THE UNIVERSITY OF HONG KONG

香 港 大 學

Spatial Epidemiology of Mortality Disparities:

A Cross-Sectional Analysis of Life Expectancy Determinants Across Hong Kong Administrative Districts

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Abstract

This study examines spatial disparities in life expectancy across Hong Kong's 18 districts and their relationship with social determinants of health. Analysis of 2021 data reveal significant variations in life expectancy at birth (LEB), with a 2.67-year gap for males and 1.6-year gap for females between highest and lowest districts. Age-standardized mortality rates (ASMR) show even more pronounced differences, with rates in Yau Tsim Mong (453.12 per 100,000) more than double those in Sham Shui Po (188.18 per 100,000).

While socioeconomic factors generally correlate with health outcomes, the relationship is not strictly linear. Districts with high ethnic diversity show varied health patterns: affluent diverse areas maintain favourable outcomes despite distinctive demographic structures, while Yau Tsim Mong presents concerning mortality trends across multiple causes despite moderate poverty rates. Environmental factors, particularly air pollution concentration due to urban morphology and traffic density, appear to significantly impact health outcomes in specific districts.

The findings demonstrate that health disparities in Hong Kong reflect complex interactions between socioeconomic status and migration patterns. This research provides evidence for developing targeted, district-specific public health interventions to address these inequities and advance health equity goals aligned with the Sustainable Development agenda.

Introduction

Health inequalities refer to systematic differences in health outcomes across social groups (Braveman, 2006). These inequalities are socially determined and follow a clear gradient: the lower the socioeconomic position, the worse the health outcomes (World Health Organization, 2025). Disadvantaged social groups, such as those experiencing poverty, racial/ethnic minorities, women, or other marginalized populations, systematically experience worse health outcomes and face greater health risks than more advantaged groups (Braveman, 2006). The Sustainable Development Goals (SDGs) agenda emphasizes health equity, "with the overarching aim of ensuring healthy lives and promoting well-being for all at all ages" (Hosseinpoor et al., 2018).

Life expectancy at birth (LEB) is a key indicator of health outcomes, which can show differences in mortality across populations. Hong Kong's LEB is one of the highest worldwide, with male LEB at 82.8 years and female LEB at 88.4 years in 2024 (The Centre for Heath Protection, 2025). However, studies have shown that despite rapid economic transition and declining mortality rates, there is a widening socioeconomic disparity in the risk of mortality outcomes (Chung et al., 2018).

According to the Census and Statistics Department (2023a), the Gini coefficient of Hong Kong was 0.397 across all households in 2021, almost reaching the international inequality threshold. In the first quarter of 2024, OXFAM Hong Kong (2024) found that overall poverty rate reached 20.2 percent, meaning more than 1.39 million people living in poverty. The poorest decile earned 81.9 times less than the richest decile. At the same time, the number of poor households in Hong Kong increased to 610,000 (22.7 percent of all households), with singleton elderly poor households forming a majority.

As shown in figure 1, Hong Kong is composed of 18 districts and embodies contrasts of wealth and poverty within extremely compact geography, with one of the world's highest population densities at 6,900 persons per km^2 (Census and Statistics Department, 2025b). During the colonial period (1842-1997) Hong Kong experienced several major immigration waves. The first large influx came after World War II (1949) as hundreds of thousands fled Communist China, increasing Hong Kong's population from 600,000 in 1945 to 2.2 million by the mid-1950s (Wong & Chin, 2008). A second wave arrived during China's Great Leap Forward famine in the late 1950s. By 1973, the influx reached 56,000 illegal immigrants in a single year. These immigrants, many entrepreneurs and skilled workers, fuelled Hong Kong's economic transformation. The pattern reversed in the 1980s following the Sino-British Joint Declaration. Approximately 300,000-500,000 Hong Kong residents, primarily educated middle-class professionals, emigrated between 1987-1996, peaking at 62,000 in 1990 alone. Recently, some of these emigrants have begun returning to Hong Kong.

Literature shows there exists an association between LEB and spatial segregation driven by discriminatory practices and socioeconomic disadvantages (Taulbut et al., 2014; Wami et al., 2021), but there remains a gap in the literature regarding spatial health inequalities in high-income, densely populated urban environments with significant income disparities. Existing research has primarily focused on health inequalities in Western contexts or developing nations, with limited attention to Asian metropolises like Hong Kong where prosperity and poverty exist in unusually close physical proximity.

