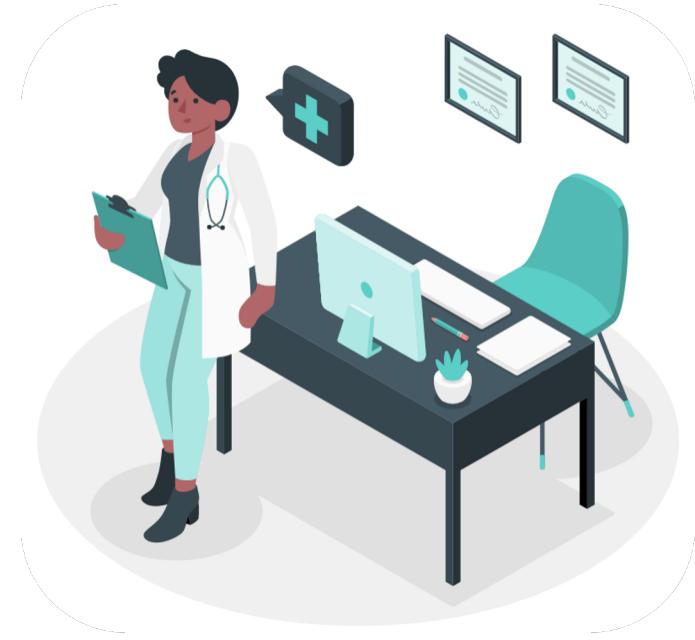


台灣疾病歷年 死亡分布統計

第一組

王中伶、賴建郡、黃渝庭、陳韋翰、王神鐸



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01

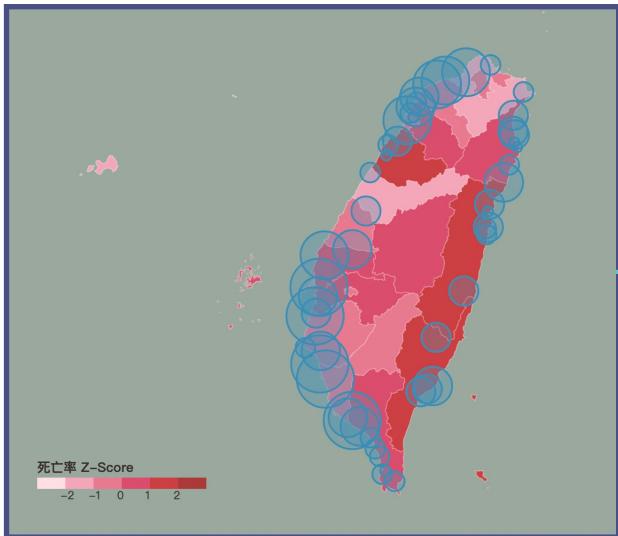
任務目標

陳韋翰





任務目標



呈現非傳染性疾病
於地區與時間下的變化

分析疾病與環境關聯

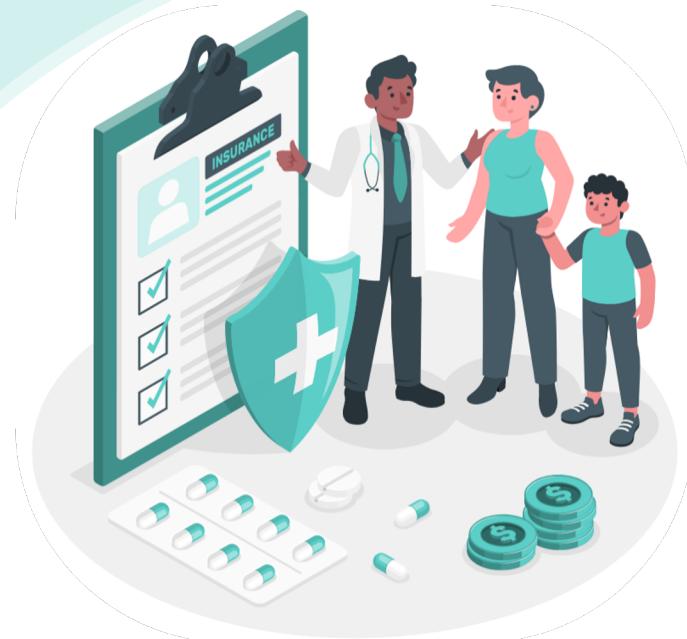
結合環境因素資料



02

資料說明

黃渝庭





資料總覽

主要死因(衛生福利部統計處)

- 縣市別
- 鄉鎮別

環境因子(行政院環境保護署)

- 水汙染
- 空氣汙染

人文因子

- 原住民分佈 (內政部統計年報)
- 吸菸人口分佈 (衛生福利部統計處)

