

Interventions

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First Year Project #1

February 22nd, 2022

Lecture Plan

- 1) (February 8th) Intro
- 2) (February 10th) Geospatial Basics
- 3) (February 15th) Estimating Associations
- 4) (February 17th) Multivariate Regression
- 5) (Today) Interventions**
- 6) (February 24th) Project Run Through
- 7) (March 1st) Q&A – Open Supervision
- 8) (March 3rd) Q&A – Open Supervision

Outline

- Data Scavenging
- Estimating Intervention Effects
- Interventions and Fixed Effects

Data Scavenging

Looking for data













- Wikipedia is always great bet...

https://en.wikipedia.org/wiki/List_of_Belgian_provinces_by_GDP

By GDP [edit]

This table reports the **gross domestic product** (nominal GDP), expressed in billions of **euro**, of the ten provinces and the **Brussels capital region** in 2018.^[1]











■ Flemish Region ■ Walloon Region

Rank	Province	GDP in bn. EUR
1	 Antwerp	88,015
-	 Brussels	83,987
2	 East Flanders	56,415
3	 Flemish Brabant	49,832
4	 West Flanders	46,916
5	 Hainaut	34,239
6	 Liège	31,639
7	 Limburg	28,707
8	 Walloon Brabant	19,299
9	 Namur	13,461
10	 Luxembourg	7,056
	 Belgium	473,085

By GDP per capita [edit]

This table reports the **gross domestic product** (adjusted for **purchasing power parity**), expressed in **euro**, of the ten provinces and the **Brussels capital region** in 2018.^[2]

■ Flemish Region ■ Walloon Region

Rank	Province	GDP per capita in EUR
-	 Brussels	62,500
1	 Walloon Brabant	43,200
2	 Antwerp	42,700
3	 Flemish Brabant	39,300
4	 West Flanders	35,400
5	 East Flanders	33,600
6	 Limburg	29,600
7	 Liège	25,700
8	 Namur	24,000
9	 Hainaut	22,900
-		

Looking for data

- ...sometimes in creative ways!



Van den Brandt [nl] (Groen, Brussels) and Barbara Trachte [fr] (Ecolo, Brussels),^[90] with the support of:

- the National Crisis Centre (NCCN)^[91] led by Bart Raeymaekers;
- the national public health institute of Belgium (Sciensano);
- the Risk Assessment Group (RAG) presided by Sciensano;
- the Risk Management Group (RMG) led by Paul Pardon MD;
- the Scientific Committee for Coronavirus (Steven Van Gucht, Marc Van Ranst, Nathalie Bossuyt, Erika Vlieghe and Charlotte Martin);
- other regional agencies such as the Agency for Care and Health in Flanders, the Agence wallonne pour une vie de qualité (AVIQ) in Wallonia and the Common Community Commission in Brussels.^[92]

Containment measures [edit]

On 29 January, Belgium issued a travel notice advising against non-essential flights to China, Hong Kong excluded, with some travel companies cancelling all flights to China.^[93]

On 1 March, as a second case of coronavirus was confirmed in Belgium, phase 2 of the health risk containment strategy was activated.^[94]^[further explanation needed] The mayor of Sint-Lambrechts-Woluwe, Olivier Maingain, was one of the only mayors to take measures to prevent the spreading of the new coronavirus by restricting access to schools, sports facilities and public places for persons returning from areas at risk^[95] and only a few schools, such as the International School Ghent, quarantined pupils returning from infected areas, such as Northern Italy.^[96]

On 10 March, the government advised citizens to cancel any indoor scheduled events to be attended by more than 1,000 people for the month of March. Prime Minister Wilmès stressed this was not an interdiction but rather a recommendation.^[97] Schools remained open but are advised to cancel both trips abroad and multi-day excursions in general. Companies were advised to have their personnel work from home as much as possible and allow flexible working times to allow a better spread of public transport use throughout the day. The authorities called this *reinforced phase 2*.^[98]

Late in the evening on 12 March, after a meeting of the National Security Council, the Belgian government moved into the federal phase of crisis management, and ordered the closure of schools, discos, cafes and restaurants, and the cancellation of all public gatherings for sporting, cultural or festive purposes from Friday 13 March at midnight onwards.^[99] It was stressed that the measures taken were not a lockdown because people were not required to stay home.^[100]