This study aims to investigate disparities in life expectancy across Hong Kong's 18 districts and their relationship with social determinants of health. The primary objectives of this research are to 1) quantify and map life expectancy disparities across Hong Kong's districts, 2) analyse the association between these disparities and key social determinants, including age, sex, ethnic composition,

languages spoken, education levels, and poverty rates, 3) identify patterns in mortality causes that may differ between socioeconomically advantaged and disadvantaged districts and, 4) generate evidence to inform targeted public health interventions and policy decisions. By examining these relationships systematically, this research seeks to contribute to a more nuanced understanding of health inequities in Hong Kong and provide an empirical foundation for efforts to address them. The findings will be relevant to policymakers, public health practitioners, and community advocates working toward health equity in alignment with the SDGs.

Figure 1. Hong Kong District map (Census and Statistics Department, 2025a).

Methods

This study employs a quantitative descriptive analysis approach to examine health outcomes across Hong Kong's 18 districts and their relationship with socioeconomic determinants. All data were collected for the year 2021.

Data Sources

1. **Life expectancy**:

   District-level life expectancy at birth by sex was obtained from the academic manuscript "Spatial Variation of Life Expectancy in Hong Kong: Is it Socioeconomic Geospatial Integration or Segregation?" (Chen et al., 2024).

2. **Mortality data**:

   Cause-specific mortality rates by district were obtained from the Department of Health's HealthyHK Public Health Information System, accessible through: https://www.healthyhk.gov.hk/phisweb/enquiry/mo_ysad10_e.html (HealthyHK Department of Health, 2025). Only non-communicable diseases were considered.

3. **Demographic data**:

   Age and sex distributions across districts were obtained from the Census and Statistics Department's Web Table 110-06811: Land-based non-institutional population by District Council district, sex and age (Census and Statistics Department, 2022).

   Population distribution by ethnicity across districts was gathered from the Interactive Data Dissemination Service of the 2021 Population Census accessible through: https://idds.census2021.gov.hk/app/idds.html (Census and Statistics Department, 2023b).

4. **Socioeconomic indicators**:

   District-level socioeconomic characteristics including household income, poverty rates, and education levels were extracted from Oxfam Hong Kong's "Hong Kong Poverty Report 2024" (OXFAM Hong Kong, 2024)

   Data on languages usually spoken and education level by age and district was gathered from thematic surveys conducted by the Census and Statistics Department (Census and Statistics Department, 2021b).

Analytical Approach

1. **Descriptive statistics**

   For each district, demographic profiles, socioeconomic characteristics, and health outcomes were tabulated to provide baseline comparisons.

2. **Age Standardized Mortality Rates**
   To account for differences in age structure across districts, we calculated Age-Standardized Mortality Rates (ASMR) using the direct standardization method. The reference population was the world standard population specified in GPE Discussion Paper Series: No.31 (World

Health Organization, 2001). This standardization allowed for more meaningful comparisons of mortality rates between districts with different age structures.

3. **Herfindahl-Hirschman Index:**

   To quantify ethnic diversity across districts, we employed the Herfindahl-Hirschman Index (HHI), a commonly used measure of concentration. The HHI was calculated as:

$$HHI = s_1^2 + s_2^2 + s_3^2 + \cdots s_n^2$$

   Where s_i represents the share (proportion) of each ethnic group in a district's population. Based on the calculated HHI values, districts were classified into three categories:

   - Highly Homogeneous Districts: HHI > 9000
   - Moderately Homogeneous Districts: HHI 8000-9000
   - Relatively More Diverse Districts: HHI 5800-8000

   This classification provided a framework for examining whether ethnic composition correlates with health outcomes and socioeconomic indicators.

4. **Geospatial Analysis:**
   To visualize spatial patterns in health, demographic, and socioeconomic indicators, we created choropleth maps at the district level using QGIS software (version 3.28). These maps enabled the identification of geographic clusters and spatial relationships between variables of interest.

Results

Disparities Life Expectancy at Birth

Figure 2 presents LEBs and ASMRs across Hong Kong's 18 districts (see Appendix A). Male LEB ranged from 79.63 to 82.30 years (2.67-year difference), while female LEB ranged from 81.89 to 83.49 years (1.6-year difference). The highest male LEB was observed in Wan Chai (82.30 years), Sham Shui Po (82.27 years), and Central and Western (82.09 years). The lowest male LEB was found in Yau Tsim Mong (79.63 years), Kwai Tsing (80.97 years), and North (81.06 years). For females, the highest LEB was recorded in Sham Shui Po (83.49 years), Wan Chai (83.41 years), and Islands (83.3 years), while the lowest was in Yau Tsim Mong (81.9 years), Kwai Tsing (82.6 years), and Islands (83.33 years).

ASMR values varied substantially across districts, with the lowest rates in Sham Shui Po (approximately 188.18 per 100,000), Wan Chai (213.86 per 100,000), and Central and Western (233.04 per 100,000) (see Appendix B). The highest ASMR was observed in Yau Tsim Mong (453.12 per 100,000), followed by Kwai Tsing (302.67 per 100,000) and Tuen Mun (302.41 per 100,000).