鄉鎮縣市經緯度

- 縣市 <https://reurl.cc/noLq0e>
- 鄉鎮 <https://reurl.cc/5rODrV>



主要死因一縣市別

▽ 縣市別資料

{ } 心臟疾病.json

{ } 肺炎.json

{ } 高血壓.json

{ } 惡性腫瘤.json

{ } 腦血管.json

{ } 慢性下呼吸道.json

{ } 糖尿病.json

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[{"city": "新北市", "99_num": 1787, "99_rate": 46, "99_norm_rate": 39.8, "99_struct": 0, "1"}, {"city": "臺北市", "99_num": 1723, "99_rate": 65.9, "99_norm_rate": 36.7, "99_struct": 0, "1}, {"city": "桃園市", "99_num": 1209, "99_rate": 60.7, "99_norm_rate": 51.5, "99_struct": 0, "1}, {"city": "臺中市", "99_num": 1387, "99_rate": 52.5, "99_norm_rate": 44.4, "99_struct": 0, "1}, {"city": "臺南市", "99_num": 1232, "99_rate": 65.7, "99_norm_rate": 43.7, "99_struct": 0, "1}, {"city": "高雄市", "99_num": 1679, "99_rate": 60.6, "99_norm_rate": 45.5, "99_struct": 0, "1}, {"city": "宜蘭縣", "99_num": 263, "99_rate": 57, "99_norm_rate": 34, "99_struct": 0, "100}, {"city": "新竹縣", "99_num": 426, "99_rate": 83.2, "99_norm_rate": 59.3, "99_struct": 0, "1}, {"city": "苗栗縣", "99_num": 453, "99_rate": 80.7, "99_norm_rate": 46.9, "99_struct": 0, "1}, {"city": "彰化縣", "99_num": 1089, "99_rate": 83.1, "99_norm_rate": 54.3, "99_struct": 0, "1}, {"city": "南投縣", "99_num": 515, "99_rate": 97.4, "99_norm_rate": 57.5, "99_struct": 0, "1}, {"city": "雲林縣", "99_num": 721, "99_rate": 100.1, "99_norm_rate": 56.2, "99_struct": 0, "1}, {"city": "嘉義縣", "99_num": 546, "99_rate": 100.1, "99_norm_rate": 53.8, "99_struct": 0, "1}, {"city": "屏東縣", "99_num": 791, "99_rate": 90.1, "99_norm_rate": 58.5, "99_struct": 0, "1}, {"city": "臺東縣", "99_num": 296, "99_rate": 127.8, "99_norm_rate": 77.5, "99_struct": 0, "1}, {"city": "花蓮縣", "99_num": 350, "99_rate": 103, "99_norm_rate": 63.2, "99_struct": 0, "1}, {"city": "澎湖縣", "99_num": 84, "99_rate": 87, "99_norm_rate": 44.8, "99_struct": 0, "100}, {"city": "基隆市", "99_num": 327, "99_rate": 84.7, "99_norm_rate": 57.5, "99_struct": 0, "1}, {"city": "新竹市", "99_num": 319, "99_rate": 77.2, "99_norm_rate": 59.9, "99_struct": 0, "1}, {"city": "嘉義市", "99_num": 199, "99_rate": 72.9, "99_norm_rate": 51.3, "99_struct": 0, "1}, {"city": "金門縣", "99_num": 75, "99_rate": 78.5, "99_norm_rate": 47.2, "99_struct": 0, "1}, {"city": "連江縣", "99_num": 11, "99_rate": 110.8, "99_norm_rate": 56.8, "99_struct": 0, "1}]
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主要死因一鄉鎮別

✓ 縣市別資料

- { } 心臟疾病.json
- { } 肺炎.json
- { } 高血壓.json
- { } 惡性腫瘤.json
- { } 腦血管.json
- { } 慢性下呼吸道.json
- { } 糖尿病.json

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   "103_norm_rate": 43.1,  
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   "104_struct": 15.1,  
   "105_num": 183,  
   "105_rate": 87.6,  
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   "106_rate": 92.9,  
   "106_norm_rate": 37.1,  
   "106_struct": 14.7,  
   "107_num": 198,  
   "107_rate": 96,  
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   "108_rate": 107.3,  
   "108_norm_rate": 39.2,  
   "108_struct": 17  
 },
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環境因子—水污染

