Sykdomspulsen – Real-time analysis + surveillance

Sykdomspulsen is a **real-time** analysis and disease surveillance system designed and developed at the Norwegian Institute of Public Health (NIPH/FHI).

Sykdomspulsen is a unique project that processes new data (e.g. covid-19 cases) **shortly after it is available**. Complex statistical analyses are automatically run for all locations in Norway, producing reports and alerting various stakeholders.

This provides the health authorities the ability to make proactive strategic decisions with the most up-to-date information.

500 000+ Automated analyses per day

100 000+ Covid-19 reports in 2021

«Data» is not useful by itself.

Data must be cleaned, analysed, and the results delivered to stakeholders.

An effective outbreak response requires this in near real-time.

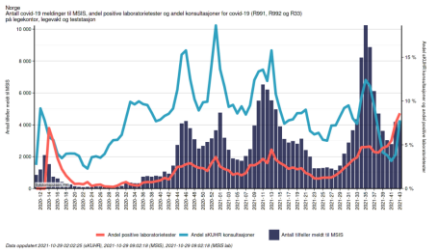
Get more information at docs.sykdomspulsen.no

Data in:

- Notifiable communicable diseases
- Lab data
- Vaccines
- Mobility
- Hospital admissions
- ICU admissions
- Primary healthcare consultations
- Veterinary Institute data
- Nordic covid-19 data
- Deaths
- Other datasets

Processing + analysis by Sykdomspulsen Analytics

Automatic reports



Websites

APIs/data/results for others to use

Sykdomspulsen – In parts

Sykdomspulsen APIs

These are APIs developed and maintained by the Sykdomspulsen team, including:

- The covid-19 modelling team in FHI
- Covid-19 statistics pages on fhi.no
- Covid-19 vaccination pages on fhi.no

Sykdomspulsen Websites

Websites developed and maintained by the Sykdomspulsen team.

The most notable is Sykdomspulsen for kommunehelsetjenesten, which is a closed website that allows municipal health authorities, county governors, and some FHI employees to view information about infectious diseases in their municipalities.

Sykdomspulsen Analytics

The heart of the system. It performs the following tasks:

- **Fetches data** from different locations (APIs, remote servers, excel files, internal FHI registries, databases).
- **Cleans and harmonizes** datasets (we receive data from more than 15 data sources daily).
- **Censors** datasets differently according to the target audience (e.g. internal vs health authorities vs public).
- **Analyses** data (500 000+ analyses per day).
- **Schedules** tasks to run at specific times.
- Creates **automatic** graphs, excel files, pdf/docx reports (500+ reports per day).
- **Delivers** data and results to health authorities, the public, and media-houses
- Sends **automatic** e-mails and SMSs.

SPLverse

A set of R packages developed to help solve problems that frequently occur when performing infectious disease surveillance.

Sykdomspulsen Analytics/Core – Making analysis easier

In disease surveillance, there are always requests for new types of reports/analyses. Sykdomspulsen's main focus is that statisticans should be able to develop new reports/analyses as quickly as possible.

Two R packages are fundamental to our work:

- Sykdomspulsen Core – free/open source surveillance infrastructure that anyone can use
- Sykdomspulsen Analytics – closed code (FHI's implentation of Sykdomspulsen Core)

A statistician who uses Sykdomspulsen Analytics/Core has the following available to them:

- Many updated, cleaned, and harmonized database tables (some censored and appropriate for public release), with access permissions already clarified and approved.
- Access to an interactive development environment (IDE) with many pre-installed R packages (including splverse) and all necessary publishing tools for creating docx and pdf reports.
- Access to a number of other analysis pipelines, other ad-hoc analyses, tutorials, and boilerplate code that can help the Sykdomspulsen statistician in running an analysis from start to finish in as little as 30 minutes.

The Sykdomspulsen Core R Package provides a means of encapsulation of:

- Hiding Complexity – e.g. interfaces into database libraries
- Performance-based e.g.:
  - SQL query optimizations.
  - Memory (RAM) optimizations.
  - Loop Control – developers don't code loops. Looping is instead handled efficiently within the package, and hence easily (and automatically) parallelized.

Performance/security upgrades to the Sykdomspulsen Core package can be done in the background, without needing the users to rewrite their code.

Sykdomspulsen Analytics - Solving urgent analysis requests in minutes

During the covid-19 pandemic, the Sykdomspulsen team responded to an **urgent** analysis request from the Ministry of Health (HOD), who needed an **overview of the covid-19 trends in all municipalities** in Norway. The Sykdomspulsen infrastructure enabled us to create this report in **35 minutes**.

This type of task would take **1 to 2 days** to complete without the Sykdomspulsen Analytics infrastructure.

Sykdomspulsen Analytics - From receiving data to website publication in 21 hours and 30 minutes.

Thursday, 26.3.2021	County governors requested the ablility to monitor mobility between municipalities during Easter.
Friday, 27.3.2021	Sykdomspulsen team contacted Telenor to ask for a daily delivery of anonymous mobility data.
12:30 Monday, 29.3.2021	Telenor delivered the first mobility data to the Sykdomspulsen team.
13:42 Monday, 29.3.2021	Mobility data was included in the Sykdomspulsen Analytics infrastructure, and the first mobility graph was produced on a development website.
10:00 Tuesday, 30.3.2021	The production graphs containing the mobility data were launched on the website Sykdomspulsen for kommunehelsetjenesten.
Thursday, 1.4.2021	Skjærtorsdag (Easter begins).