

Supplementary Materials for
Quantitative Assessment of Air Pollutants and Construction
Accidents: Developing Risk-Based Concentration Groups

FIGURE Captions

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Figure S2. Frequency analysis of accidents to O₃ concentration and its WHO's classification

Figure S3. Frequency analysis of accidents to NO₂ concentration and its WHO's classification

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Figure S5. Relative probability analysis of accidents to NO₂ concentration and its WHO's classification

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TABLE Captions

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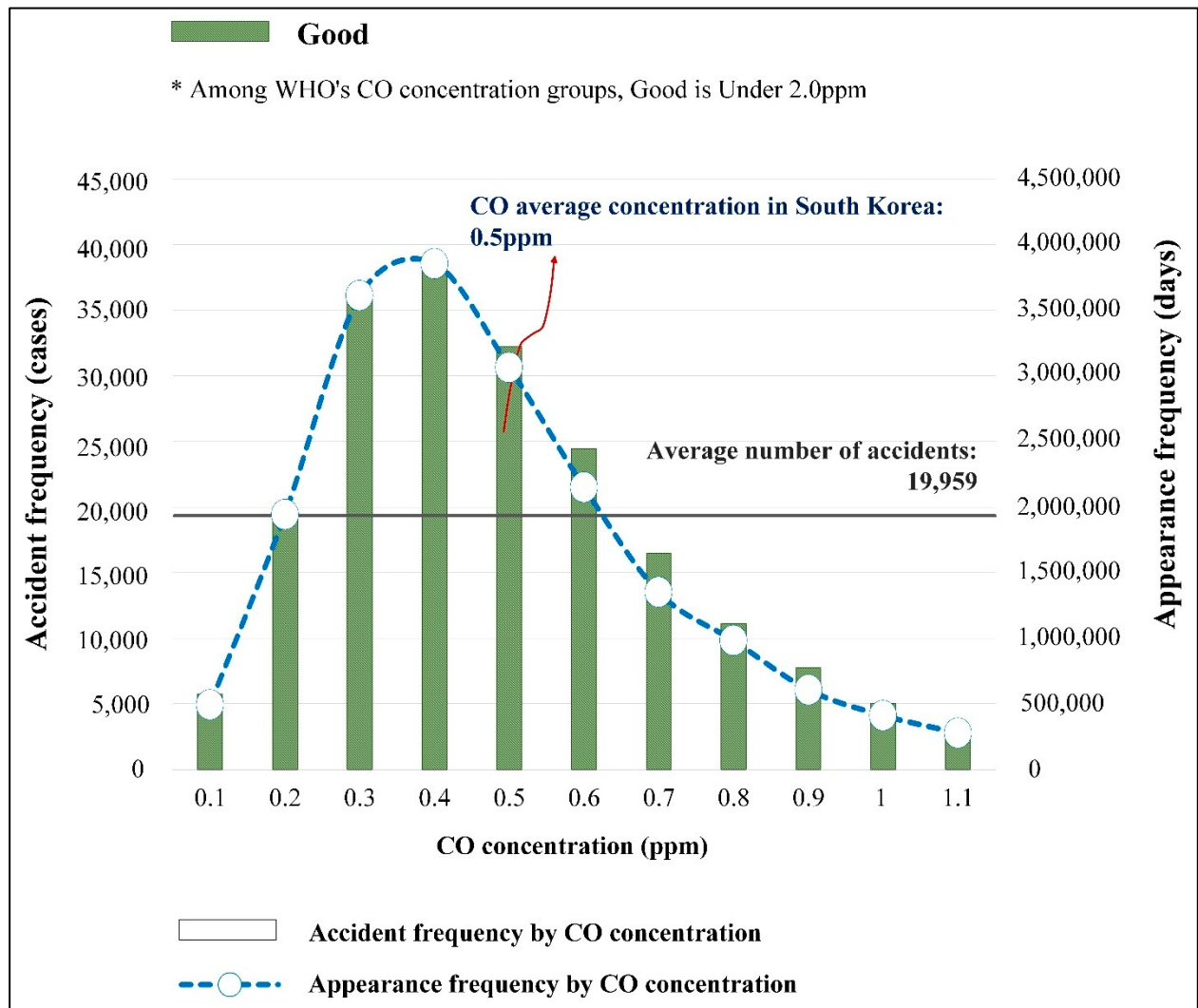


Figure S1. Frequency analysis of accidents to CO concentration and its WHO's classification