On 17 March, the National Security Council decided to take additional measures, based on the spread of COVID-19 in Belgium and on recommendations of experts. Stricter social distancing measures were imposed from noon the following day until 5 April, with non-essential travel prohibited, non-essential shops to close, gatherings banned, with penalties for corporate and individual persons who failed to comply with the restrictions.^[101]^[specify]

On 20 March at 3 pm Belgium closed its borders to all non-essential travel.^[102] Earlier, the governor of West Flanders had complained about Dutch and French citizens coming to Belgium for tourism or shopping,^[103] while mayors of municipalities close to the border with the Netherlands such as Paul Van Miert of Turnhout urged their Dutch counterparts to request their national authorities in the Netherlands to implement similar measures as in Belgium, to stop Belgian citizens going to Dutch cafés or restaurants.^[104] From 25 March onwards, people arriving at Brussels Airport were handed a leaflet with the compelling advice to quarantine themselves for a fortnight.^[105]

On 27 March, the National Security Council and the governments decided to extend the measures until 19 April (end of the Easter vacation).^[106] On 15 April, the containment measures were extended until the 3 May.^[107]



Looking for data

- Some journals mandate authors to share their data publicly: Plos One, Nature Human Behaviour, ...

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0104813#s5>

Using Random Walks to Generate Associations between Objects

Muhammed A. Yildirim , Michele Coscia

Supporting Information

Abstract

Introduction

Methods

Results

Discussion

Supporting Information

Acknowledgments

Author Contributions

References

Figure S1.

Threshold sensitivity. AUC values for different threshold (δ) choices in four datasets: O-Net (top left), IPUMS (top right), Aid (bottom left) and Congress (bottom right). See Material S1 for details.

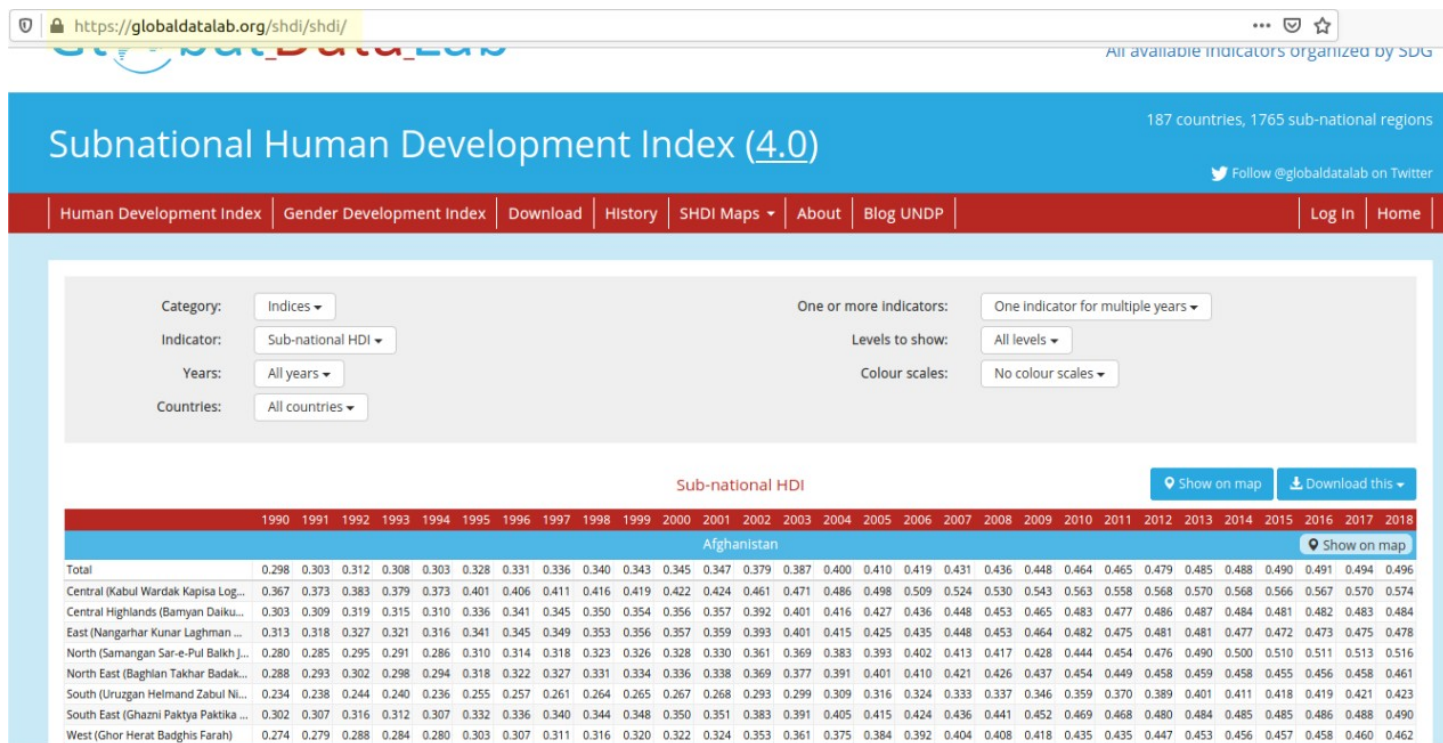
<https://doi.org/10.1371/journal.pone.0104813.s001>
(EPS)