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[{
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    "lat": 25.226953,
    "lng": 121.630624,
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    "year_100": 2,
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    "year_103": 2,
    "year_104": 1,
    "year_105": 1,
    "year_106": 2,
    "year_107": 1,
    "year_108": 2
}, {
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    "lat": 25.170901,
    "lng": 121.422745,
    "year_99": 3,
    "year_100": 3,
    "year_101": 3,
    "year_102": 3,
    "year_103": 5,
    "year_104": 6,
    "year_105": 5,
    "year_106": 6,
    "year_107": 6,
    "year_108": 6
}]
```

$$\text{河川污染指數 (RPI)} = \frac{1}{4} \sum_{i=1}^4 S_i$$

水質/項目	未(稍)受污染	輕度污染	中度污染	嚴重污染
溶氧量 (DO) mg/L	DO \geq 6.5	6.5 > DO \geq 4.6	4.5 \geq DO \geq 2.0	DO < 2.0
生化需氧量 (BOD ₅) mg/L	BOD ₅ \leq 3.0	3.0 < BOD ₅ \leq 4.9	5.0 \leq BOD ₅ \leq 15.0	BOD ₅ > 15.0
懸浮固體 (SS) mg/L	SS \leq 20.0	20.0 < SS \leq 49.9	50.0 \leq SS \leq 100	SS > 100
氨氮 (NH ₃ -N) mg/L	NH ₃ -N \leq 0.50	0.50 < NH ₃ -N \leq 0.99	1.00 \leq NH ₃ -N \leq 3.00	NH ₃ -N > 3.00
點數	1	3	6	10
污染指數積分值 (S)	S \leq 2.0	2.0 < S \leq 3.0	3.1 \leq S \leq 6.0	S > 6.0

*左側值為每一測站於當年測的所有數據的平均值



環境因子—空氣汙染

將當日空氣中臭氧 (O_3)、細懸浮微粒 ($PM_{2.5}$)、懸浮微粒 (PM_{10})、一氧化碳 (CO)、二氧化硫 (SO_2) 及二氧化氮 (NO_2) 濃度等數值，以其對人體健康的影響程度，分別換算出不同污染物之副指標值，再以當日各副指標之最大值為該測站當日之空氣品質指標值 (AQI)。