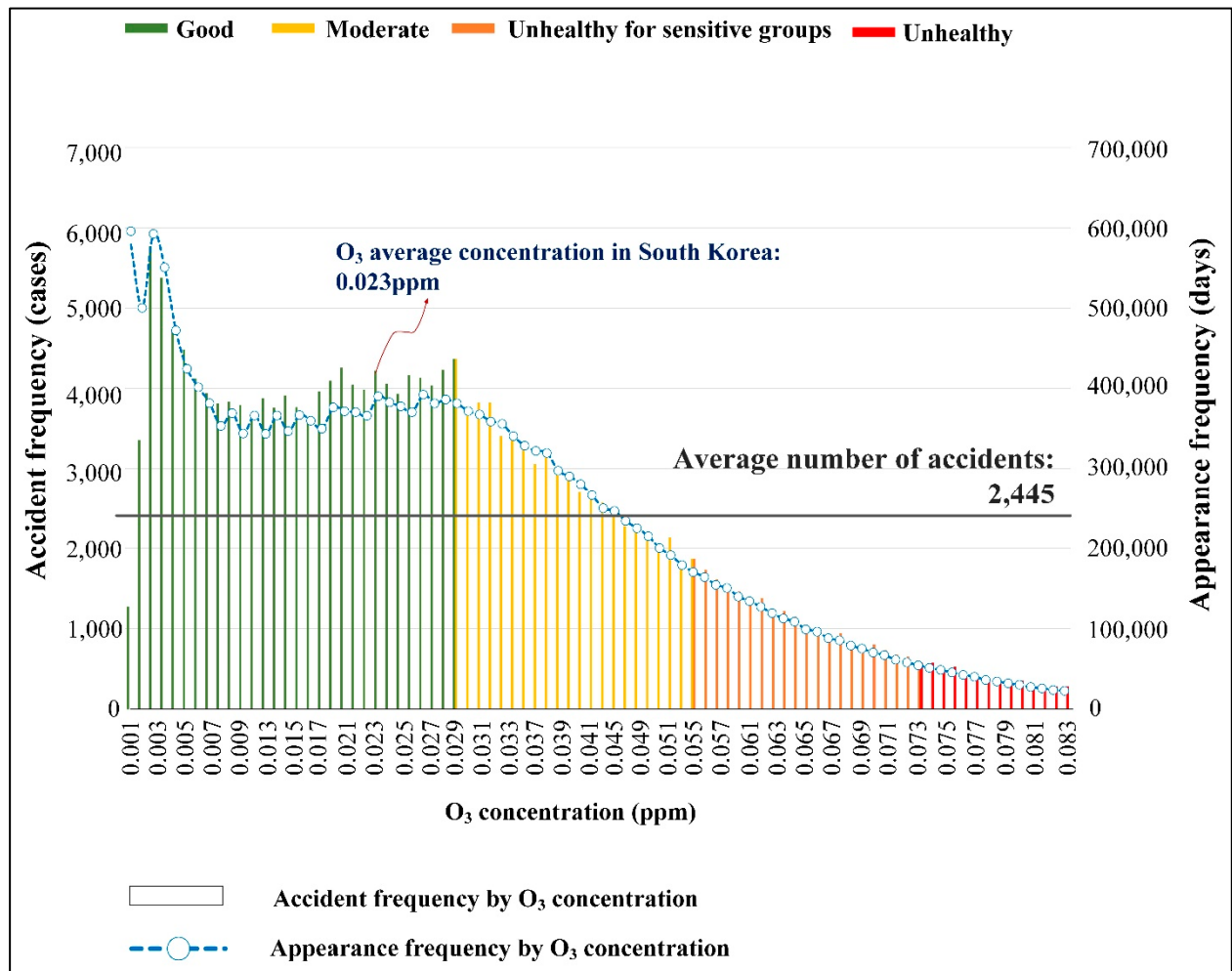


Figure S2. Frequency analysis of accidents to O₃ concentration and its WHO's classification

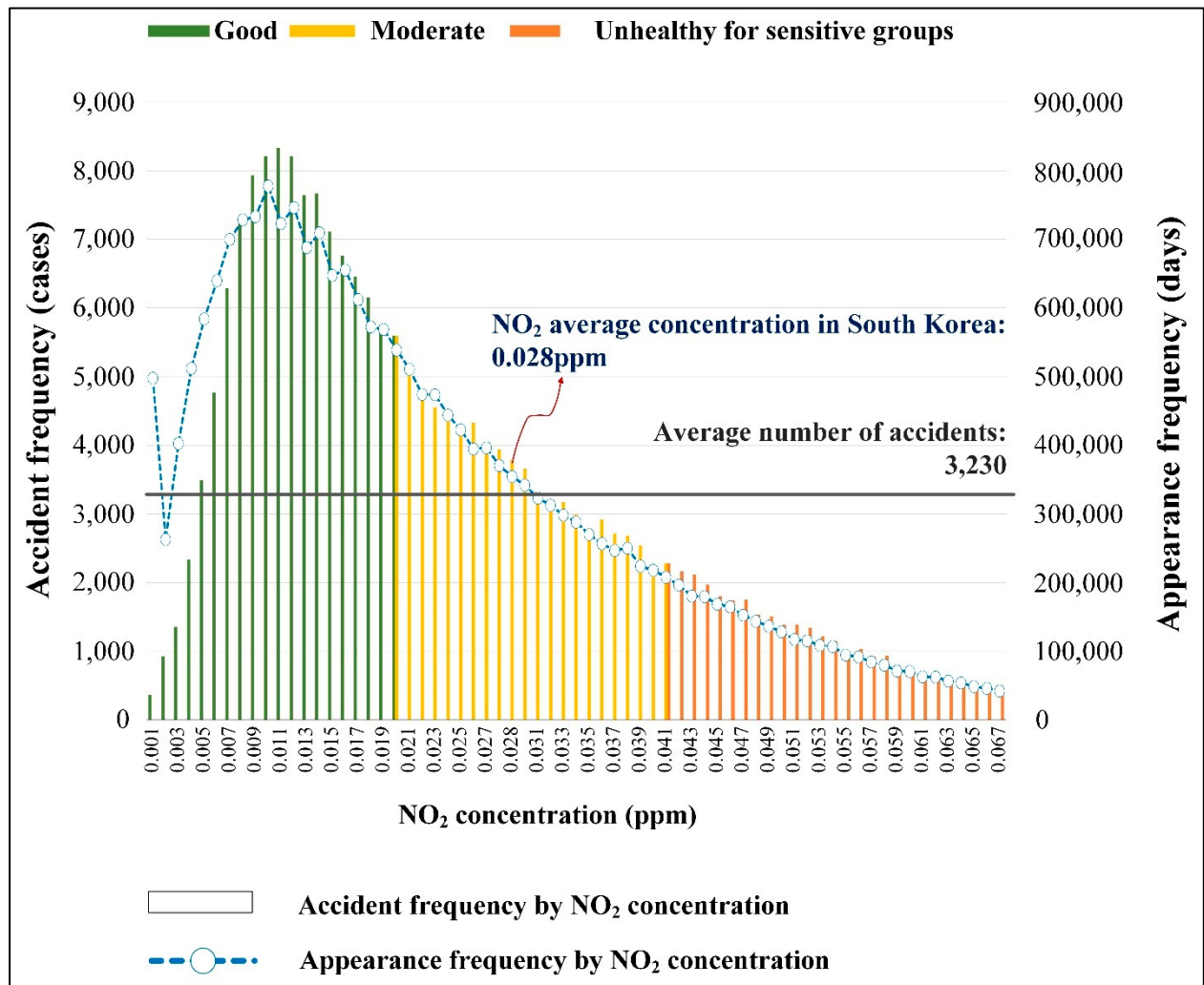


Figure S3. Frequency analysis of accidents to NO₂ concentration and its WHO's classification