Material S1.

<https://doi.org/10.1371/journal.pone.0104813.s002>
(PDF)

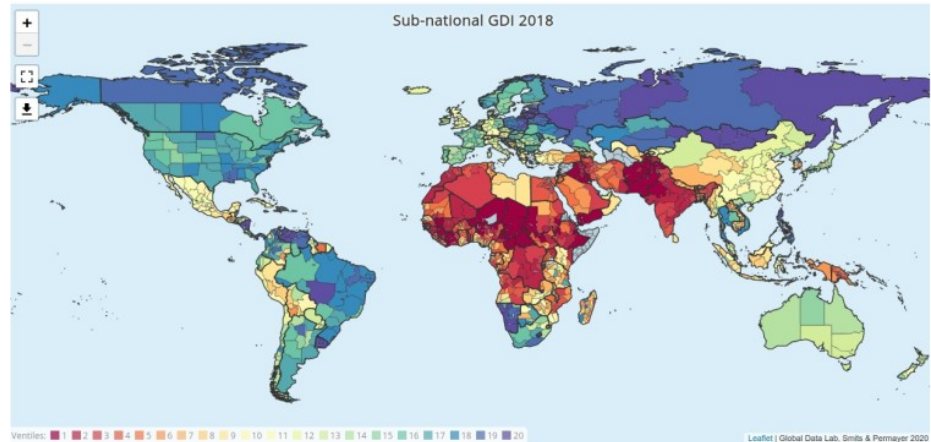
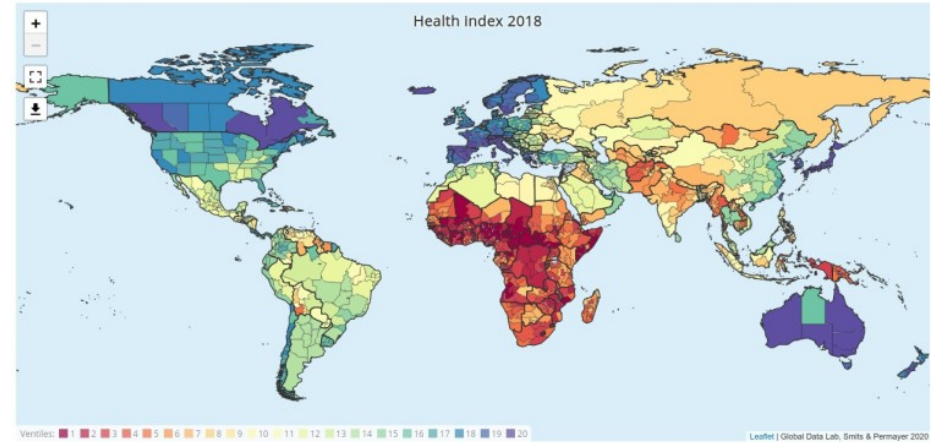
Looking for data

- International institutions are waking up!
- Hit the World Bank, European agencies, ...
- Example, HDI by region:



Global Data Lab

- Health index
- Gender equality
- And more!



Additional Corona Data

- Our World in Data for country-country comparisons

https://ourworldindata.org/coronavirus

Our World in Data

Articles by topic

Search...