An inverse relationship between ASMR and LEB was evident across districts, those with higher ASMR consistently demonstrated lower life expectancy for both sexes.

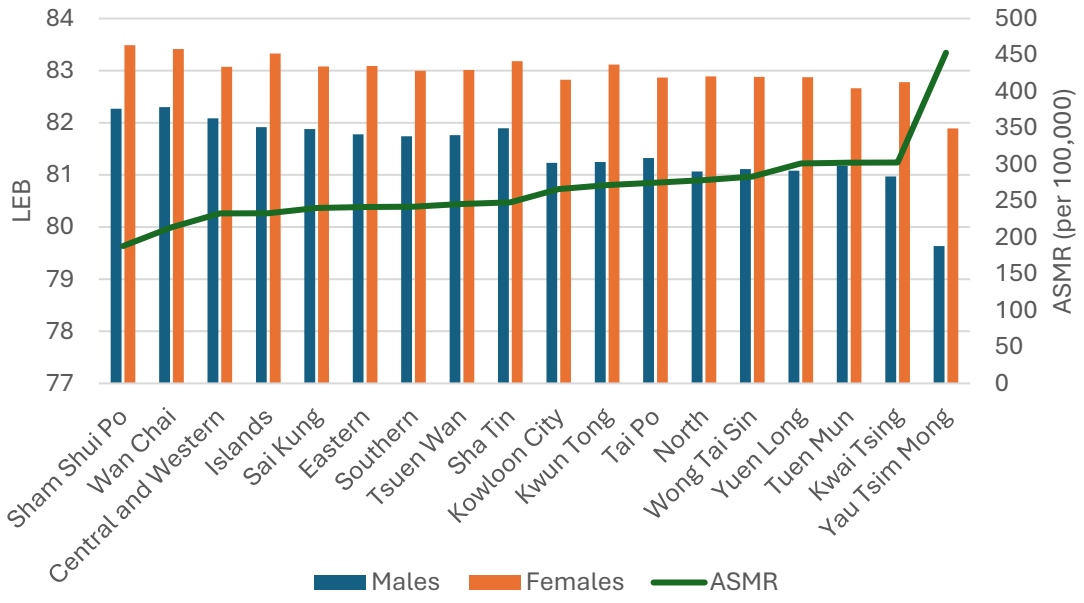


Figure 2. LEB and ASMR by District

Causes of Mortality Across Districts

As shown in figure 3, analysis of age-standardized mortality data reveals several notable geographic patterns across Hong Kong's 18 administrative districts (see Appendix B). Yau Tsim Mong consistently demonstrates the highest mortality burden, ranking first in nine of ten major cause categories examined, with particularly elevated rates for lung cancer (38.14 per 100,000) and cerebrovascular diseases (29.05 per 100,000).