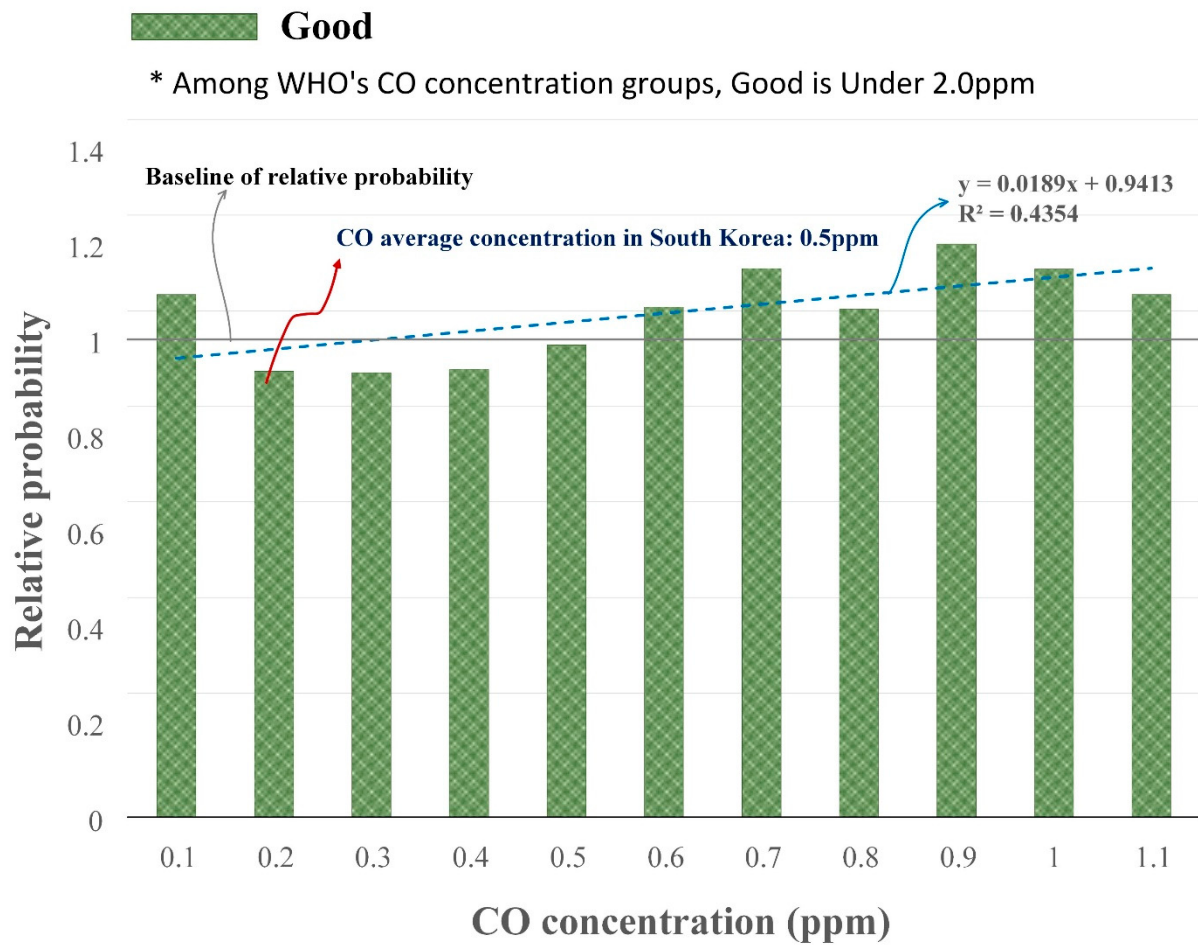


Figure S4. Relative probability analysis of accidents to CO concentration and its WHO's classification

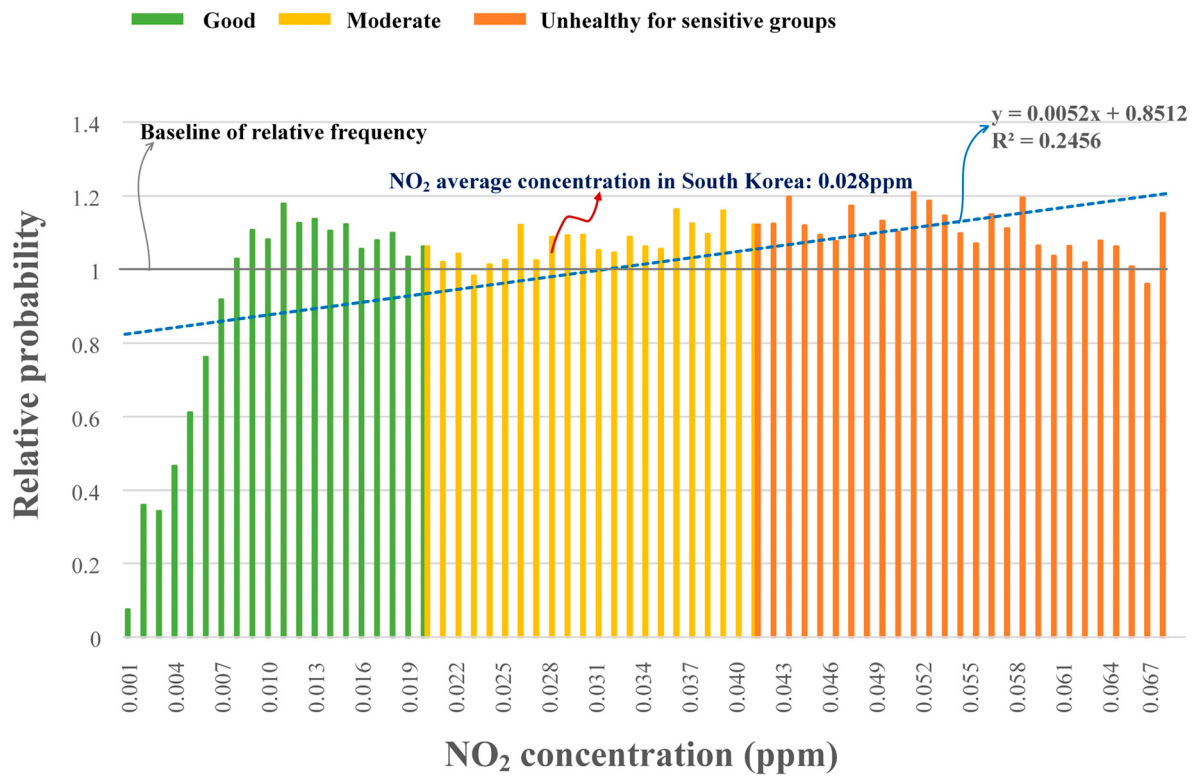


Figure S5. Relative probability analysis of accidents to NO_2 concentration and its WHO's classification