```
[{"station_name": "二林", "county": "彰化縣", "lng": 120.409653, "lat": 23.925175, "avg_103": 55.0, "std_103": 16.0, "avg_104": 52.0, "std_104": 16.0, "avg_105": 50.0, "std_105": 16.0, "avg_106": 65.0, "std_106": 29.0, "avg_107": 72, "std_107": 29, "avg_108": 65, "std_108": 27}, {"station_name": "三義", "county": "苗栗縣", "lng": 120.758833, "lat": 24.382942, "avg_103": 52.0, "std_103": 15.0, "avg_104": 51.0, "std_104": 15.0, "avg_105": 48.0, "std_105": 12.0, "avg_106": 57.0, "std_106": 18.0, "avg_107": 53, "std_107": 17, "avg_108": 51, "std_108": 17}, {"station_name": "土城", "county": "新北市", "lng": 121.451861, "lat": 24.982528, "avg_103": 55.0, "std_103": 19.0, "avg_104": 52.0, "std_104": 19.0, "avg_105": 50.0, "std_105": 20.0, "avg_106": 62.0, "std_106": 32.0, "avg_107": 62, "std_107": 29, "avg_108": 55, "std_108": 26}, {"station_name": "士林", "county": "臺北市", "lng": 121.5145, "lat": 25.105917, "avg_103": 51.0, "std_103": 16.0, "avg_104": 49.0, "std_104": 14.0, "avg_105": 46.0, "std_105": 15.0, "avg_106": 55.0, "std_106": 23.0, "avg_107": 55, "std_107": 24, "avg_108": 55, "std_108": 25}, {"station_name": "大同", "county": "臺北市", "lng": 121.513311, "lat": 25.0632, "avg_103": 53.0, "std_103": 11.0, "avg_104": 49.0, "std_104": 11.0, "avg_105": 47.0, "std_105": 11.0, "avg_106": 56.0, "std_106": 19.0, "avg_107": 55, "std_107": 17, "avg_108": 52, "std_108": 15}, {"station_name": "大里", "county": "臺中市", "lng": 120.677689, "lat": 24.099611, "avg_103": 59.0, "std_103": 18.0, "avg_104": 56.0, "std_104": 19.0, "avg_105": 54.0, "std_105": 18.0, "avg_106": 72.0, "std_106": 35.0, "avg_107": 64, "std_107": 34, "avg_108": 62, "std_108": 31}, {"station_name": "大園", "county": "桃園市", "lng": 