Latest About Donate

All charts Sustainable Development Goals Tracker

OXFORD MARTIN SCHOOL OF PUBLIC AFFAIRS

GC DL

Coronavirus Pandemic (COVID-19)

Our Team →

The data on the coronavirus pandemic is updated daily. Last update: 5 hours ago. [Reuse our work freely](#) [Cite this research](#)

Coronavirus > **By country** Data explorer Deaths Cases Tests Hospitalizations Vaccinations Mortality risk Excess mortality Policy responses Exemplars

Data Explorer

Explore all metrics – including cases, deaths, testing, and vaccinations – in one place.

Country Profiles

Get an overview of the pandemic for any country on a single page.

Download Dataset

Download our complete dataset of COVID-19 metrics on GitHub. It's open access and free for anyone to use.

Vaccinations

Explore our global dataset on COVID-19 vaccinations.

Stringency Index

- Quantification of **overall** intervention at the **country** level

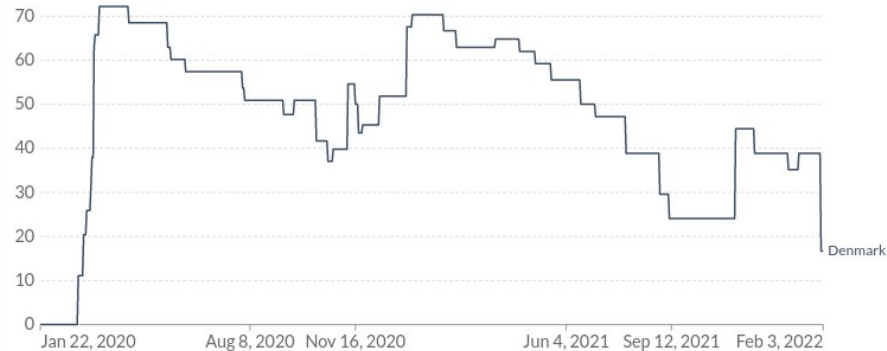
Denmark: Government Stringency Index

COVID-19 Stringency Index

The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

Our World
in Data

[+ Add country](#)



Source: Oxford COVID-19 Government Response Tracker, Blavatnik School of Government, University of Oxford - Last updated 6 February 2022, 21:50 (London time)
OurWorldInData.org/coronavirus • CC BY