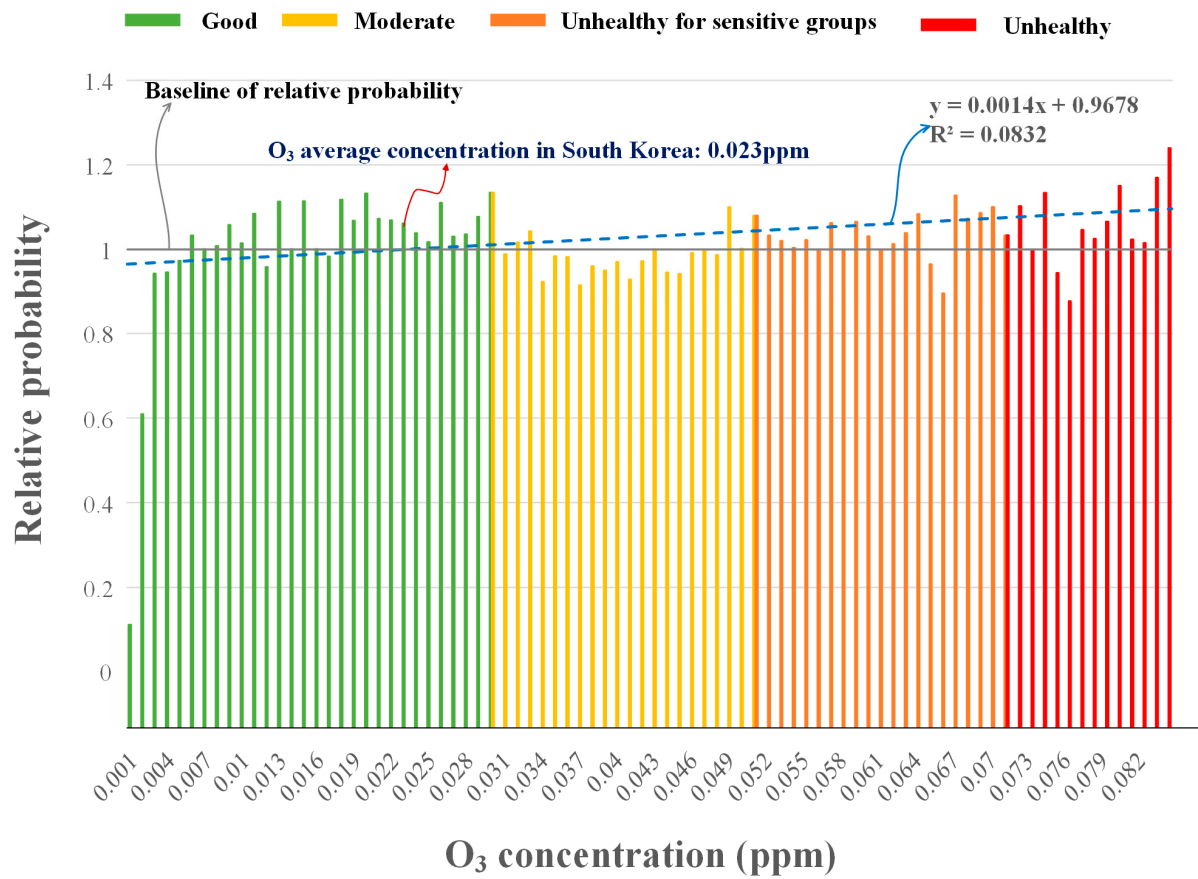


Figure S6. Relative probability analysis of accidents to O_3 concentration and its WHO's classification

