$

Transmissibility | Rate of contact | Duration of infectiousness

- Transmissibility (ie probability of infection given contact between a susceptible and infected individual)
- Average rate of contact between susceptible and infected individuals
- Duration of infectiousness

What's behind the R_0?

$$\mathcal{R}_0 \propto \left(\frac{\text{infection}}{\text{contact}}\right) \cdot \left(\frac{\text{contact}}{\text{time}}\right) \cdot \left(\frac{\text{time}}{\text{infection}}\right)$$

- Transmissibility: may decrease when temperature increases
- Rate of contact: underlies decisions for quarantine, confinement, self-isolation
- Duration of infectiousness: highlights the importance of finding a drug that would reduce disease duration

Garbage In, Garbage Out (GIGO)

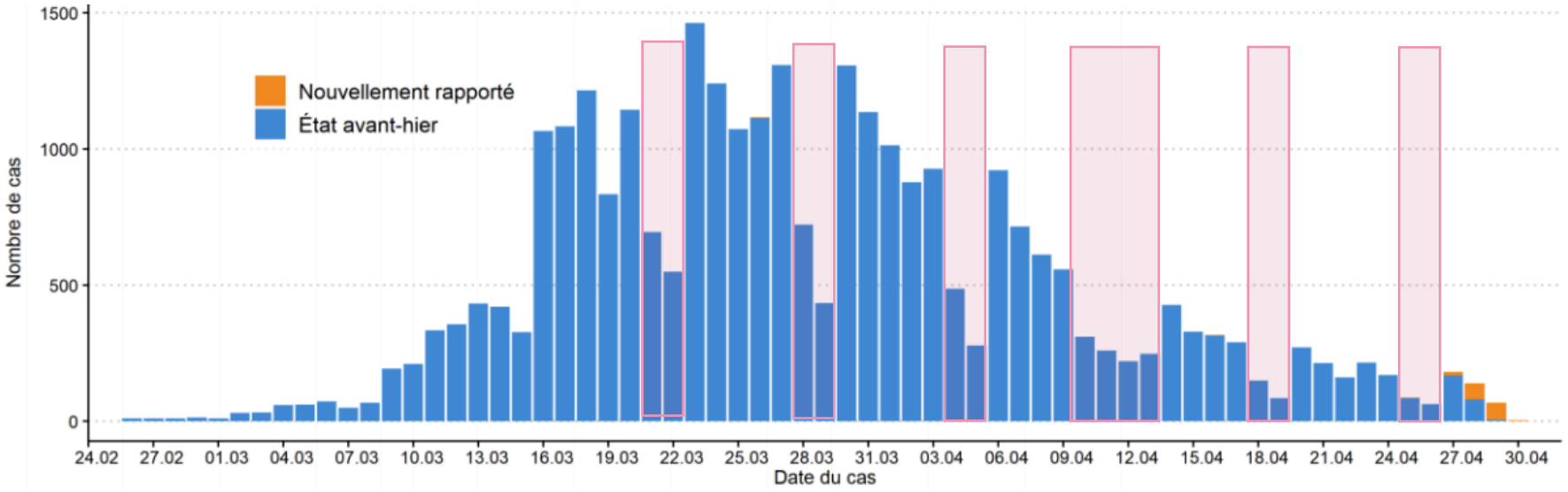
- Data on patients with the disease or on the number of tests is necessary for:
  - Planning care ressources
  - Helping patients
  - Monitoring disease progression and understanding when the disease is contained

→ Data quality input is crucial

Garbage In, Garbage Out (GIGO)

Aim	Examples of GI	Examples of GO
Planning care ressources	- SL: missing name info - CH: Fax sent to FOPH may take time to be inputted	Samples were considered duplicates Less precise estimation of R_0

Switzerland epidemiological curve



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Garbage In, Garbage Out (GIGO)

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Helping patients	- GE: Labs do not provide accurate phone number	- Delay in contacting pts → isolation starts later

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Helping patients	- GE: Labs do not provide accurate phone number	- Delay in contacting pts → isolation starts later
Monitoring disease progression and understanding when the disease is contained	- Only deaths at hospital are reported - GE: Addresses often wrong or missing	- Underestimation of deaths and case fatality rate - Incorrect reporting of clusters

Who owns the data?

