

Influence of Chinese city's hygiene on SARS-CoV2 transmission

A retrospective analysis on transmission dynamics

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Outline

Influence of
Chinese city's
hygiene on
SARS-CoV2
transmission

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1 Motivation

2 Methods

3 Findings

4 Summary

5 Q & A

Motivation

Methods

Findings

Summary

Q & A

Motivation

Background

Influence of
Chinese city's
hygiene on
SARS-CoV2
transmission

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Motivation

Methods

Findings

Summary

Q & A

- Transmission dynamics of this emerging infectious disease haven't been fully understood
- Environment is closely related to human health
- A city's hygiene may have prominent influence of the SARS-CoV2 transmission.

My Aim

Influence of
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transmission

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Motivation

Methods

Findings

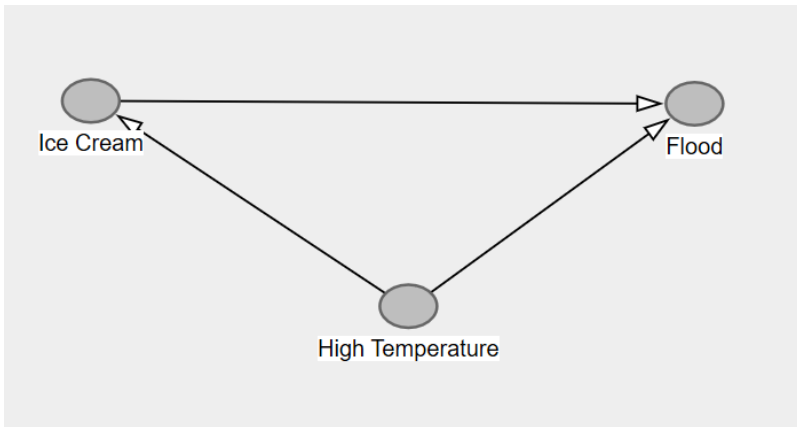
Summary

Q & A

- Get the datasets which is sufficient and high-quality to conduct the analysis
- Evaluate how city's hygiene can impact the transmission dynamics of SARS-CoV-2.

Causality & Association

Will eating ice-cream cause flood?

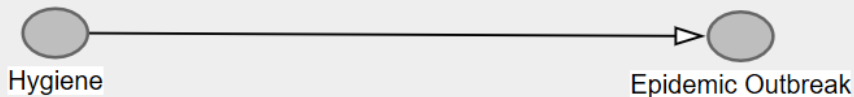


Causality & Association

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hygiene on
SARS-CoV2
transmission

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Any guess of a third variable?



Motivation

Methods

Findings

Summary

Q & A

Causality & Association

Influence of
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hygiene on
SARS-CoV2
transmission

Wang et al.

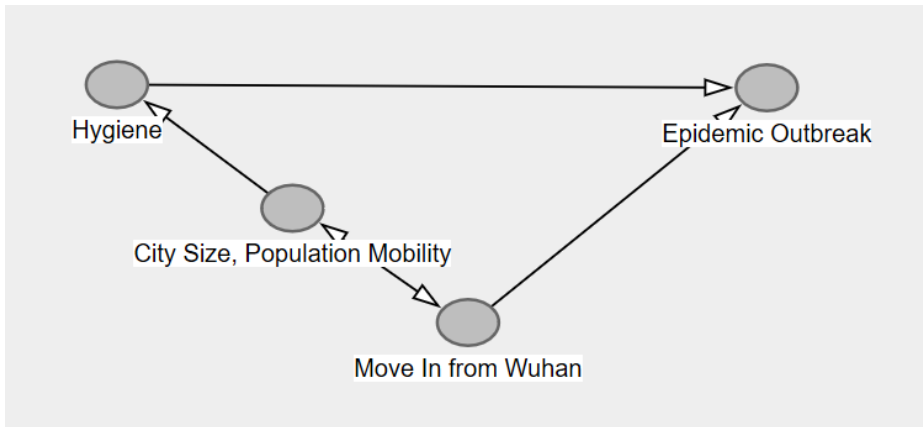
Motivation

Methods

Findings

Summary

Q & A



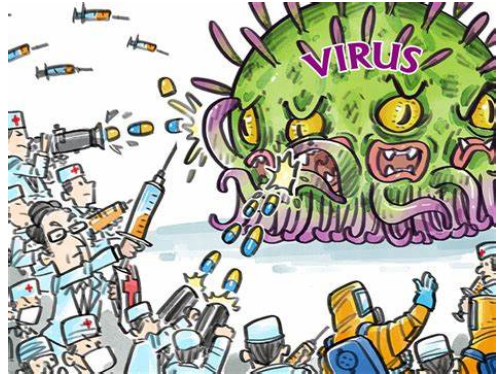
Methods

Study Design

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- Retrospective study
- Causal model
- Multi-dataset
 - Hygiene Data
 - Epidemic Data
 - Move-out Data