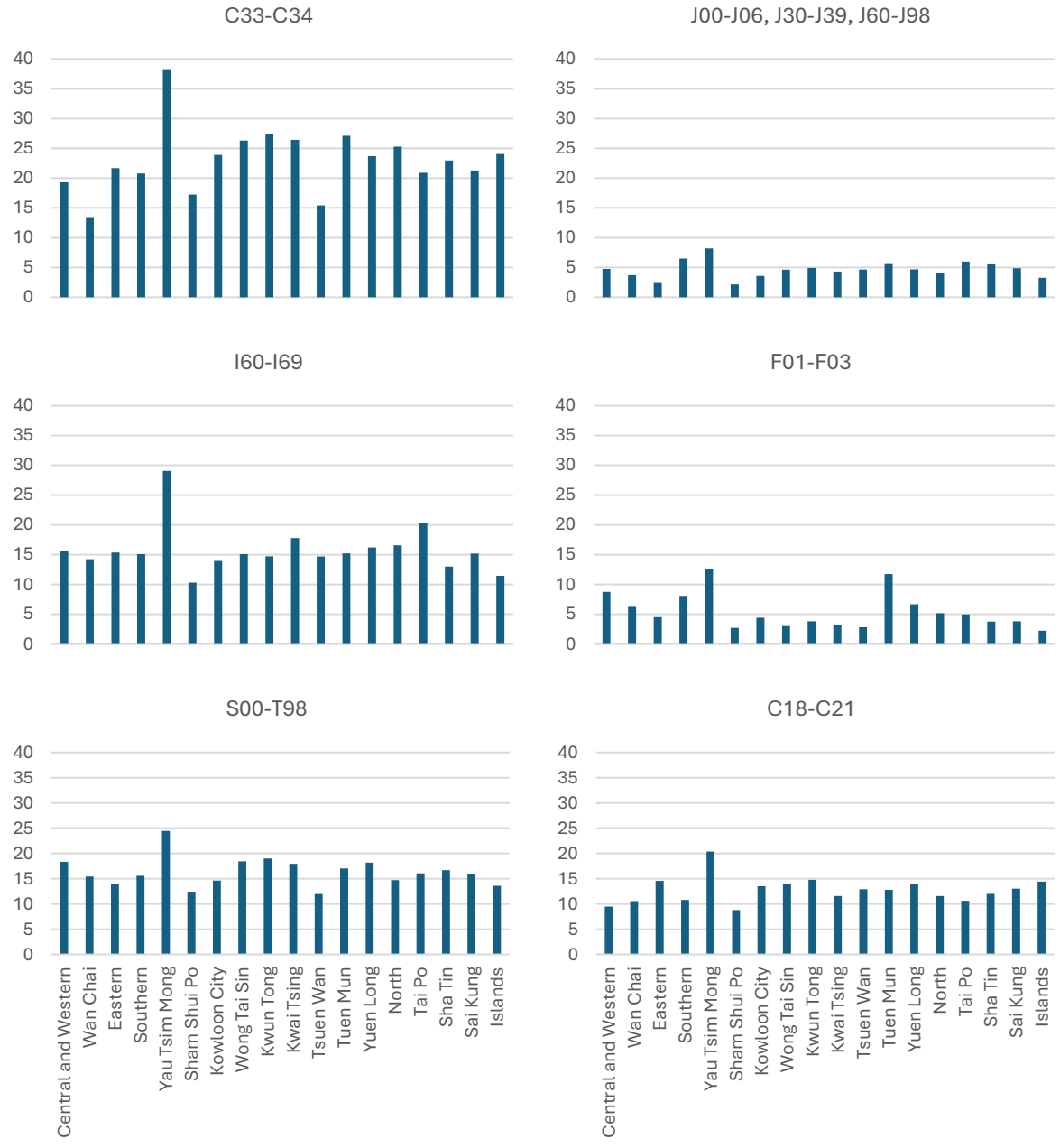
A clear urban-rural gradient is observed for several causes, with generally higher mortality in older urban districts (Yau Tsim Mong, Kwun Tong, Wong Tai Sin) compared to newer developments and

outlying areas. However, this pattern is not universal; Islands district demonstrates unexpectedly high rates of acute myocardial infarction (9.99 per 100,000) despite its relatively rural character.

Kowloon districts generally exhibit higher mortality than Hong Kong Island districts across most cause categories. Notably, Wan Chai and Central and Western consistently rank among districts with lowest mortality rates for multiple causes, particularly for cardiovascular diseases and respiratory conditions.

The New Territories presents a mixed pattern, with northeastern districts (Tai Po, North) showing elevated cardiovascular disease mortality, while northwestern districts (Yuen Long, Tuen Mun) demonstrate higher rates for liver cancer and dementia respectively.

Inter-district mortality disparities vary substantially by cause category. The most pronounced variations are observed for dementia (5.6-fold difference between highest and lowest districts), respiratory diseases (3.8-fold), and renal failure (3.6-fold), while external causes show more modest variation (2.0-fold).