- Patients own their data! Yes, but:
  - In the case of an epidemics, healthcare professionals need to have access to these data even if the patient has not given consent.
    → Ebola SL: data was hosted in the US because CDC provided a solution for case monitoring first.
  - Law of epidemics, art 12, obligation to declare.
    To paraphrase Alain Berset: “Security should be as strong as possible, but as lax as necessary.”
    → COVID Geneva: Office of the surgeon general required that the labs provide cellphone numbers to allow rapid monitoring and self-quarantine advice to new cases

Actionnable Registry of the Geneva Outpatient with SARS-Cov2 (ARGOS) - Data flow

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ARGOS

- A blood sample is not a person
  → avoiding duplicates
- What's behind the R_0?
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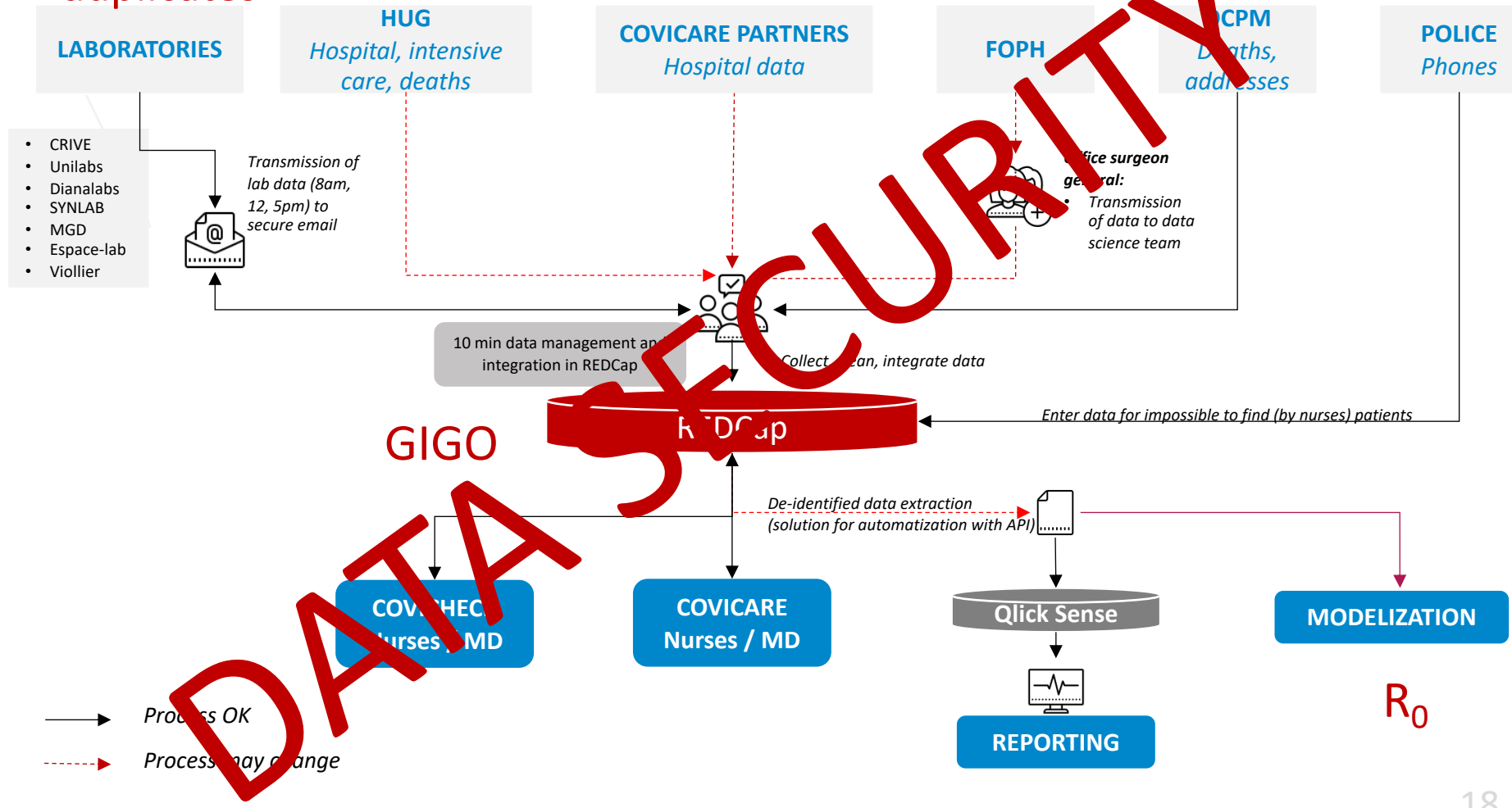
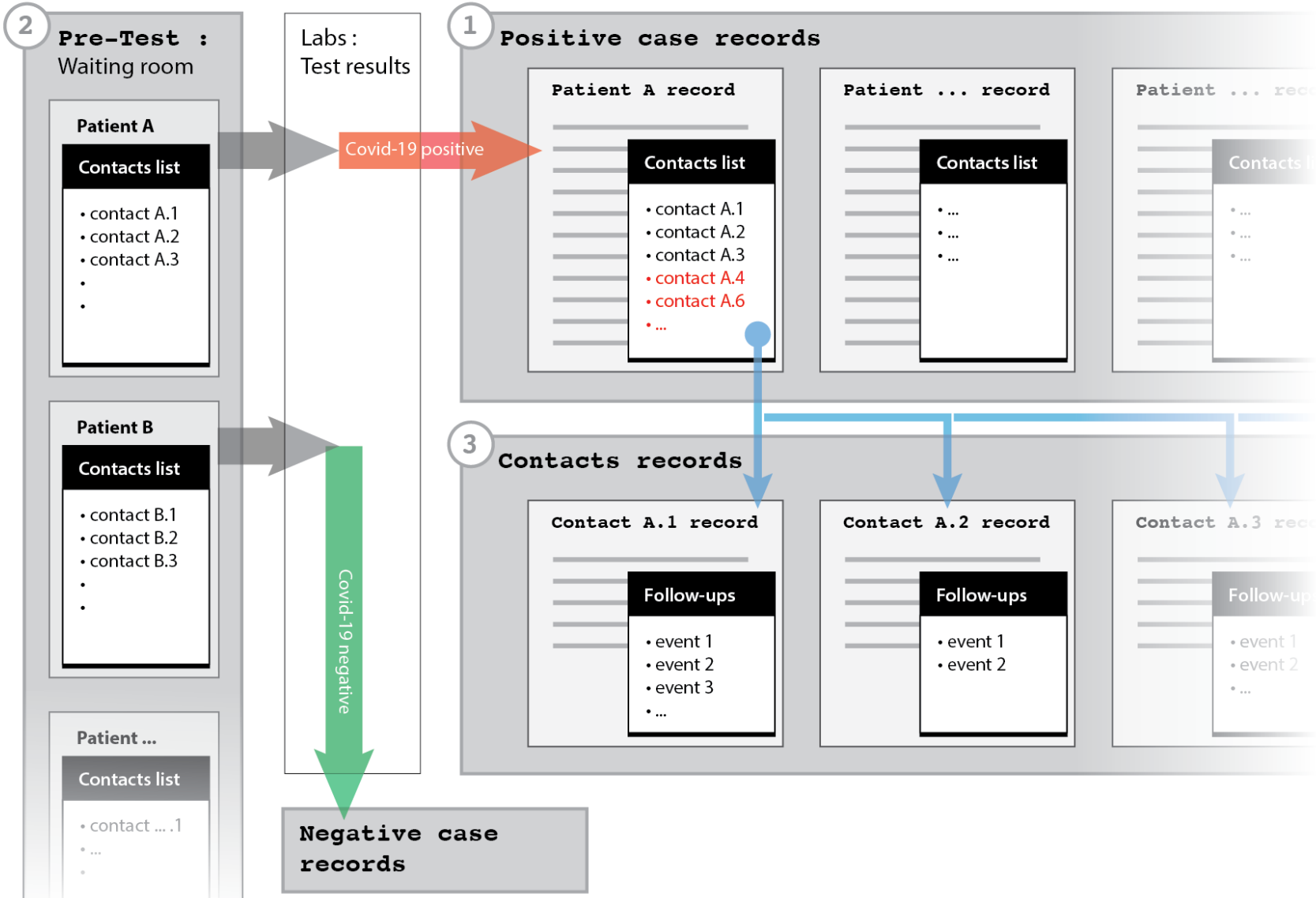
Data flow: cases