Measures of Hygiene

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hygiene on
SARS-CoV2
transmission

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Motivation

Methods

Findings

Summary

Q & A

National hygienic city - Ninety three reconfirm national hygienic cities in China in 2018, this is the newest list of national hygienic city.(Source: National Health Commission of the People's Republic of China; Date: Mar 20th, 2019).

- The assessment of national hygienic city has a comprehensive guideline on following items:
 - Solid waste management
 - Waste water management
 - Coverage of green area and green area per capita
 - Air Pollution Index (API) or Air Quality index (AQI)
 - Other seven items.
 - Full guideline can be download from the website of National Health Commission of the People's Republic of China.

Measures of Epidemic outbreak

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Motivation

Methods

Findings

Summary

Q & A

Total confirmed cases

- nCov2019 packages.
- Excluding infected arrivals from abroad

Measures of Move-Out from Wuhan

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Motivation

Methods

Findings

Summary

Q & A

Move-out data before lockdown

- Baidu Qianxi
- Inspect elements
- 16 days (Jan 10,2020 - Jan 25,2020)
- Each city's move-out strength is presented as percentage
- Total move-out strength were adjusted by each day's move-out strength.

Findings

Move-out trend from Wuhan

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transmission

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Motivation

Methods

Findings

Summary

Q & A

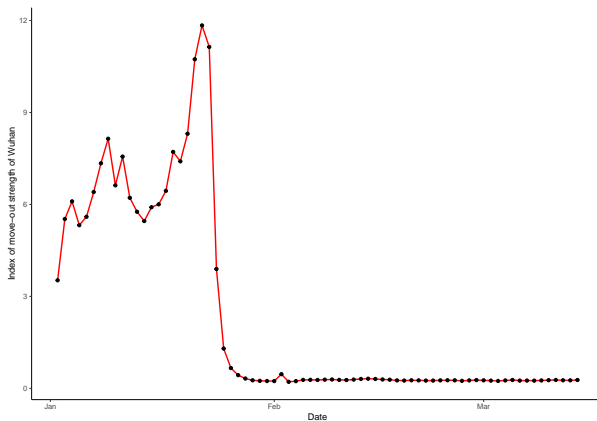


Figure 1: Move out trend from Wuhan

Top move-out cities are all in Hubei province

- Top move-out cities from Wuhan are all in Hubei province



Figure 2: Hubei in China

Hygiene of city and epidemic outbreak

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SARS-CoV2
transmission

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Motivation

Methods

Findings

Summary

Q & A

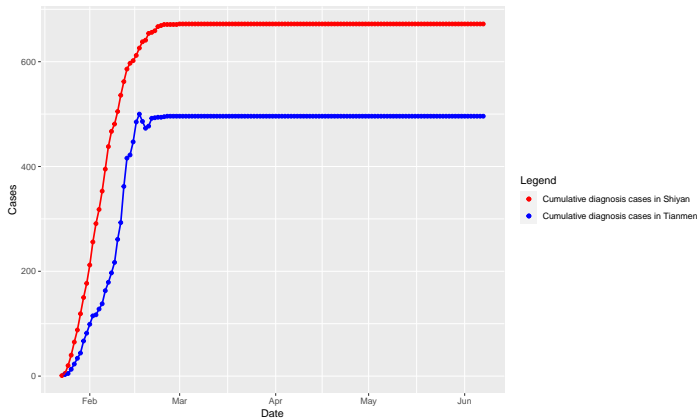


Figure 3: A comparison of Tianmen and Shiyen

All cities outside Wuhan

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hygiene on
SARS-CoV2
transmission

Wang et al.