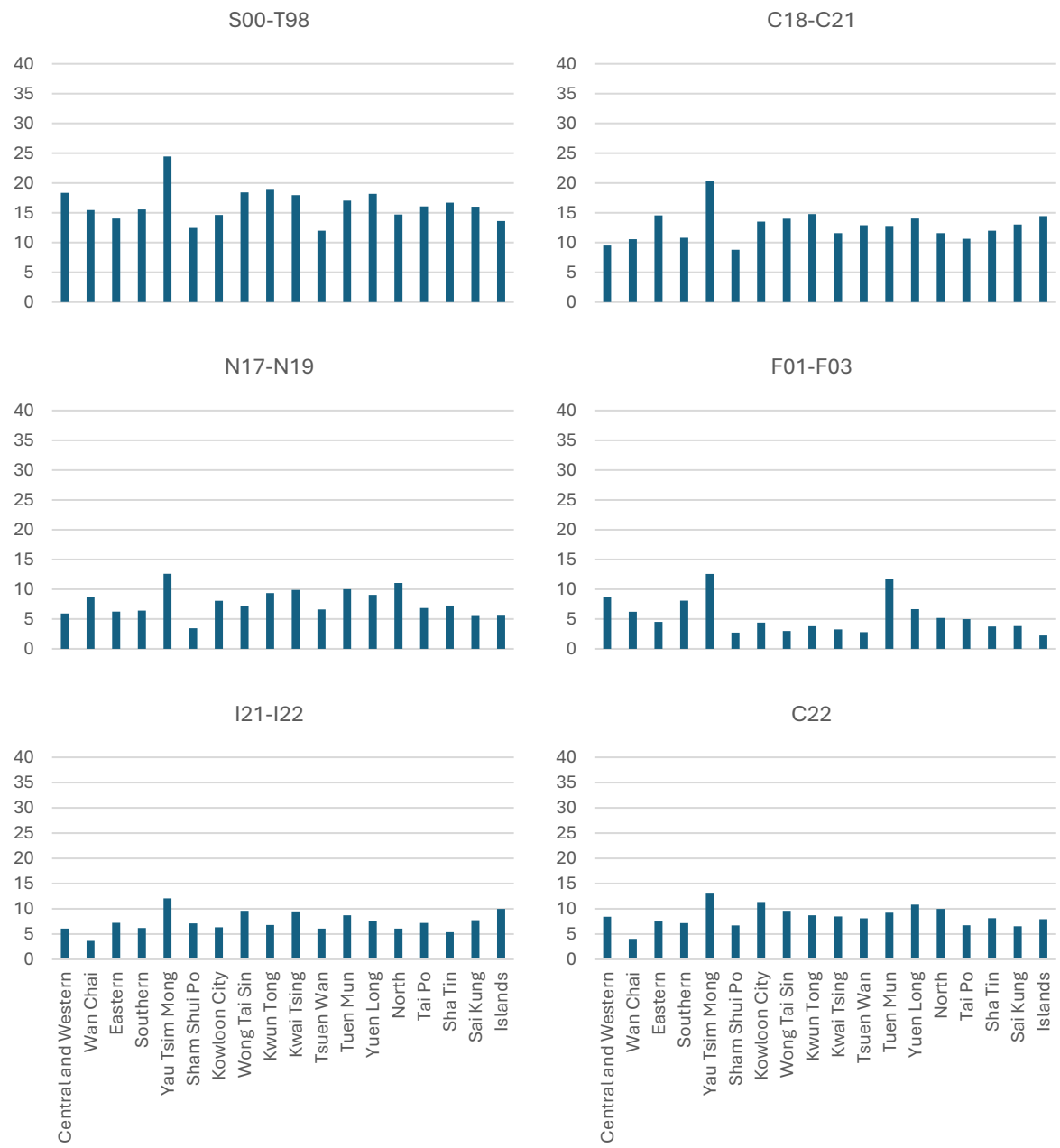


Figure 3. Age Adjusted Mortality Rates by top 10 causes of Death per district (per 100,000)

Remarks: Malignant neoplasm of trachea, bronchus and lung (C33-C34), remainder of diseases of the respiratory system (J00-J06, J30-J39, J60-J98), cerebrovascular diseases (i60-i69), other ischaemic heart diseases (i20, i23-i25), injury, poisoning and certain other consequences of external causes (s00-t98), malignant neoplasm of colon, rectum and anus (c18-c21), renal failure (n17-n19) dementia (f01-f03), acute myocardial infarction (i21-i22), malignant neoplasm of liver and intrahepatic bile ducts (c22).

Demographic Profiles

Demographic analysis of Hong Kong's population pyramids reveals distinct patterns across the territory's districts (figure 4). Hong Kong Island districts exhibit constrained pyramids with narrower bases and pronounced bulges in the 30-54 age cohorts. This structure is reflected in Eastern district's high elderly population (22.85%) and corresponding elevated dependency ratio (48.50) (see Appendix

D). The extreme contraction in younger cohorts, particularly in Central and Western and Wan Chai, aligns with their distinctive sex ratios (0.72 and 0.67 respectively).

