

WEATHER AND GOVERNMENT RESPONSE IMPACT ON COVID-19 IN DENMARK

Group H



SINGLE VARIABLE ANALYSIS

- Key statistics
- Range
- Check mean vs median



INTRODUCTION

Research question:

“What parts of the weather have a significant correlation with Covid-19 cases in Denmark?”



DATA

- Dataset layouts
- Data cleaning and merging
 - Time delta
 - Datetime formatting

Column	Type
date	string
region_code	string
hospitalized_addition	int

Column	Type
date	string
iso3166-2	string
RelativeHumiditySurface	float
⋮	⋮
WindSpeed	float

Column	Type
CountryName	string
CountryCode	string
Date	int
C1_School closing	float
⋮	⋮
StringencyIndex	float



SINGLE VARIABLE ANALYSIS

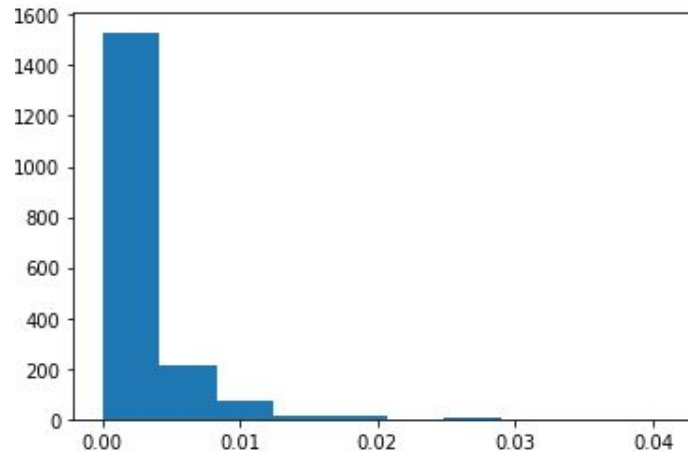
	Surfacepressu... ▾	TemperatureAb... ▾	Totalprecipit... ▾	UVIndex float64 ▾	WindSpeed floa... ▾
min	2342463.021446	265.409594	0	0	0.804547
mean	2425408.6540672 635	282.53512853224 93	0.0021269224932 24932	14.701755647154 469	4.4523962216802 175
median	2426780.412072	282.187354	0.000773	10.603854	4.165541
max	2494230.364226	296.35325	0.041373	44.536232	12.495682