121.201811, "lat": 25.060344, "avg_103": 51.0, "std_103": 13.0, "avg_104": 47.0, "std_104": 12.0, "avg_105": 46.0, "std_105": 13.0, "avg_106": 60.0, "std_106": 29.0, "avg_107": 60, "std_107": 26, "avg_108": 56, "std_108": 25}, {"station_name": "大寮", "county": "高雄市", "lng": 120.425311, "lat": 22.564136, "avg_103": 63.0, "std_103": 23.0, "avg_104": 56.0, "std_104": 21.0, "avg_105": 55.0, "std_105": 22.0, "avg_106": 80.0, "std_106": 34.0, "avg_107": 84, "std_107": 35, "avg_108": 79, "std_108": 34}, {"station_name": "小港", "county": "高雄市", "lng": 120.337736, "lat": 22.565833, "avg_103": 63.0, "std_103": 21.0, "avg_104": 57.0, "std_104": 18.0, "avg_105": 52.0, "std_105": 17.0, "avg_106": 86.0, "std_106": 38.0, "avg_107": 75, "std_107": 36, "avg_108": 69, "std_108": 34}, {"station_name": "中山", "county": "臺北市", "lng": 121.526528, "lat": 25.062361, "avg_103": 56.0, "std_103": 13.0, "avg_104": 47.0, "std_104": 16.0, "avg_105": 44.0, "std_105": 16.0, "avg_106": 55.0, "std_106": 20.0, "avg_107": 52, "std_107": 20, "avg_108": 49, "std_108": 18}, {"station_name": "中壢", "county": "桃園市", "lng": 121.221667, "lat": 24.953278, "avg_103": 55.0, "std_103": 13.0, "avg_104": 50.0, "std_104": 13.0, "avg_105": 48.0, "std_105": 12.0, "avg_106": 56.0, "std_106": 23.0, "avg_107": 54, "std_107": 23, "avg_108": 55, "std_108": 23}, {"station_name": "仁武", "county": "高雄市", "lng": 120.332631, "lat": 22.689056, "avg_103": 62.0, "std_103": 18.0, "avg_104": 60.0, "std_104": 19.0, "avg_105": 59.0, "std_105": 19.0, "avg_106": 87.0, "std_106": 40.0, "avg_107": 80, "std_107": 40, "avg_108": 76, "std_108": 36}, {"station_name": "大肚", "county": "台中市", "lng": 120.425311, "lat": 24.099611, "avg_103": 59.0, "std_103": 18.0, "avg_104": 56.0, "std_104": 19.0, "avg_105": 54.0, "std_105": 18.0, "avg_106": 72.0, "std_106": 35.0, "avg_107": 64, "std_107": 34, "avg_108": 62, "std_108": 31}]]