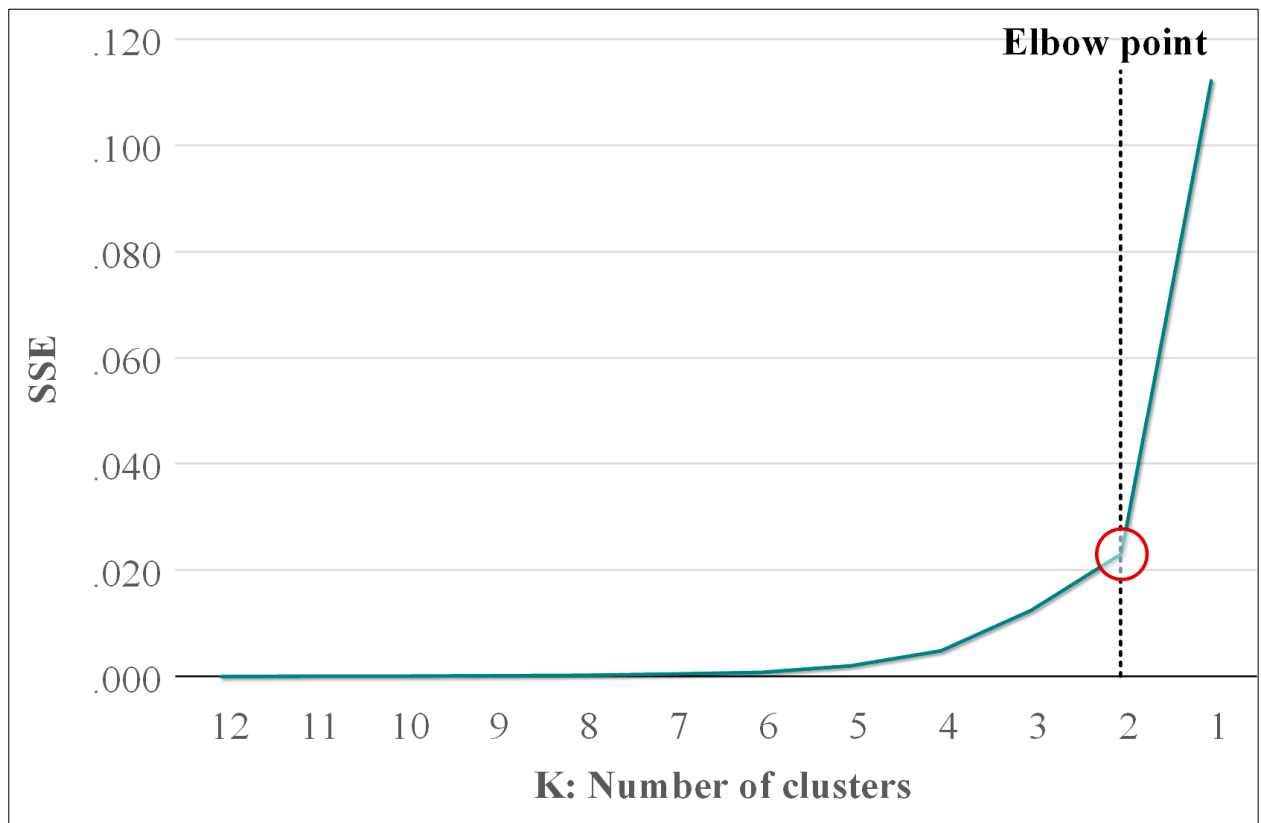


Figure S7. Elbow point analysis about SO₂

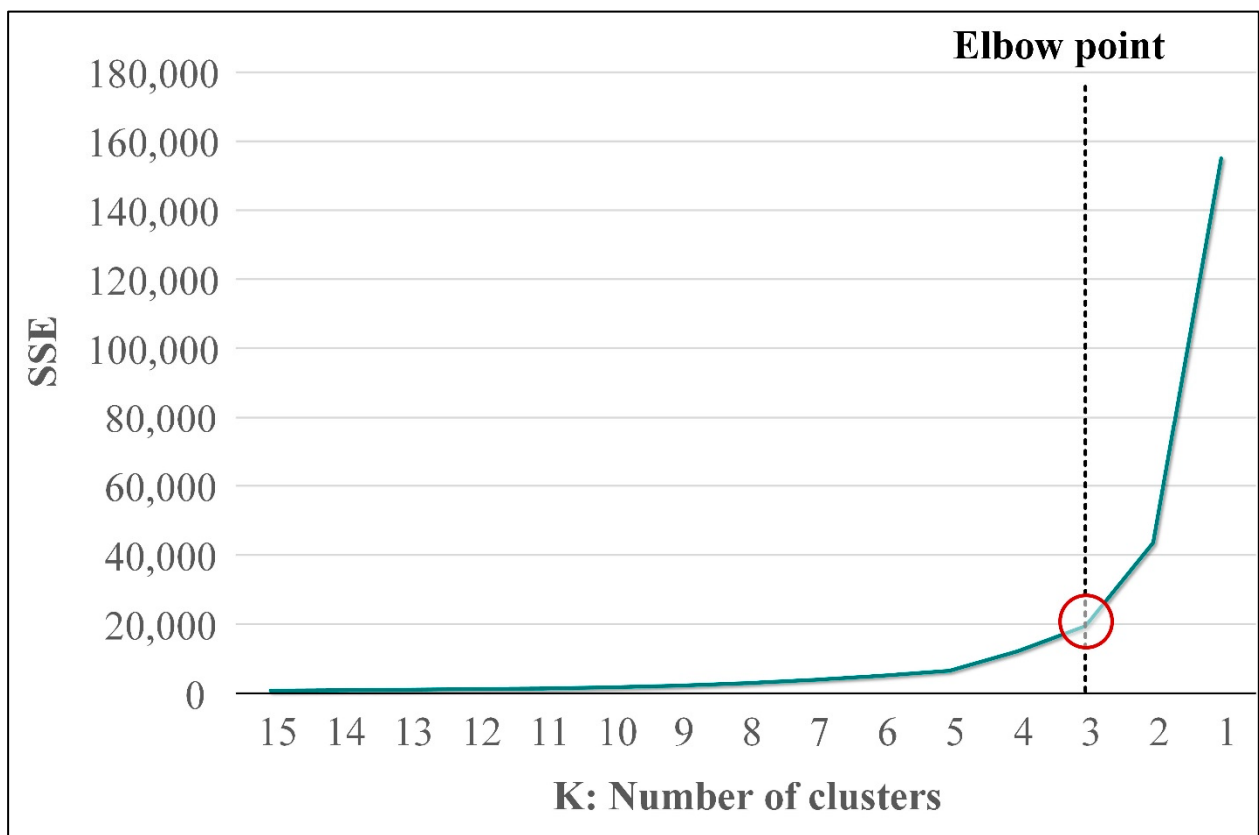


Figure S8. Elbow point analysis about PM₁₀.