▶ Jan 21, 2020 Feb 3, 2022

CHART

MAP

TABLE

SOURCES

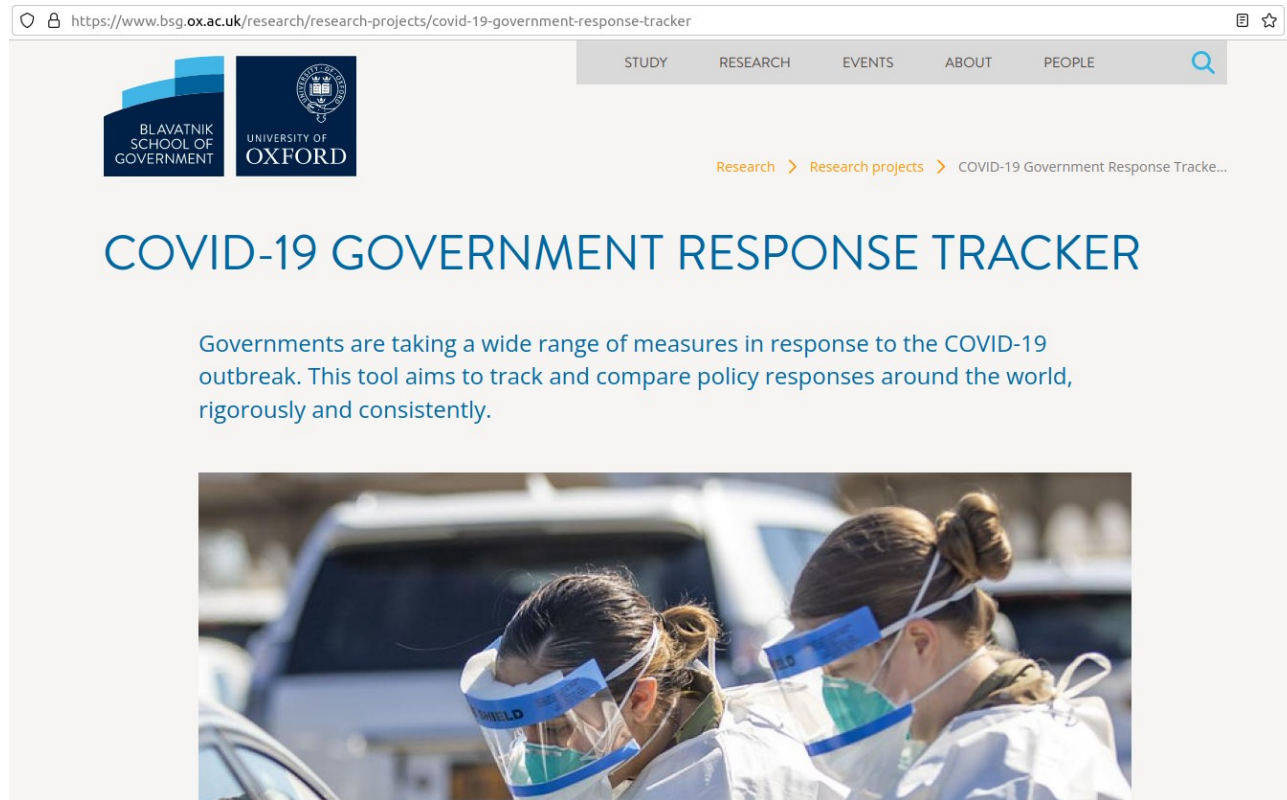
DOWNLOAD

Share

Related: [What is the COVID-19 Stringency Index?](#)

Covid Interventions

- More granular data about **specific** interventions



Let's integrate some data

The screenshot shows a JupyterLab environment with a file explorer on the left and a code editor on the right. The file explorer shows a directory named 'notebooks' with several files, including 'pr01_e05.ipynb' which is selected. The code editor shows the following Python code:

```
[35]: # As usual, importing the libraries we need
import json
import numpy as np
import pandas as pd
import statsmodels.api as sm
from scipy.stats import pearsonr, spearmanr

[36]: # Clean the data
corona_df = pd.read_csv("../data/raw/corona/dk_corona.csv", sep = "\t")

with open("../data/raw/metadeta/dk_metadeta.json", 'r') as f:
    country_metadeta = json.load(f)

region_map = {country_metadeta["country_metadeta"][i]["covid_region_code"]: country_metadeta["country_metadeta"][i]["iso3166-2_code"] for i in range(len(country_metadeta["country_me
corona_df["region"] = corona_df["region_code"].map(region_map)

population_map = {country_metadeta["country_metadeta"][i]["iso3166-2_code"]: country_metadeta["country_metadeta"][i]["population"] for i in range(len(country_metadeta["country_metac
corona_df["population"] = corona_df["region"].map(population_map)
corona_df["cases_pc"] = corona_df["hospitalized_addition"] / corona_df["population"]

weather_df = pd.read_csv("../data/raw/weather/weather.csv")

weather_df["TemperatureAboveGround"] = weather_df["TemperatureAboveGround"] - 273.15
weather_df = weather_df[weather_df["iso3166-2"].str.startswith("DK")]

df = corona_df.merge(weather_df, left_on = ["date", "region"], right_on = ["date", "iso3166-2"])
df = df.drop(["region_code", "region"], axis = 1)

df
```

The output of the code is a DataFrame with the following columns: date, hospitalized_addition, population, cases_pc, iso3166-2, RelativeHumiditySurface, SolarRadiation, Surfacepressure, TemperatureAboveGround, Totalprecipitation, UVIndex, WindSpeed. The DataFrame contains 1799 rows of data, with the first 4 rows and the last 4 rows shown.