```





人文因子

原住民人口分布

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    "pop_103": 4103,  
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    "pop_104": 4162,  
    "households_105": 1464,  
    "pop_105": 4178,  
    "households_106": 1488,  
    "pop_106": 4244,  
    "households_107": 1545,  
    "pop_107": 4294,  
    "households_108": 1566,  
    "pop_108": 4301,  
    "lng": 121.4579675,  
    "lat": 25.01186453  
},
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吸菸人口分布

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    "year_106": 14.4,  
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    "lat": 24.91571  
,  
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        "year_103": 15.6,  
        "year_104": 13.1,  
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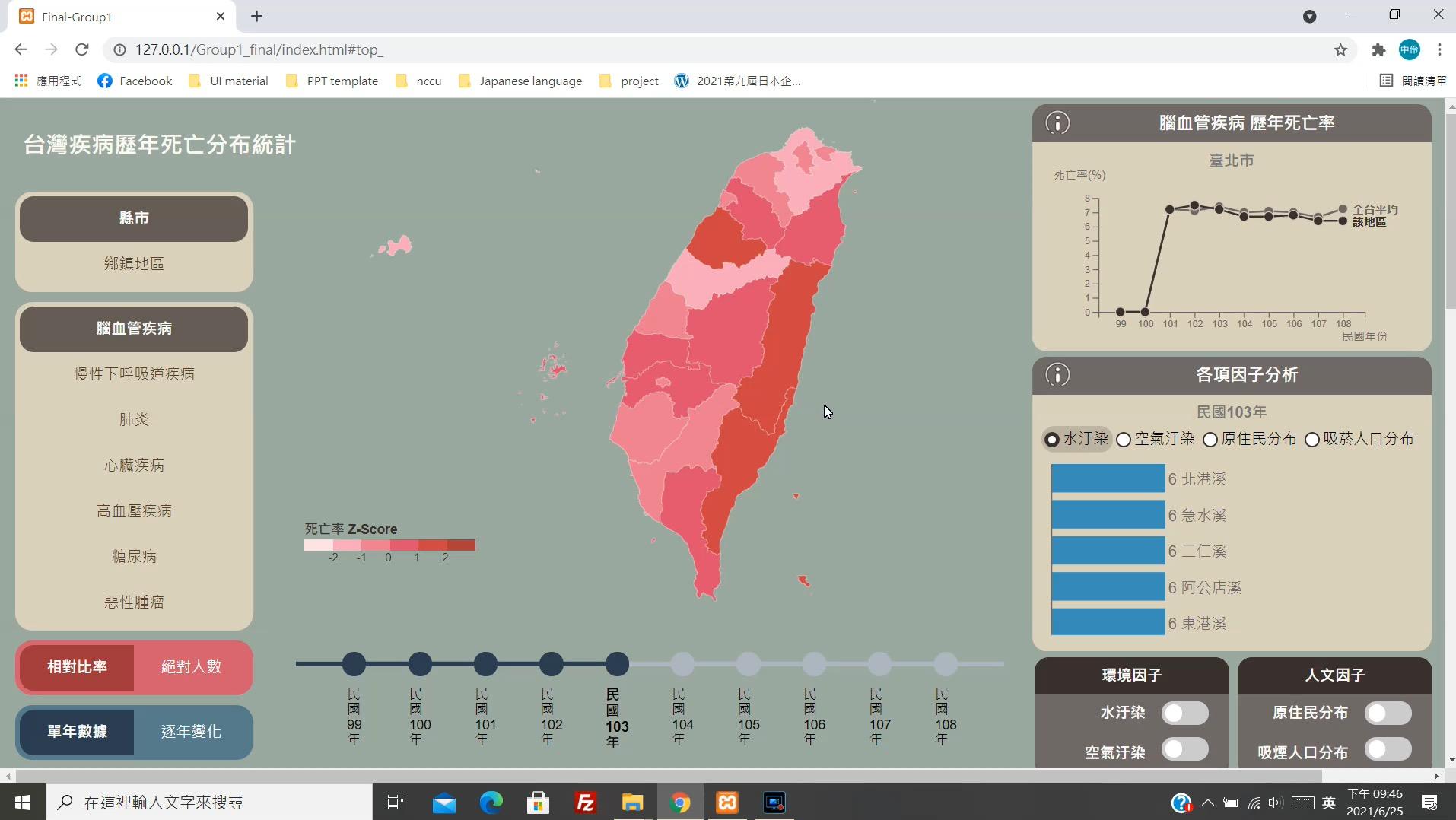


03

操作展示及說明

王中伶







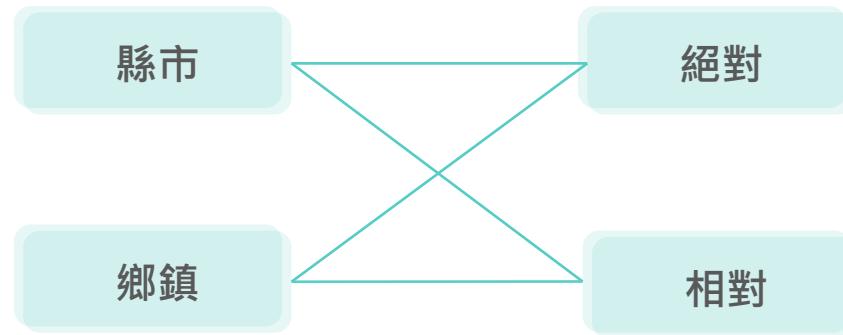
04 設計理念

賴建郡





分層設色圖

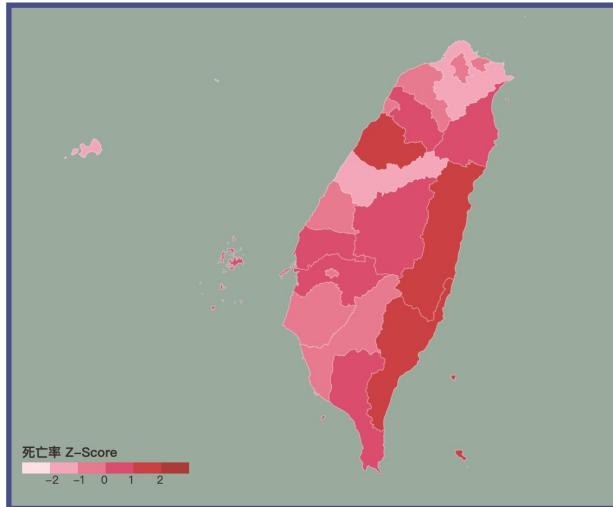




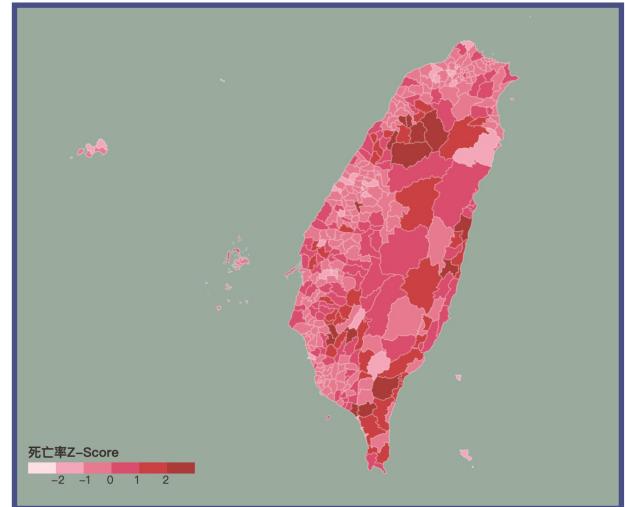
分層設色圖

分色依據：死亡率Z-score

縣市



鄉鎮





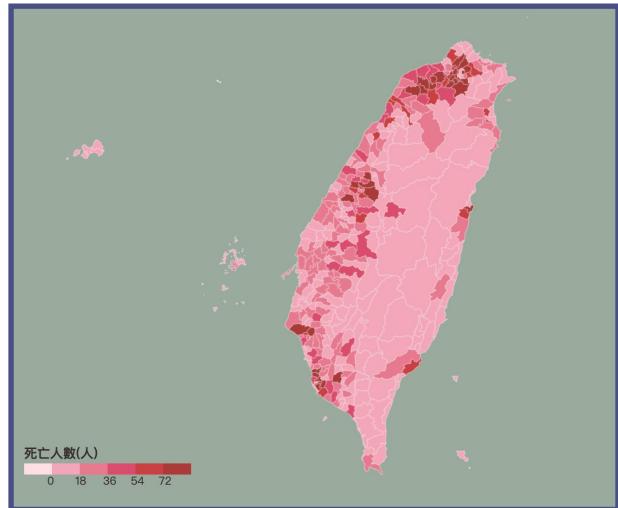
分層設色圖

分色依據：死亡人數

切換分色依據



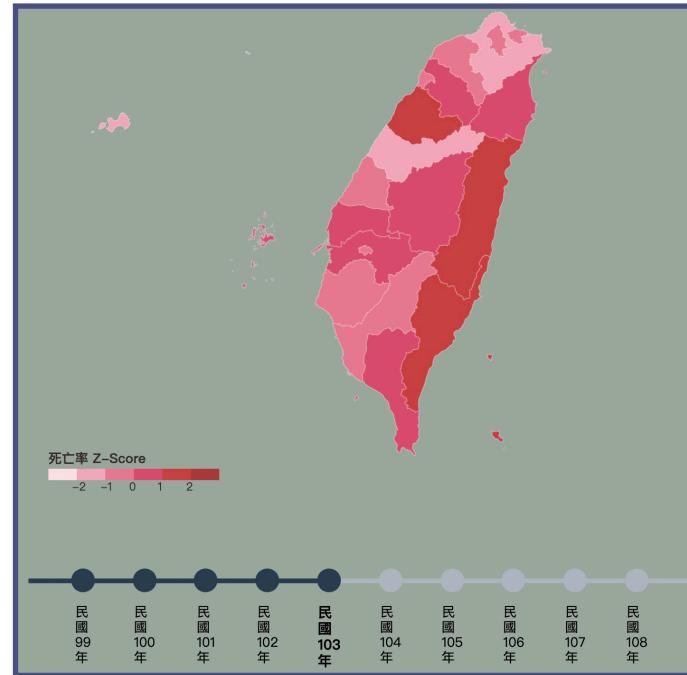
鄉鎮





分層設色圖

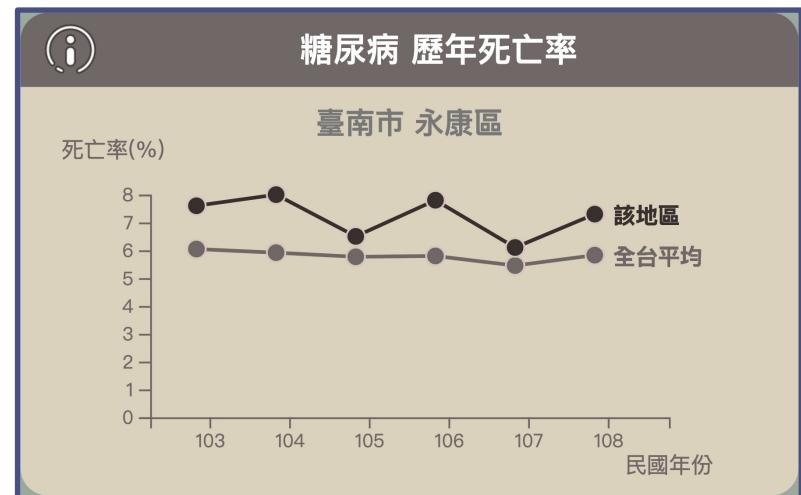
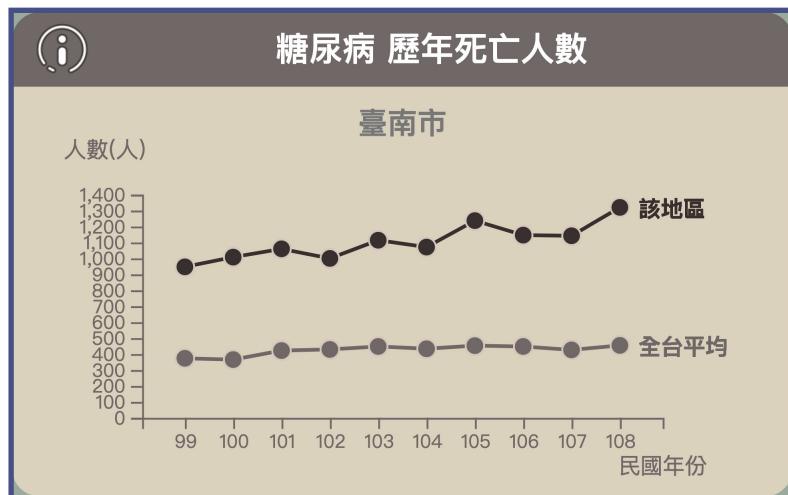
時間軸





折線圖

- 點擊地圖區域呈現歷年總死亡率或死亡人數
- 繪製全台平均線以作為觀測該區域是否有顯著大於的趨勢





泡泡圖

切換因子

環境因子

水汙染



空氣汙染



人文因子

原住民分布



吸煙人口分布

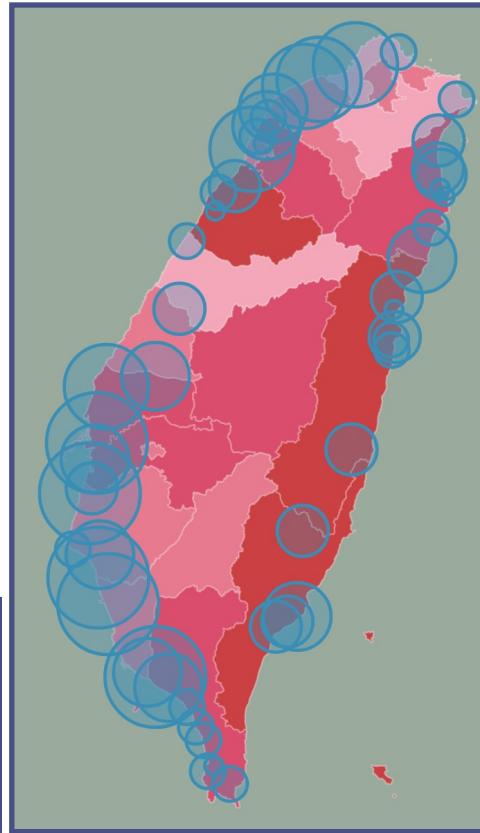




泡泡圖

環境因子

- 泡泡的大小以該年平均汙染值呈現大小
- 利用平均污染值最大值為最大半徑圓圈進而縮放
- 將圓圈放置在觀測站、該區域的中心點
