

2019 Data Visualization - 2P2H

Team 4 / 2P2H:

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2P2H - Visualization with diseases and environmental variables

- Find relevance between patient numbers and environmental variables (temperature, fine dust, etc ...)



01. Purpose & Target

we raised awareness of the problem by showing the relationship between disease and the environmental variables to the citizens. In addition, we select specific cities, not the whole country.



Seoul and Busan have the highest levels of fine dust. Therefore, we thought that we could clearly see the change in the number of patients by environmental variables in Seoul and Busan.

During research for project, we found fine dust's severity in Seoul and Busan So we target Seoul, Busan for DV project's target region

Paper1) effect of fine dust on respiratory diseases, eye diseases, and skin diseases

The Survival Rate of Cultured Epithelial Keratinocyte Cell and Dermal Fibroblast Cell treated with Particulate matter(PM10)

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Paper2) connection between fine dust and asthma

Original Articles

Particulate Matter (PM_{2.5}, PM_{10-2.5}, and PM₁₀) and Children's Hospital Admissions for Asthma and Respiratory Diseases: A Bidirectional Case-Crossover Study

Lokman Hakan Tecer¹, Omar Alagha, Ferhat Karaca, Grdal Tuncel & Nilufer Eldes

Pages 513-520 | Received 15 Oct 2007, Accepted 27 Dec 2007, Published online: 12 Mar 2008

Download citation | <https://doi.org/10.1080/15287390801907459>

Full Article | Figures & data | References | Citations | Metrics | Reprints & Permissions | Get access

Target region: Seoul, Busan / Target: citizens and doctors



02. Data preparation

Data detail

1. **Actual clinical data** such as cold, asthma, skin diseases, eye diseases
- Public data portal

2. **Seoul, Busan Fine Dust Data**

- Public Health and Environmental Information System

3. **Seoul, Busan Daily Weather Data (27 variables)**

4. Additional data

- Population and **population density** by region – National indicator system
- longitude, latitude in Seoul, Busan city

연도	시도	감기	눈병	전식	피부병
20140101	서울	5992	247	715	246
20140101	부산	3158	91	554	138
20140101	대구	2190	96	370	85
20140101	인천	3426	83	437	138

측정 시간	측정 항목					
	초미세먼지 PM-2.5(µg/m³)	미세먼지 PM-10(µg/m³)	아황산가스 SO2(ppm)	오존 O3(ppm)	이산화질소 NO2(ppm)	일산화탄소 CO(ppm)
환경 기준	35/24이하	100/24이하	0.15/1이하	0.1/1이하	0.1/1이하	25/1이하
09월 01일	16	20	0.01	0.023	0.02	0.2
02일	16	22	0.016	0.019	0.022	0.2

4 kinds of patients number in 2014 ~ 2016

Cold / Asthma / Skin disease / Eye disease

10 Environmental variables

Average temperature / Dew point temperature / Average vapor pressure

carbon monoxide / Relative humidity / Autumn time / Nitrogen Dioxide

Sulfur dioxide / Local air pressure / air index



Data visualization tools



1. **Data preprocessing**
(excel) basic technique
(R studio) basic technique



2. **ggplot2 package**
(ggplot2) correlogram

(ggplot2) Scatter plot



3. **R shiny package**
(R shiny) Interactive visualization

(R shiny) Polygon mapping
(R shiny) Image, Text output

Data processing

4 patient variables + 5 fine dust variables + 27 environmental variables +
location information = 40 variables in total

1. Use only average value among minimum, maximum and average values
(there is no big difference for maximum, minimum)
(If there is no average value, use the maximum value)