Key statistics



SINGLE VARIABLE ANALYSIS

Example - Total precipitation



ASSOCIATIONS

- Pearson

$$\frac{\text{cov}(X, Y)}{\sigma_X \sigma_Y}$$

- Spearman rank

$$\frac{\text{cov}(R(X), R(Y))}{\sigma_{R(X)} \sigma_{R(Y)}}$$

- Log-Pearson

$$\frac{\text{cov}(X, \ln(Y))}{\sigma_X \sigma_{\ln(Y)}}$$



ASSOCIATIONS

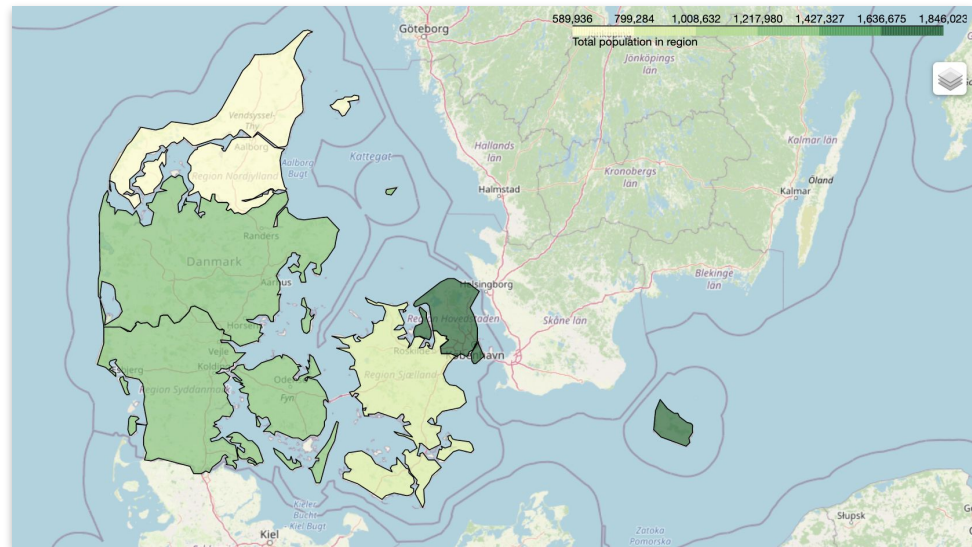
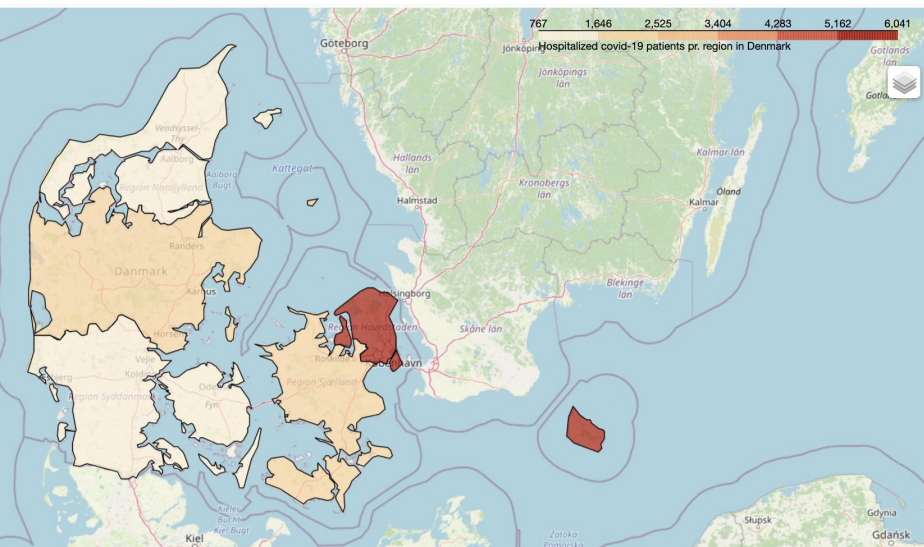
-	TemperatureAboveGround	UVIndex	Surfacepressure	Totalprecipitation	WindSpeed
Pearson	True	True	True	False	False
Spearman rank r	True	True	False	True	False
Log Pearson r	True	True	True	False	False