- 圓圈越大污染程度越嚴重
- 圓圈越小污染程度越輕微





泡泡圖

泡泡疊圖

- 當兩個按鈕都點擊時，泡泡圖會進行疊加

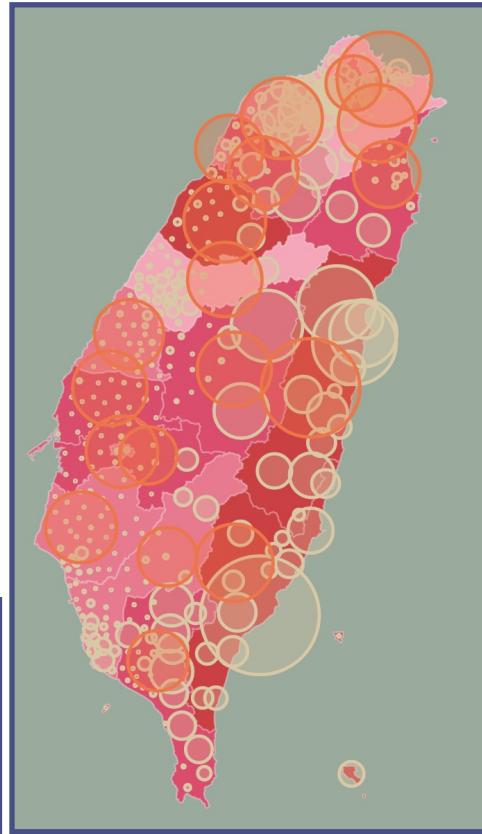




泡泡圖

人文因子

- 人文因子以該類別的人數多寡來進行繪製
- 清晰觀測多項因子之間的交集與疾病間的關聯





長條圖

- 避免泡泡圖難以觀測到數值最大的地點
- 繪製長條圖列出各因子排名前五的數值





05

分析與驗證

王神鐸





NCDs & Environment

NCDs

- Malignant Tumor
- Heart Disease
- Diabetes
- Cerebrovascular Disease
- Pneumonia
- Chronic Lower Respiratory Diseases
- Hypertensive Diseases

Environment

- River pollution
- Air pollution
- Smoking
- Indigenous population



NCDs and Death Rate

- First Law of Geography - “Everything is related to everything else, but near things are more related than distant things” - Tobler
- Death ratio in different populations - NCDs and their “vital” information
 - Observing unusually **high death rates in certain areas**
 - Looking at potentially unusual **environmental factors**



Respiratory Disease

Correlation?



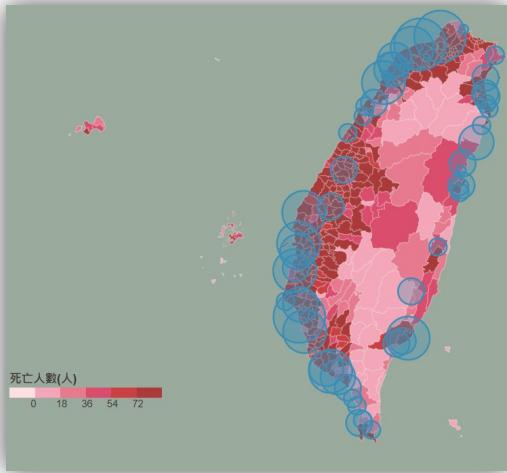
Smoking



Air pollution



Analysis

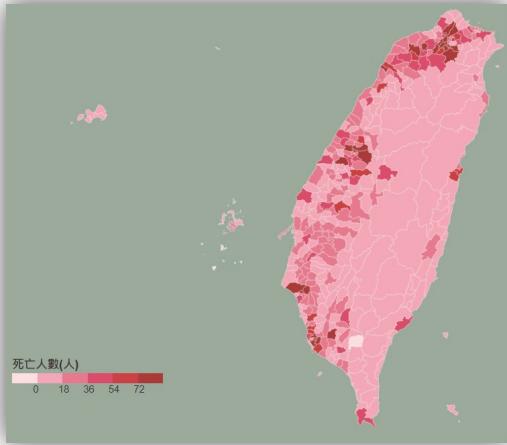


River Pollution

River pollution would cause higher probability of cancer, high blood pressure, heart attack. Especially, in Tainan, Chiayi, Yilan, there're much industrial waste in the groundwater. However, cancer takes the first place of the death rate in all diseases in Taiwan. Therefore, the disease seems just little related to the river pollution in our graph.



Analysis



Air Pollution

Air pollution would cause higher probability of pneumonia, chronic lower respiratory diseases. The graph shows the distribution of pneumonia. We observed the air pollution exactly impacts the residents' health.



Environmental Factors and Impact on Health

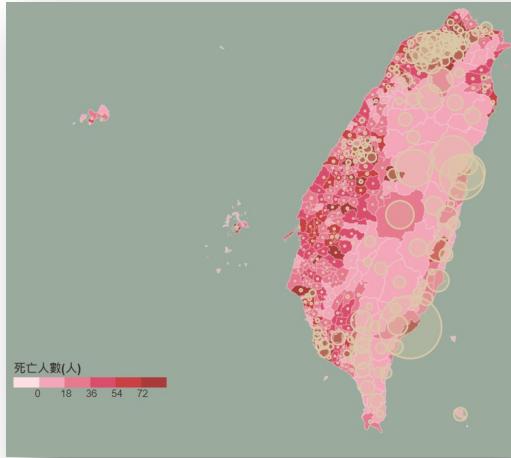