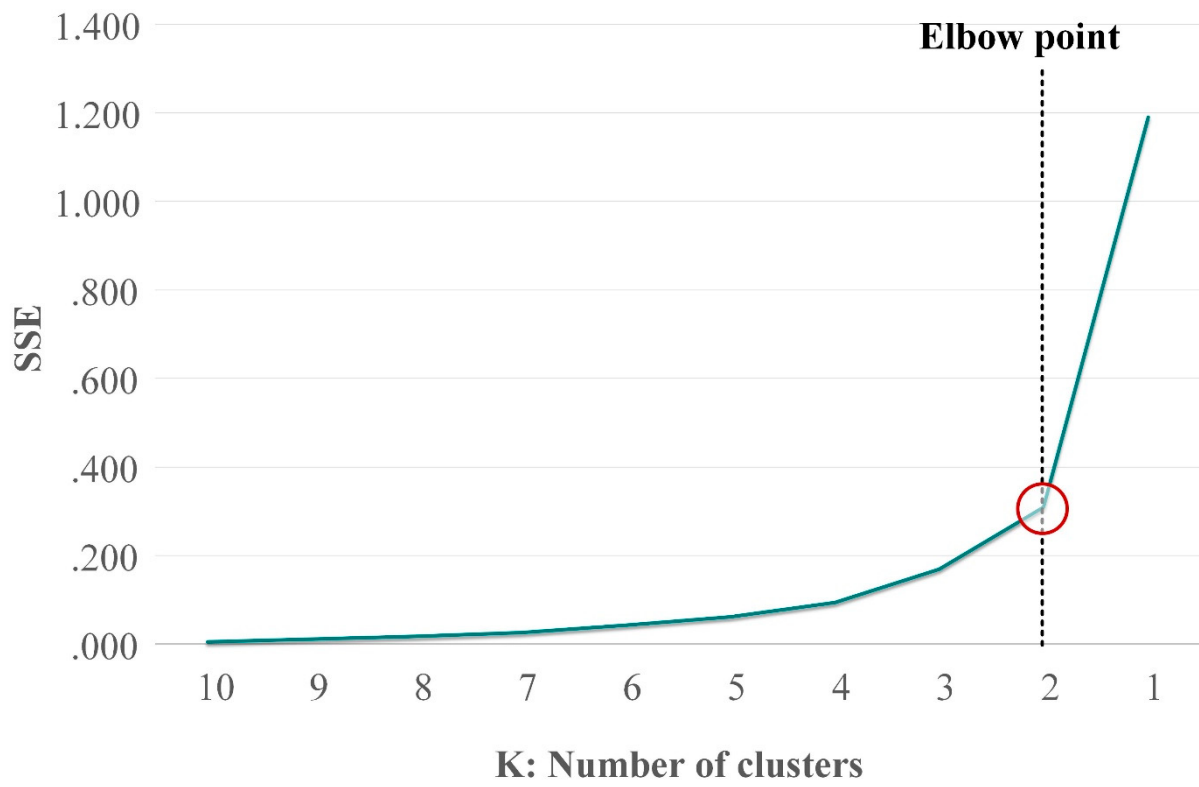


Figure S9. Elbow point analysis about CO

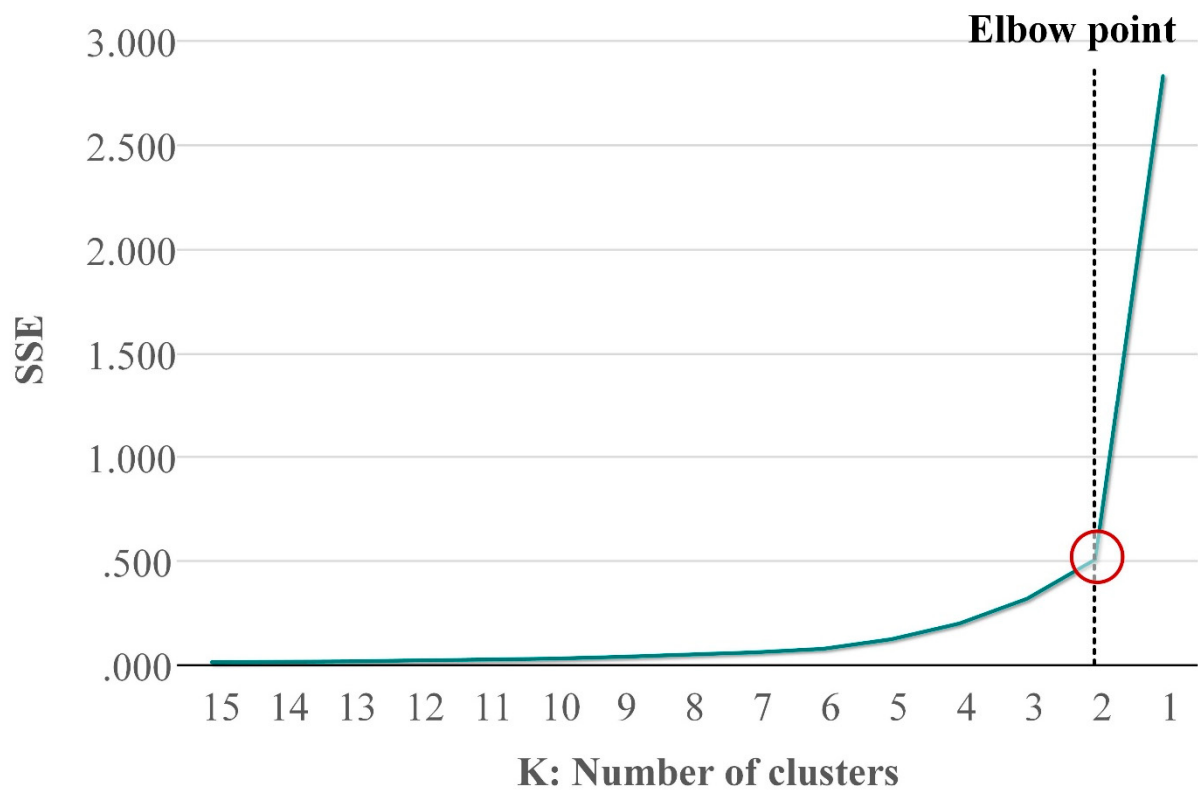


Figure S10. Elbow point analysis about PM₁₀

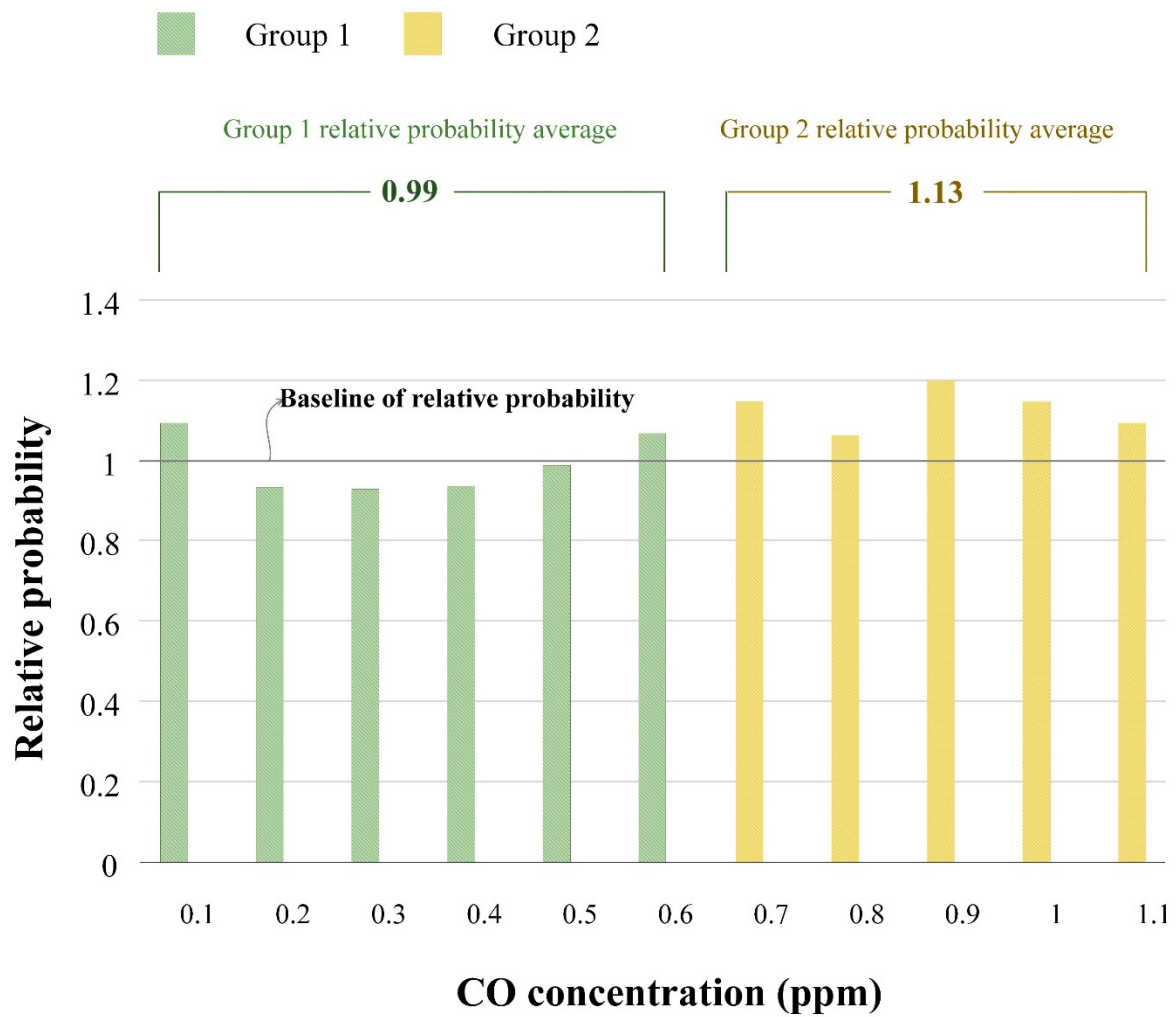