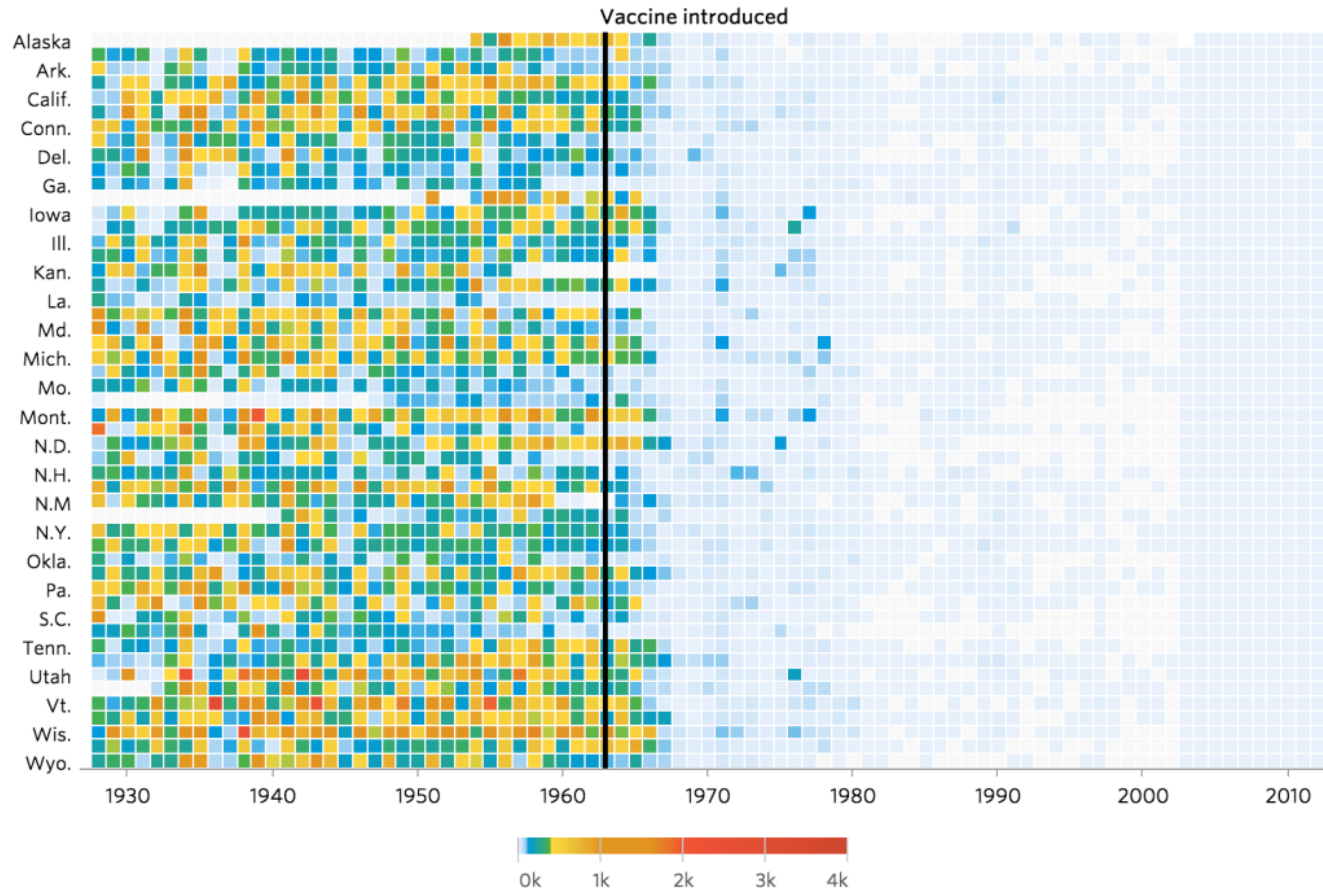
	date	hospitalized_addition	population	cases_pc	iso3166-2	RelativeHumiditySurface	SolarRadiation	Surfacepressure	TemperatureAboveGround	Totalprecipitation	UVIndex	WindSpeed
0	2020-03-01	1	1846023	5.417051e-07	DK-84	79.371362	3.383109e+06	2.370635e+06	5.064128	0.000784	2.595843	6.668466
1	2020-03-02	0	1846023	0.000000e+00	DK-84	86.574612	3.303007e+06	2.380293e+06	4.470362	0.001416	4.286374	2.475038
2	2020-03-03	1	1846023	5.417051e-07	DK-84	93.285949	8.690623e+04	2.395165e+06	3.884757	0.002084	1.676674	2.345198
3	2020-03-04	0	1846023	0.000000e+00	DK-84	86.105840	3.227602e+06	2.407377e+06	4.677848	0.000926	4.771363	4.631544
4	2020-03-05	1	1846023	5.417051e-07	DK-84	86.688654	2.998848e+06	2.403363e+06	3.949029	0.000420	4.919169	2.801289
...
1755	2021-02-11	1	589936	1.695099e-06	DK-81	73.558470	3.624393e+06	2.475768e+06	-6.216205	0.000383	1.495042	4.113037
1756	2021-02-12	1	589936	1.695099e-06	DK-81	74.618363	4.379149e+06	2.491939e+06	-6.035219	0.000006	1.992372	1.915713
1757	2021-02-13	1	589936	1.695099e-06	DK-81	76.532522	4.910543e+06	2.494230e+06	-4.408170	0.000000	2.279176	1.357024
1758	2021-02-14	1	589936	1.695099e-06	DK-81	74.459283	4.752374e+06	2.484782e+06	-3.379998	0.000000	2.772693	2.861502
1759	2021-02-15	2	589936	3.390198e-06	DK-81	76.951013	3.486211e+04	2.452897e+06	-0.972067	0.002582	0.015256	5.553239