2. New air index added to integrate fine dust information

3. Calculate the percentage of patients (to overlap all local plots).

4. Use Correlogram to reduce the number of meaningful variables

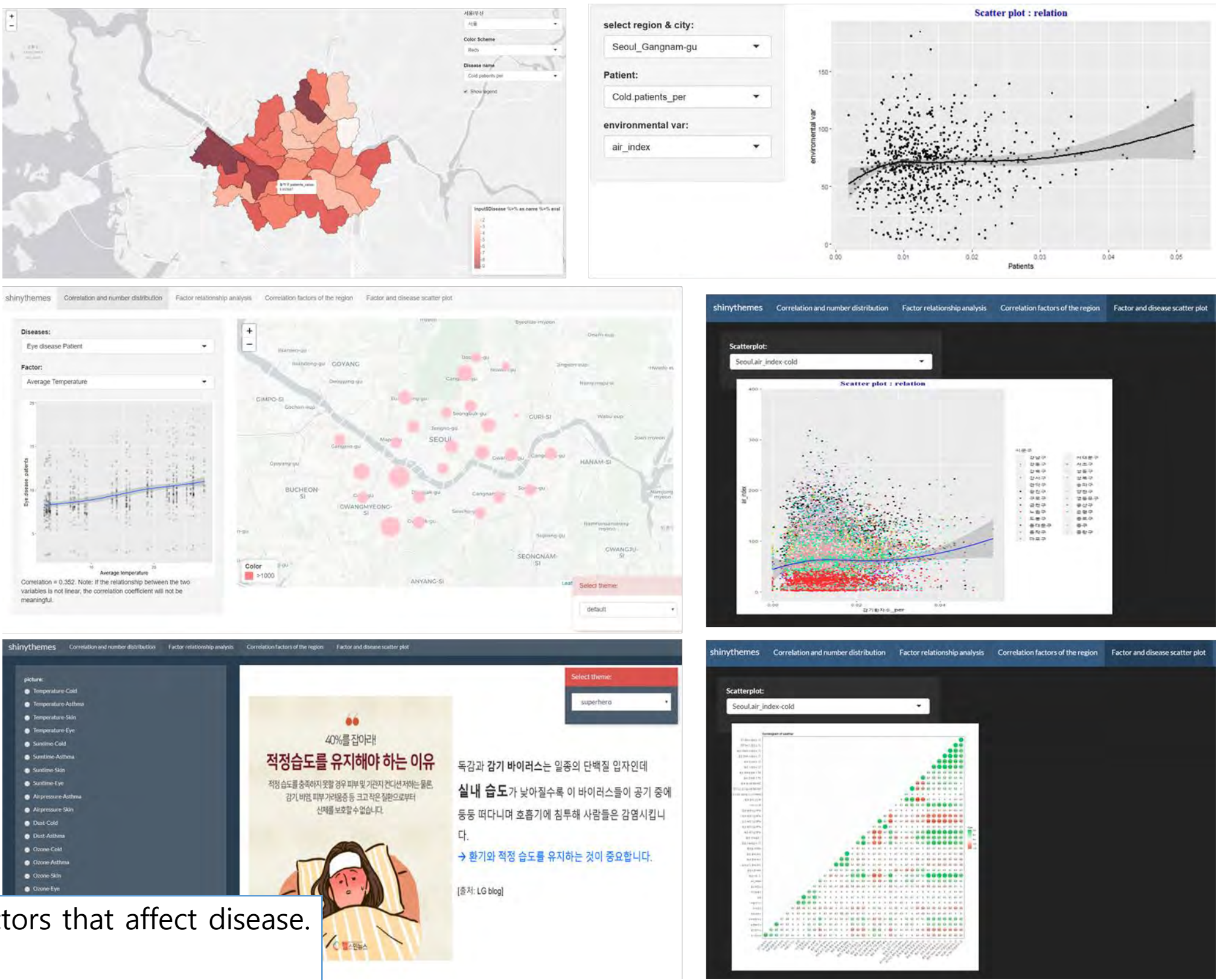
After excluding weekends and Mondays, we use the data +1 and -1 day to see the delay



03. Visualization Results

1. **Polygon mapping** for all areas of Seoul and Busan
2. **Correlogram** check for all areas of Seoul and Busan
3. **Scatter plot** check for all areas of Seoul and Busan
4. **Interactive visualization** of all areas of Seoul and Busan (scatter plot + mapping)
5. Visualize relevant **news and information** using **images output**
6. (Additional) **Scatter plot** for Seoul and Busan **each regions**.

Tab-panel



04. Discussion

- 1) One of the strengths is that it uses big data to analyze one of the factors that affect disease. We think this would be very good to alert patients.
- 2) Another strength is that doctors can use it to communicate medical information to patients. When explaining to patients through visualization, they will be more understanding.
- 3) An application is to provide people with medical knowledge by using touchscreen panels in the patient reception area.