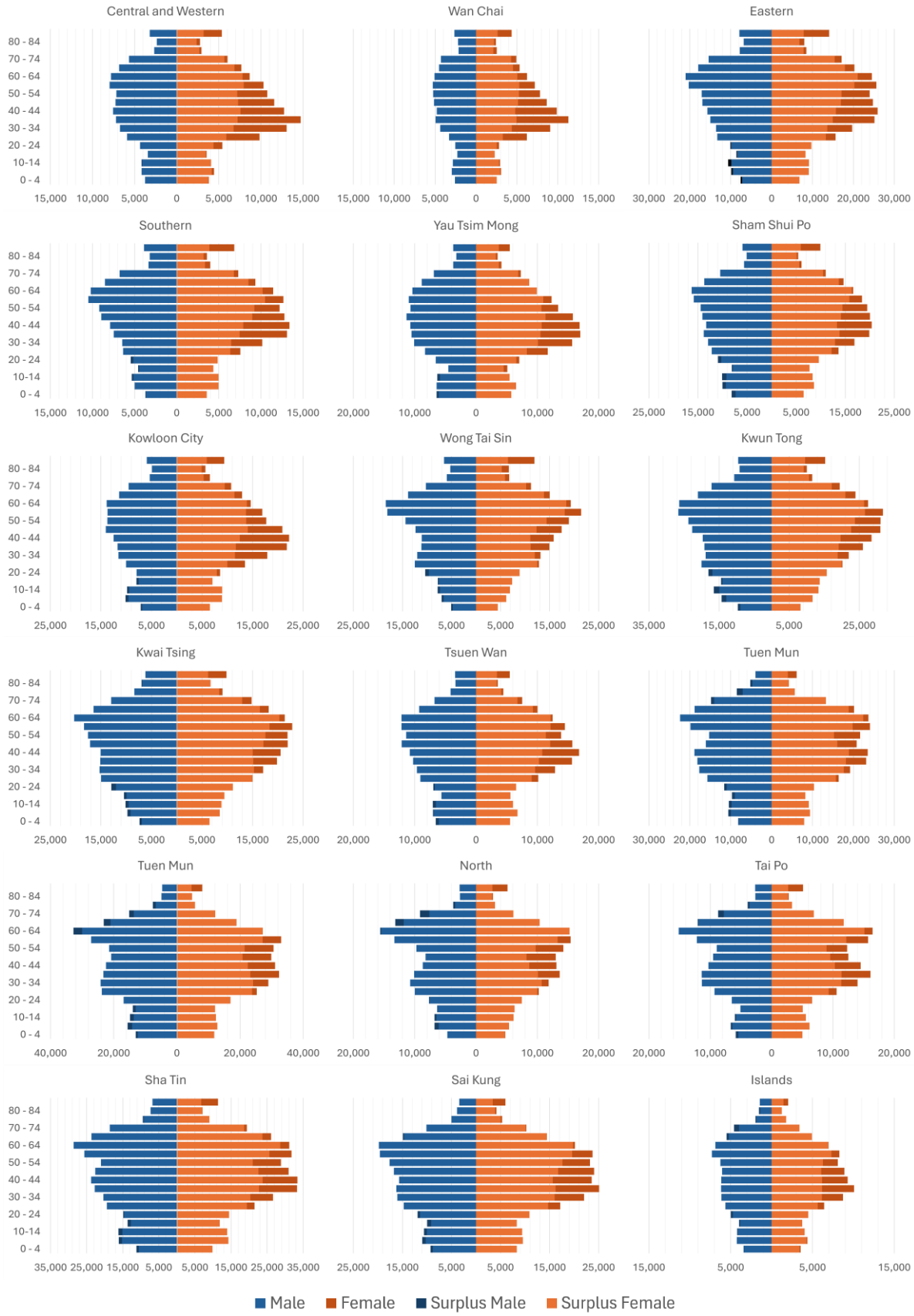


Figure 4. Population Distribution by Age Groups

Kowloon's districts show varied demographic profiles. Yau Tsim Mong has the youngest population structure with concentrated 25-44 age groups, confirmed by its low elderly percentage (17.08%). Wong Tai Sin's pyramid reveals substantial 50-64 age bulges, corresponding to its high elderly population (22.38%) and elevated dependency ratio (45.59). Kwun Tong's broad middle-age representation aligns with its substantial elderly population (21.55%) and the highest dependency ratio in Kowloon (47.07). The moderate sex ratios across Kowloon districts (0.78-0.87) manifest in their population pyramids as less extreme gender imbalances than observed in Hong Kong Island.

New Territories districts display diverse pyramid structures. Sha Tin shows substantial middle-aged cohorts with notable bulges in the 35-44 age brackets, reflected in its moderate elderly percentage (19.70%). Yuen Long's broader-based pyramid with younger cohorts corresponds to its low elderly population (14.53%) and the territory's lowest dependency ratio (35.52). Islands district's distinctive narrow structure aligns with its minimal elderly population (14.37%). The relatively balanced sex ratios in New Territories districts (0.84-0.90) appear in their pyramids as more symmetrical distributions between genders, particularly in Tuen Mun (0.90), though still showing the universal pattern of female longevity in the upper age brackets.

Table 1. Demographic metrics per district

District	*Old Population (<65 %)*	*Age dependency ratio*	*Sex ratio (male/female)*
Central and Western	18.68	40.97	0.72
Wan Chai	20.65	44.91	0.67
Eastern	22.85	48.50	0.79
Southern	20.46	44.93	0.78
Yau Tsim Mong	17.08	40.60	0.80
Sham Shui Po	19.72	45.50	0.84
Kowloon City	19.17	46.15	0.78
Wong Tai Sin	22.38	45.59	0.86
Kwun Tong	21.55	47.07	0.87
Kwai Tsing	21.31	45.72	0.88
Tseun Wan	17.35	41.42	0.85
Tuen Mun	18.74	41.99	0.90
Yuen Long	14.53	35.52	0.88
North	17.34	39.40	0.89
Tai Po	17.76	40.42	0.86
Sha Tin	19.70	45.36	0.85
Sai Kung	15.51	37.15	0.84
Islands	14.37	37.59	0.84
Total Land	19.00	42.87	0.84