The bottom status bar shows the current mode is 'Command', the cursor is at line 4, column 17, and the active file is 'pr01_e05.ipynb'.

Estimating Intervention Effects

The Ideal Scenario

Measles

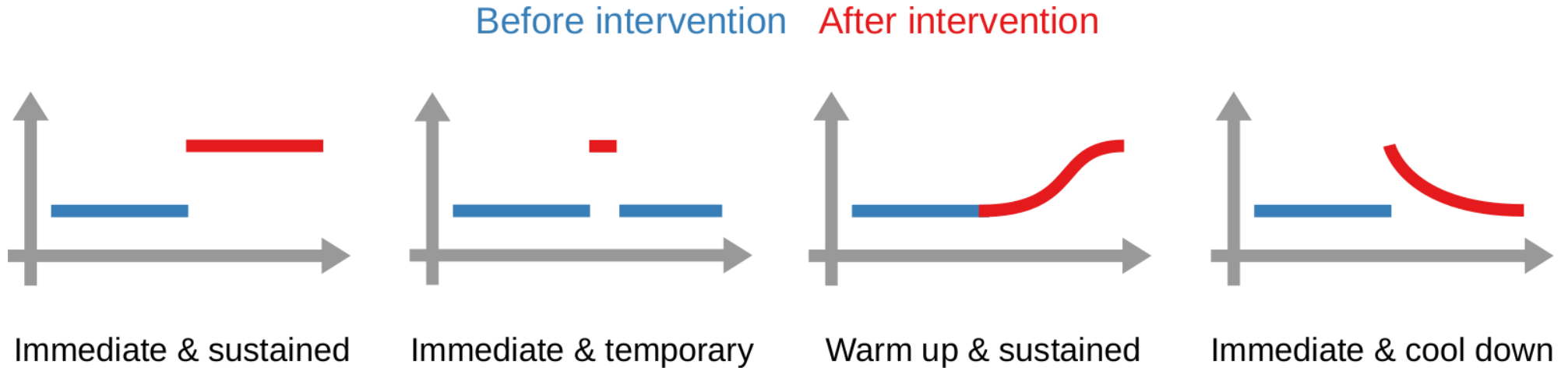


It's never that easy...

- Did the lockdown work?
- Too many things happen at the same time:
 - New variants
 - Ebb & flow of epidemics
 - Individual & collective behavior
 - Influence of weather
 - Which interacts with collective behavior
- Vaccine development

It's never that easy...

- Also: what type of effect did the intervention cause?



Interventions and Fixed Effects

A Rule of Thumb

- You don't know what an intervention did
- You only know if it's on or off
- How to implement it?
- Fixed Effects!

Interventions and Fixed Effects

- Create a column for intervention
- Value = 1 if the intervention is in place
- Value = 0 if it is not

Beware!