If tests' p-value is significant

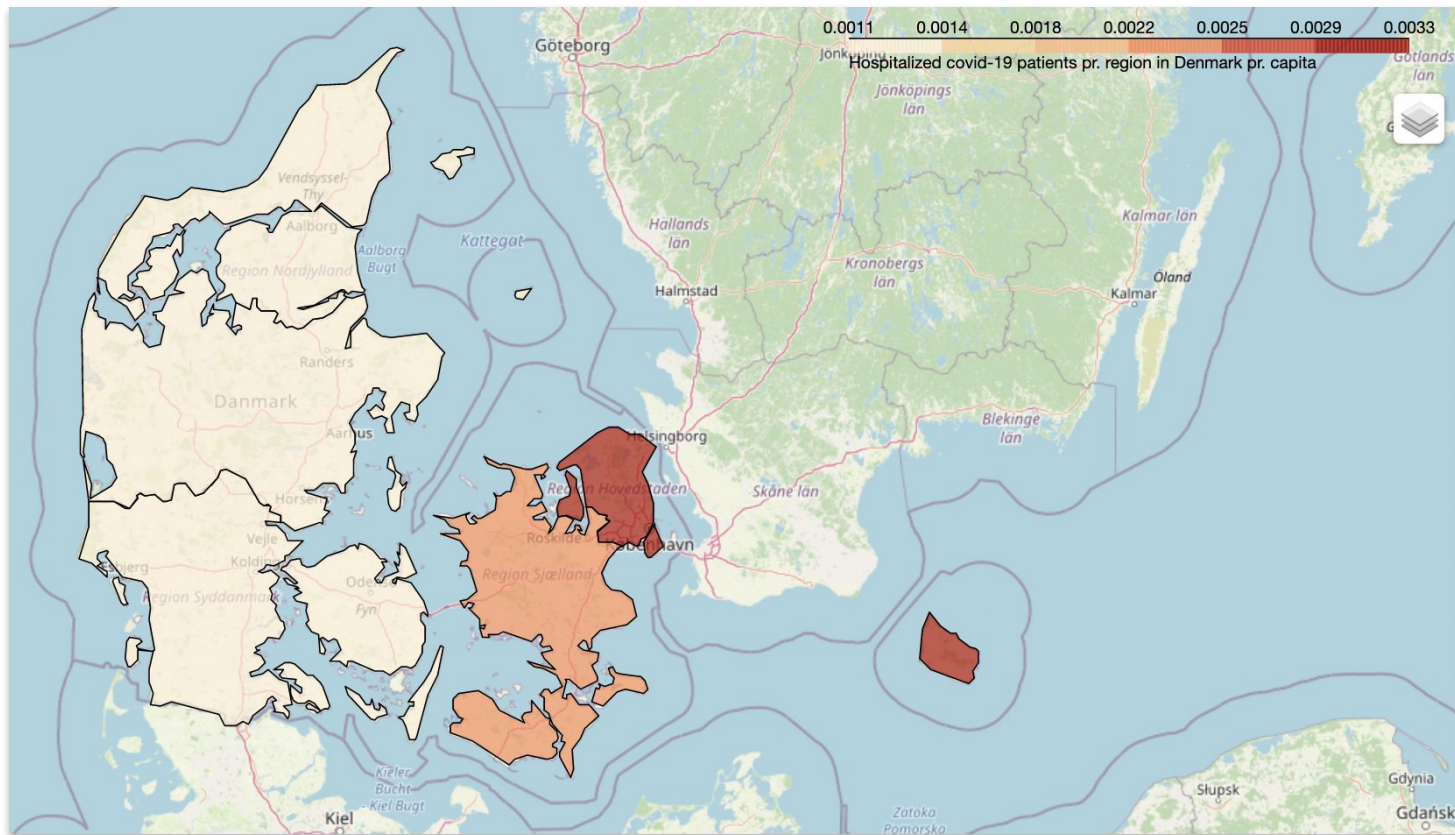


MAP VISUALIZATION

Folium Library → Choropleths



MAP VISUALIZATION



OPEN QUESTION

- Weather data is controlled by nature
- Stringency is controlled by governments

This leads to another research question:

- Does the stringency index correlate with Covid-19 cases in Denmark?



OPEN QUESTION

Significant variables in
multivariate regression

Variable	coefficient	std err	P> t
TemperatureAboveGround	0.0474	0.004	< 0.001
Totalprecipitation	-216088	3.232	< 0.001
UVIndex	-0.0352	0.002	< 0.001
C1_School closing	-0.3636	0.025	< 0.001
C2_Workplace closing	-0.3774	0.054	< 0.001
C3_Cancel public events	13269	0.056	< 0.001
C4_Restrictions on gatherings	0.4019	0.024	< 0.001
C5_Close public transport	-0.3375	0.065	< 0.001
C6_Stay at home requirements	0.5860	0.056	< 0.001
C7_Restrictions on internal movement	0.2345	0.046	< 0.001
C8_International travel controls	0.0978	0.033	0.003
H2_Testing policy	-0.4173	0.030	< 0.001
H3_Contact tracing	-12.9176	1.602	< 0.001
H4_Emergency investment in healthcare	7.66E-06	1.75e-09	< 0.001
H6_Facial Coverings	0.9138	0.028	< 0.001
H7_Vaccination policy	-0.2367	0.024	< 0.001
H8_Protection of elderly people	0.3457	0.027	< 0.001



LIMITATIONS

~ 374

DAYS

In the data set

5

REGIONS

In Denmark

- Relatively small dataset
- Only correlation, no causation
- Stringency Index components



CONCLUSIONS

Significant weather variables:

- Temperature
- Total precipitation
- UV Index



CONCLUSIONS

Significant Government Interventions:

- Cancel public events
- Contact Tracing
- Facial Covering



FUTURE WORK

- Longer time frame
 - Other Covid-19 variants
- Coefficient of Temperature
- Multiple countries





SOURCES

The Weather Company, IBM. Advancing weather science with accurate forecasting products & technology for businesses everywhere. <https://www.ibm.com/weather>

Statens Serum Institut. (2020). Arkiv med overvågningsdata for COVID-19. Archived March 3rd 2022 at: <https://web.archive.org/web/20201101060302/https://www.ssi.dk/sygdomme-beredskab-og-forskning/sygdomsovervc/covid19-overvaagning/arkiv-med-overvaagningsdata-for-covid19>

Center for Systems Science and Engineering at Johns Hopkins University (CSSE JHU). (2020). COVID-19 Data Repository. <https://github.com/CSSEGISandData/COVID-19>. Accessed March 3rd 2022 at: <https://github.com/owid/covid-19-data/tree/master/public/data>

Hale, T. et al. (2021). A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). Nature Human Behaviour. <https://doi.org/10.1038/s41562-021-01079-8>. Accessed March 3rd 2022 at: <https://github.com/OxCGRT/covid-policy-tracker>

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Belgian Collaborative Group on COVID-19 Hospital Surveillance (BCGCHS). (2020). Time between Symptom Onset, Hospitalisation and Recovery or Death: Statistical Analysis of Belgian COVID-19 Patients. Int J Environ Res Public Health. doi:10.3390/ijerph17207560.