Figure S11. New concentration group of CO using relative probability of accident

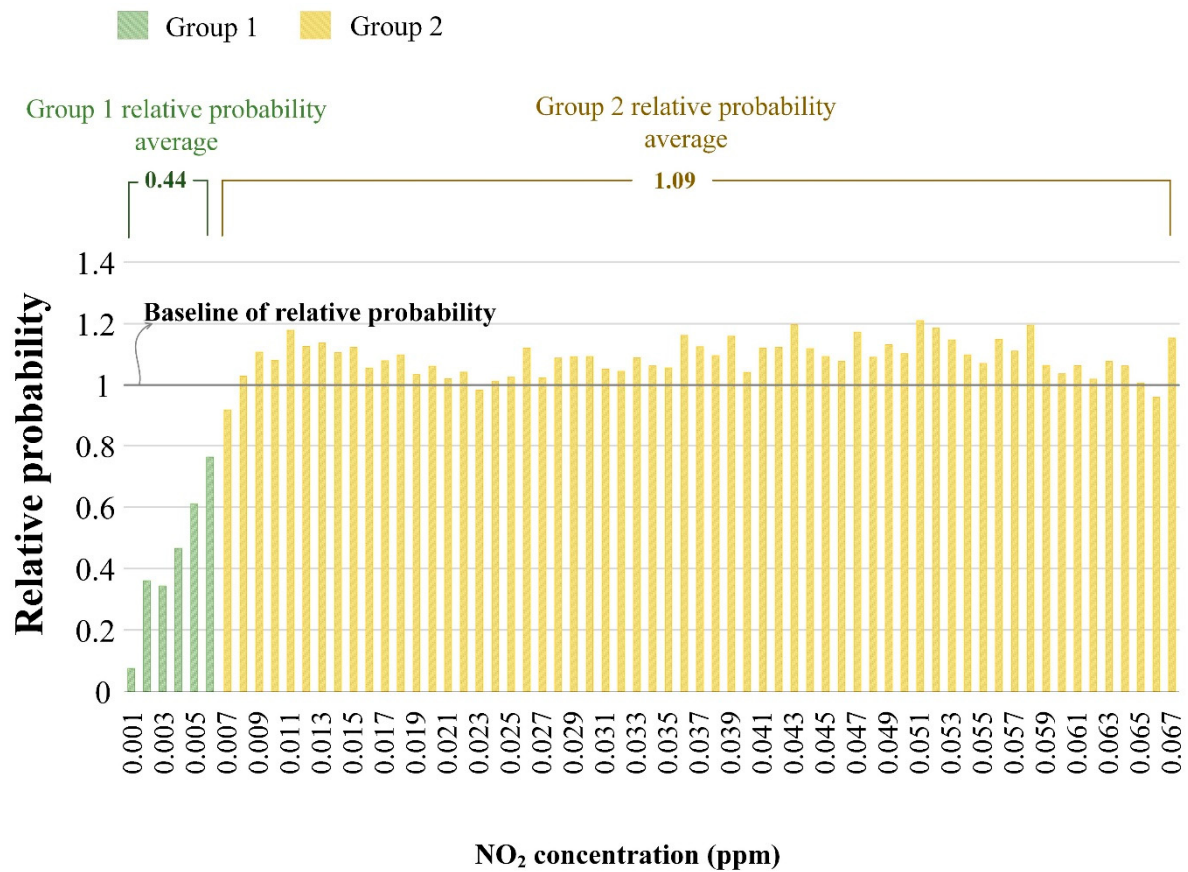


Figure S12. New concentration group of NO₂ using relative probability of accident