Motivation

Methods

Findings

Summary

Q & A

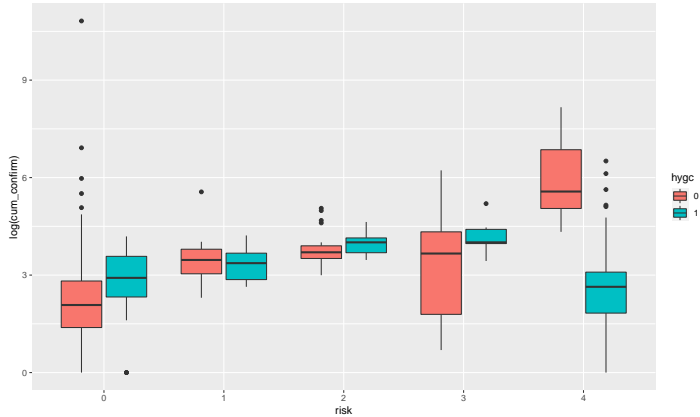


Figure 4: A comparison of all cities outside Wuhan

All cities outside Wuhan

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hygiene on
SARS-CoV2
transmission

Wang et al.

Motivation

Methods

Findings

Summary

Q & A

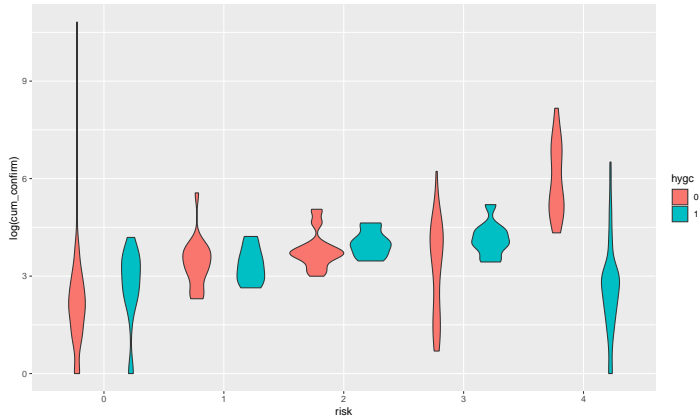


Figure 5: A comparison of all cities outside Wuhan

Summary

Conclusions

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SARS-CoV2
transmission

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Motivation

Methods

Findings

Summary

Q & A

- Lockdown of Wuhan City effectively cut-down the move-out from Wuhan City.
- Top 10% move-out cities from Jan 10,2020 to Jan 25,2020 are all in Hubei province
- National hygienic city may not have a better control of the epidemic
- However, the outliers with weak epidemic control, are more likely to be non- national hygienic city
- Still ongoing...

Future work

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Motivation

Methods

Findings

Summary

Q & A

- Multi-way ANOVA
- Multiple linear regression
- Mortality & Inhospital time
- Detailed hygiene condition

Value and impact

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SARS-CoV2
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Motivation

Methods

Findings

Summary

Q & A

Theoretical implication: how does hygiene impact the disease transmission, which will help to understand the transmission dynamics of the virus.

Practical implication: to evaluate the effectiveness of national hygienic cities, which will promote the city hygiene in China and beyond.

Limitations

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Motivation

Methods

Findings

Summary

Q & A

- The transmission may start from New Year travel in early January
- The move-out data from Wuhan does not include transportation means
- Real performance of local government varies in response to this emerging infectious disease

Acknowledgement

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hygiene on
SARS-CoV2
transmission

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Motivation

Methods

Findings

Summary

Q & A

- Baidu Qianxi
- ncovr and nCov2019 packages

References

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Q & A

I think you may ask?

Justification and Limitations

Q1: How's the GDP's influence on the disease transmission? A1: GDP may be related to move out data, and the move out data will be controlled adjusted in the data analysis.

Q2: Will the emerging public health response level in different city be an confounding variable? Q2: No, other than the lockdown of Wuhan city, the policy in China are relatively consistent. Each city announce their emergency public health response level according to national standard. **However, we don't know if the real performance varies in each city's local government, this will be an limitation.**

Q3: Will the rural infected cases and rural hygiene be included in the analysis Q3: Yes, the assementent of national hygienic cities include the rural areas belong to this city. The rural infected cases also included in the total confirmed cases in a city.

You may ask

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Chinese city's
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SARS-CoV2
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Wang et al.

Motivation

Methods

Findings

Summary

Q & A

Q4: There is a time difference of the assessment of national hygienic cities and epidemic outbreak, will it bias the results. A4: Not likely, because the assessment based the whole year performance in 2018 and published at March, 2019, which is the newest version. The epidemic outside mainly start transmission at Spring Festival travel in 2020. The hygiene of a city is the long-term efforts of local government and citizens, the change can be neglected to change within one year.

Q5: Will the transmission start from New Year travel in early January. A5: **Maybe, this will be an limitation**

Q6: After the lockdown of Wuhan city, some people scape out Wuhan city secretly, will they be included in the move out data. A6: It's difficult to know them, but we assume the number are not too much