- Environments shaping people and health
- Environment diversity in Taiwan
- Separating/ clustering environments on a map





Analysis

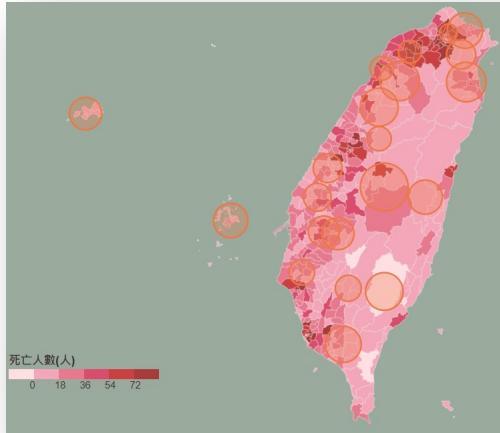
Indigenous Population



We wonder the different lifestyle whether causes the death rate of the different disease. Research has shown that cultural habits in lifestyle have an observable impact on health. This can manifest particularly in more isolated communities like indigenous populations, where health deteriorating habits like alcohol, tobacco and betel nut consumption is 9% higher than in the Han Chinese population. Our graph showed a higher occurrence of heart attack than any other disease in the indigenous population. Therefore, it could prove that the lifestyle may impact the different disease occurring.



Analysis



Smoking Population

The effect of smoking in health is well known in the medical literature. It increases risk of lung diseases, including lung cancer. The risk of other illnesses such as heart disease, stroke are also connected to smoking. The graph shows the distribution of cerebrovascular disease. There would be many reasons to cause the cerebrovascular disease. Therefore, they have little relationship in our graph.



Conclusion

Usefulness of geographical data and visualization as a tool in disease and environment relationship



- Where data overlaps and its importance
- Our visualization tool - Different applications for researchers in different fields
 - Coming from a environmental perspective
 - Coming from a medical perspective
- Interaction providing “higher” understanding

Thanks for listening

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