Avoiding duplicates



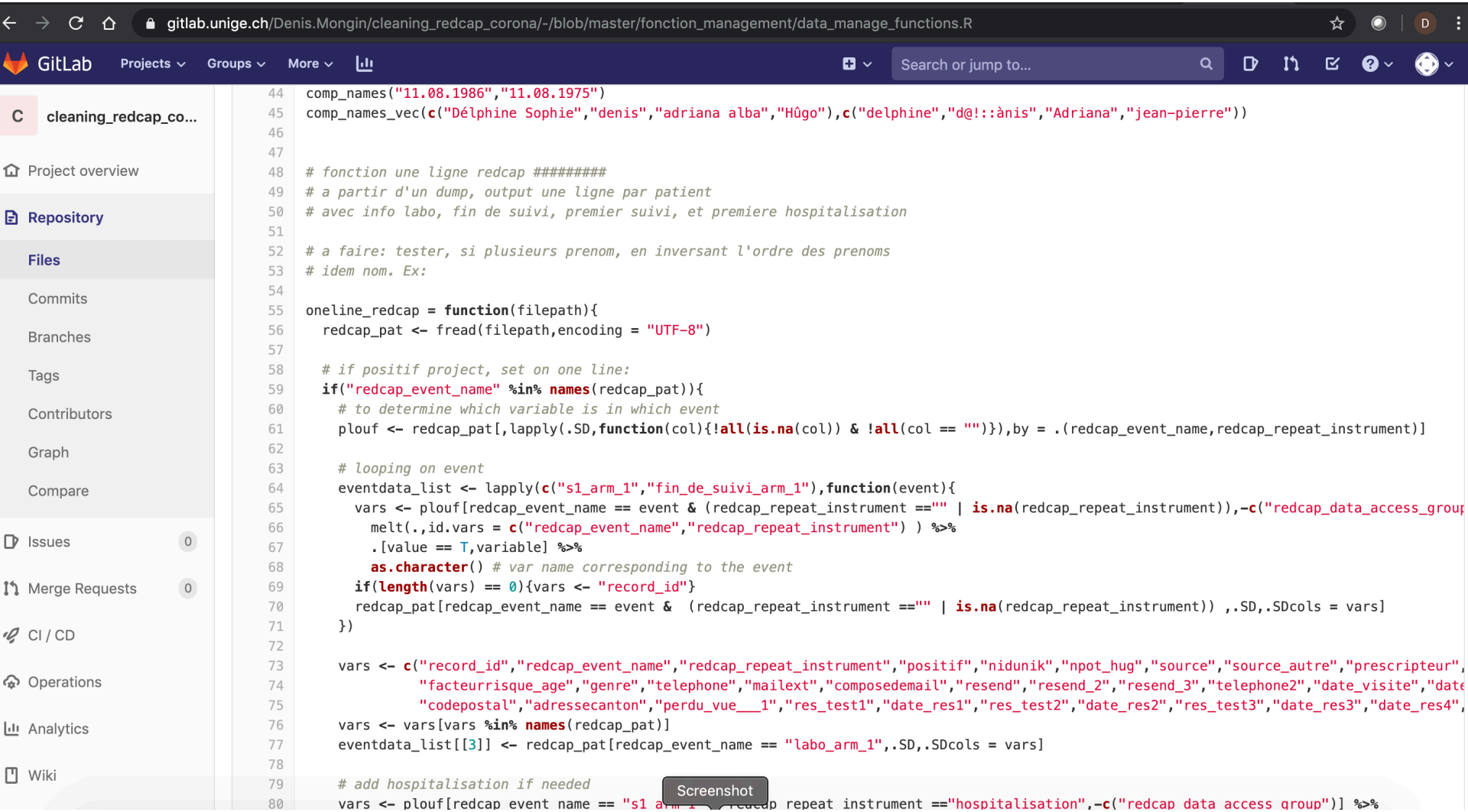
Schematic by Sophia Vignard

Data flow: contacts



What it really looks like…

~5000 lines of code developed in 6 weeks



A multidisciplinary team effort
Thank you!

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