- It might take time for an intervention to take effect
- You should shift your observations accordingly
- By how much depends on the Y variable (and on the intervention)
 - Cases > Hospitalizations > Deaths

Let's Intervene

The screenshot shows a JupyterLab environment with a notebook titled 'pr01_e05.ipynb'. The notebook contains the following code:

```
[2]: The condition number is large, 1.92e+03. This might indicate that there are strong multicollinearity or other numerical problems.
```

```
[7]: # Final question (naive check): what intervention did what, and let's take into account one week delay.
```

```
npi_df = pd.read_csv("../data/raw/corona/OxCGRt_latest.csv")
varlist = ["Date", "C1_School closing", "C2_Workplace closing", "C3_Cancel public events", "C4_Restrictions on gatherings", "C5_Close public transport", "C6_Stay at home requirements", "C7_Restrictions on internal movement", "C8_International travel controls"]
npi_df = npi_df[npi_df["CountryCode"] == "DNK"]
npi_df["date"] = npi_df["Date"].map(lambda x: f"{str(x)[4:]}-{str(x)[6:]}-{str(x)[8:]}")
npi_df = npi_df.drop("Date", axis = 1).dropna()
npi_df["date"] = pd.to_datetime(npi_df["date"], format = "%Y-%m-%d") + timedelta(days = 7)
npi_df = (npi_df.set_index("date") > 0).astype(int).reset_index()
npi_df["date"] = npi_df["date"].dt.strftime("%Y-%m-%d")

npi_df

df = df.merge(npi_df, on = "date")
df
```

A warning message is displayed:

```
/usr/local/lib/python3.9/dist-packages/IPython/core/interactiveshell.py:3457: DtypeWarning: Columns (2,3) have mixed types.Specify dtype option on import or set low_memory=False.
exec(code_obj, self.user_global_ns, self.user_ns)
```

```
[7]:
```

	const	date	hospitalized_addition	population	cases_pc	iso3166-2	RelativeHumiditySurface	SolarRadiation	Surfacepressure	TemperatureAboveGround	...	DK-84	DK-83	C1_School closing	C2_Workplace closing	C3_Cancel public events	C4_Restrictions on gatherings
0	1.0	2020-03-01	1	1846023	5.417051e-07	DK-84	79.371362	3.383109e+06	2.370635e+06	5.064128	...	1	0	0	0	0	0
1	1.0	2020-03-01	0	837359	0.000000e+00	DK-85	80.658130	3.376985e+06	2.370150e+06	5.111854	...	0	0	0	0	0	0
2	1.0	2020-03-01	0	1223105	0.000000e+00	DK-83	80.691986	3.601074e+06	2.360351e+06	5.451110	...	0	1	0	0	0	0
3	1.0	2020-03-01	0	1326340	0.000000e+00	DK-82	83.944243	4.346587e+06	2.351536e+06	4.795169	...	0	0	0	0	0	0
4	1.0	2020-03-01	0	589936	0.000000e+00	DK-81	83.830573	4.163014e+06	2.351863e+06	4.667017	...	0	0	0	0	0	0
...
1755	1.0	2021-02-15	4	1846023	2.166820e-06	DK-84	78.648719	4.083331e+05	2.464868e+06	-1.458766	...	1	0	1	1	1	1
1756	1.0	2021-02-15	7	837359	8.359616e-06	DK-85	78.951895	1.382502e+04	2.461460e+06	-1.277317	...	0	0	1	1	1	1
1757	1.0	2021-02-15	5	1223105	4.087956e-06	DK-83	70.380505	6.083510e+04	2.450499e+06	-0.896892	...	0	1	1	1	1	1
1758	1.0	2021-02-15	3	1326340	2.261863e-06	DK-82	72.866680	3.564665e+04	2.447235e+06	-0.881744	...	0	0	1	1	1	1
1759	1.0	2021-02-15	2	589936	3.390198e-06	DK-81	76.951013	3.486211e+04	2.452897e+06	-0.972067	...	0	0	1	1	1	1

1760 rows x 30 columns

```
[8]: Xs = ['const', 'TemperatureAboveGround', 'UVIndex', "C1_School closing", "C2_Workplace closing", "C3_Cancel public events", "C4_Restrictions on gatherings", "C5_Close public transport", "C6_Stay at home requirements", "C7_Restrictions on internal movement", "C8_International travel controls"]
```

The bottom status bar shows: Simple Python 3 (ipykernel) | Idle Mode: Command Ln 2, Col 107 pr01_e05.ipynb

Q&A