Socioeconomic Characteristics

As shown in figure 5 (and appendix B), the overall poverty rate of Hong Kong is 23.6% (Census and Statistics Department, 2021a). Above the average poverty rate there is Central and Western (16.9%), Wan Chai (17.0%), Sai Kung (17.6%), Southern (18.2%), Eastern (19.4%), Yau Tsim Mong (20.8%), Tsuen Wan (21.2%), Kowloon City (21.5%), and Tai Po (23.5%). Below the average poverty rate there is Sha Tin (23.7%), Yuen Mun (24.0%), Yuen Long (25.6%), Islands (25.7%), Sham Shui Po (26.5%), North (27.0%), Wong Tai Sin (27.1%), Kwai Tsing (27.5%), and Kwun Tong (28.8%).

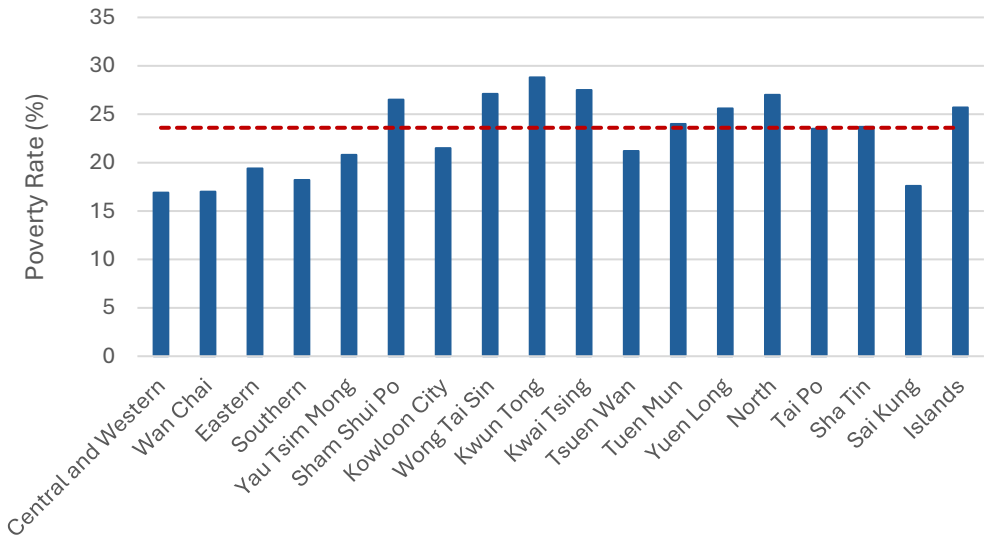


Figure 5. Poverty Rate by District.
Remarks: Red line indicates the total land average.

The choropleth map in Figure 6 visualizes these variations, revealing a distinct geographic pattern where Hong Kong Island districts appear in the lightest shades (0.169-0.187), indicating the lowest poverty rates, while the darkest shades (0.268-0.288) concentrate in eastern Kowloon and the northwestern New Territories, showing a gradient of increasing poverty with distance from the central business districts. This spatial distribution highlights five poverty intensity zones across the territory, with the most affluent areas clustered on Hong Kong Island and the highest poverty concentrations forming distinct hotspots in Kwun Tong, Wong Tai Sin, Kwai Tsing, and North district.

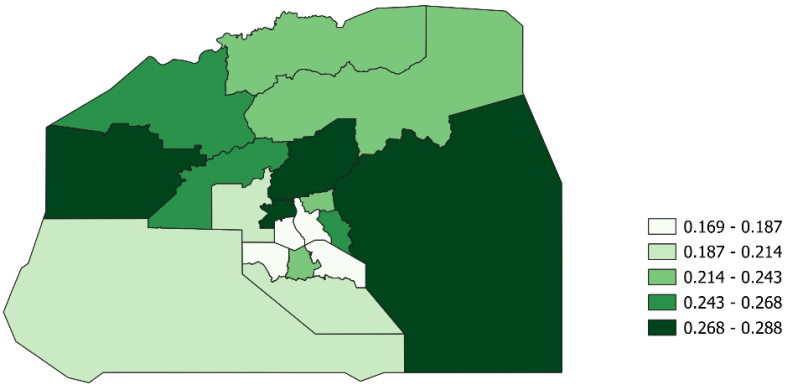


Figure 6. Choropleth Map of Poverty Rate by District

Ethnic Composition

Analysis of Hong Kong's population reveals distinctive patterns of ethnic composition that correspond with demographic structures across the territory's districts (figure 7). The Herfindahl-Hirschman Index (HHI) values in Table 2 and the detailed ethnic breakdowns in Appendix E demonstrate clear spatial patterns of diversity.