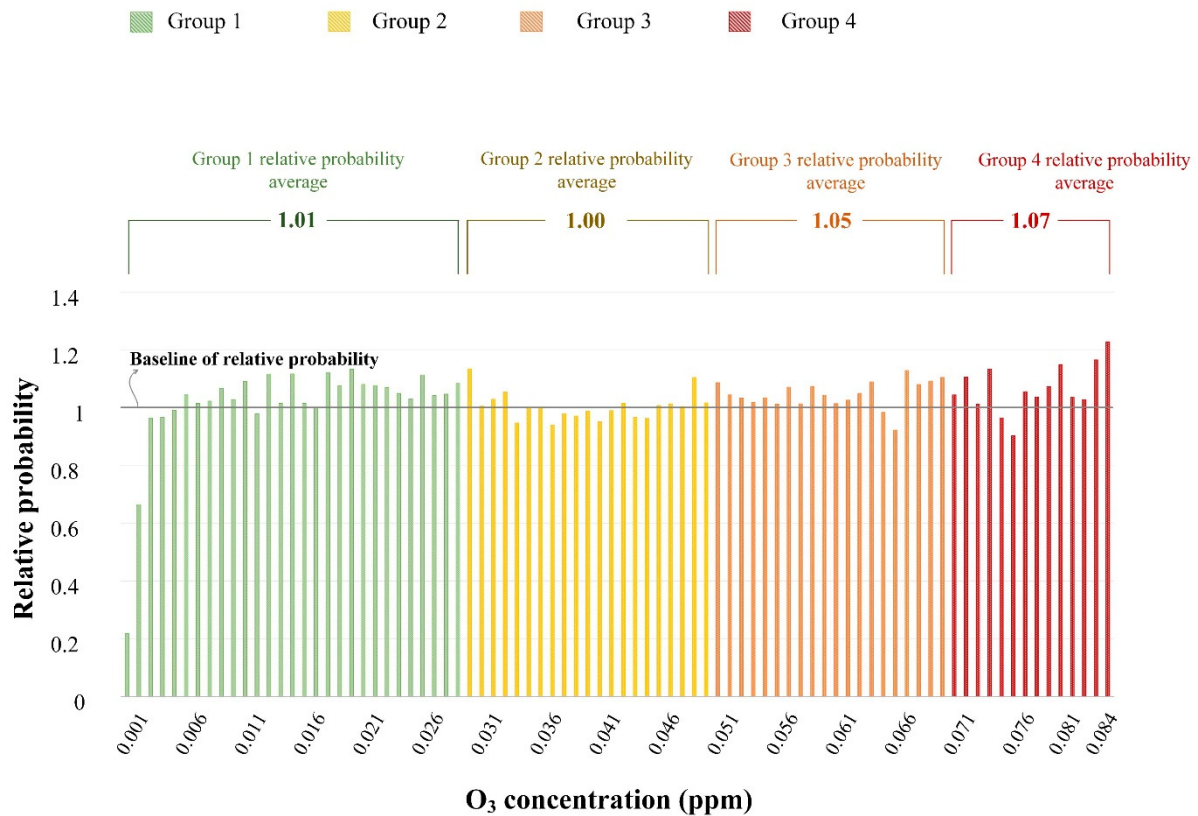


Figure S13. New concentration group of O₃ using relative probability of accident

Figure S1 to Figure S3 is a graph showing the frequency analysis for CO, O₃, and NO₂ concentrations and their WHO classifications.

Figure S3 to Figure S6 is a graph showing the relative probability of air pollutants (CO, NO₂, O₃).

Figure S7 and Figure S10 is the result of elbow point through the hierarchical cluster of SO₂, PM₁₀, CO and NO₂, respectively. O₃ has a low R^2 , indicating that there is no correlation between concentration and accident.

Figure S11 to Figure S13 are concentration groups newly classified based on the effect of the concentrations of CO, NO₂, and O₃ on the occurrence of accidents, respectively.

O₃ is not classified in terms of relative probability, so the relative probability average is

presented as the existing WHO group

Table S1. Frequency of accidents by time.

Hour	Frequency of accidents (cases)
Others	4,705
07 to 19	209,833
Total	214,538

Table S2. Air pollutant WHO criteria and concentration ranges were collected for this study.

Classification		Air pollutants				
		PM ₁₀ ($\mu\text{g}/\text{m}^3$)	O ₃ (ppm)	NO ₂ (ppm)	SO ₂ (ppm)	CO (ppm)
Group	Good	Under 30	Under 0.03	Under 0.02	Under 0.018	Under 2.0
	Moderate	30–49	0.03–0.05	0.02–0.04	0.018–0.03	2.0–4.4
	Unhealthy for sensitive people	50–89	0.06–0.07	0.05–0.07	0.04–0.08	4.5–8.9
	Unhealthy	90–119	0.08–0.09	0.08–0.09	0.09–0.19	9.0–15.4
	Very unhealthy	120–154	0.10–0.19	0.10–0.19	0.20–0.39	15.5–24.9
	Hazardous	Over 155	Over 0.20	Over 0.20	Over 0.40	Over 25.0
Data range collected		1–123	0.001–0.084	0.001–0.067	0.001–0.013	0.1–1.1
Group range of collected data		Good to very unhealthy	Good to unhealthy	Good to unhealthy for sensitive people	Good	Good
Classified air pollutant interval		1	0.001	0.001	0.001	0.1

Table S3. Existing WHO groups and newly proposed groups of air pollutants.

Air pollutants	Existing WHO classification (Health aspect)	Developed group (Accident aspect)
SO ₂	6	2
PM ₁₀		3

Table S4. t-test results of the new CO concentration group.

Variable	Group	N	Average	SD	t	p
CO	1	6	0.99	0.07	-3.65	0.006
	2	5	1.13	0.05		

Table S5. t-test results of the new NO₂ concentration group.

Variable	Group	N	Average	SD	t	p
NO ₂	1	6	0.44	0.24	-6.69	0.001
	2	61	1.09	0.06		

Table S4 is the result of the t-test on a new group of CO. The groups were divided into two groups, and the p-value was 0.006, the numbers in each group were divided into 6 and 5. confirming that there was a difference in the mean between the two groups.

Table S5 is the result of the t-test on a new group of NO₂. The groups were divided into two groups, and the p-value was 0.001, the numbers in each group were divided into 6 and 61. confirming that there was a difference in the mean between the two groups.