Hong Kong Island districts exhibit the highest ethnic diversity, particularly Central and Western (HHI 6158.868) and Wan Chai (HHI 5869.368). This diversity is characterized by substantial Western

expatriate populations, with Central and Western hosting 13,408 White residents (5.7% of the district population) and significant Filipino communities (18,584 residents or 7.9%).

Yau Tsim Mong emerges as another diverse district (HHI 6901.281) with a distinctive demographic profile. Unlike Hong Kong Island's expatriate-driven diversity, Yau Tsim Mong's ethnic mix features the largest Nepalese community in Hong Kong (12,560 residents) alongside substantial Indian (8,000) and Indonesian (7,215) populations. The highest ethnic homogeneity appears in Wong Tai Sin (HHI 9236.089), North district (HHI 9262.039), and Kwun Tong (HHI 9220.024), where Chinese residents constitute over 96% of the population. These districts display more traditional population pyramids with substantial elderly populations and balanced sex ratios. Kwai Tsing presents an interesting case with high homogeneity (HHI 9110.773) despite hosting Hong Kong's largest Pakistani community (4,400 residents).

Islands district combines high ethnic diversity (HHI 6185.018) with the territory's highest proportion of White residents (5.9%) and substantial Indian communities (3.3%). This distinctive ethnic profile corresponds with its atypical population structure showing the lowest elderly percentage in Hong Kong.

Table 2. Ethnicity HHI by District

District	*HHI*
Central and Western	6158.868
Wan Chai	5869.368
Eastern	8269.964
Southern	7450.626
Yau Tsim Mong	6901.281
Sham Shui Po	8800.428
Kowloon City	7997.726
Wong Tai Sin	9236.089
Kwun Tong	9220.024
Kwai Tsing	9110.773
Tsuen Wan	8674.382
Tuen Mun	9091.101
Yuen Long	8689.474
North	9262.039
Tai Po	8702.277
Sha Tin	8900.406
Sai Kung	8205.644
Islands	6185.018
Total Land	8411.788

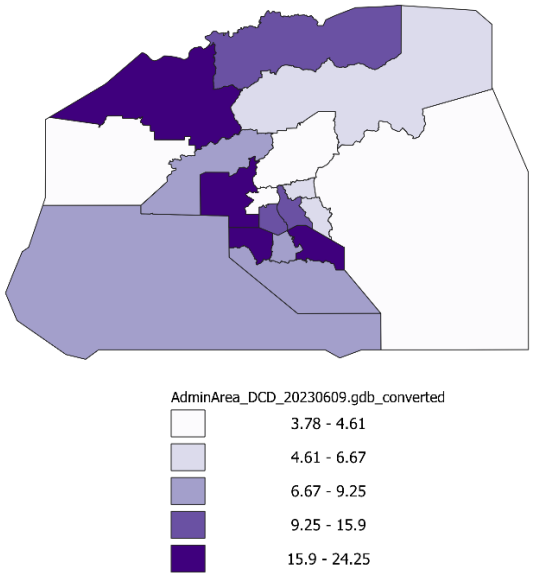


Figure 7. Non-Chinese ethnicity Choropleth map

Linguistic data reveals distinct spatial patterns in language use across Hong Kong (figure 7). While Cantonese dominates as the primary spoken language territory-wide (88.16%), significant variations exist between districts (see Appendix F). Hong Kong Island districts show markedly lower Cantonese usage and higher English prevalence. Central and Western (70.35% Cantonese, 18.06% English) and Wan Chai (70.59% Cantonese, 18.39% English) stand out with the highest English usage in the territory. These districts also show elevated Putonghua (mandarin Chinese) rates (5.39% and 4.42% respectively), indicating their cosmopolitan character.

A clear geographic gradient exists, with Cantonese prevalence increasing as one move from Hong Kong Island to Kowloon and the New Territories. The highest Cantonese concentrations appear in Tuen

Mun (93.96%), North district (93.90%), and Wong Tai Sin (93.08%). Whereas Putonghua speakers concentrate primarily in commercial and business districts such as Central and Western (5.39%), Yau Tsim Mong (4.74%), Wan Chai (4.42%), and Islands (3.86%). Other Chinese dialects reach their highest percentages in Kwun Tong (5.04%), Sham Shui Po (3.96%), Eastern (3.82%), and Wong Tai Sin (3.53%), likely reflecting historical migration patterns from different regions of China.

Yau Tsim Mong exhibits the highest percentage of other languages (7.70%), followed by Islands (6.41%) and Wan Chai (5.30%), indicating concentrations of non-Chinese ethnic communities, particularly South and Southeast Asian populations. Southern district shows a distinctive pattern with relatively high English usage (10.41%) despite moderate Cantonese prevalence (82.63%), differing from other Hong Kong Island districts.

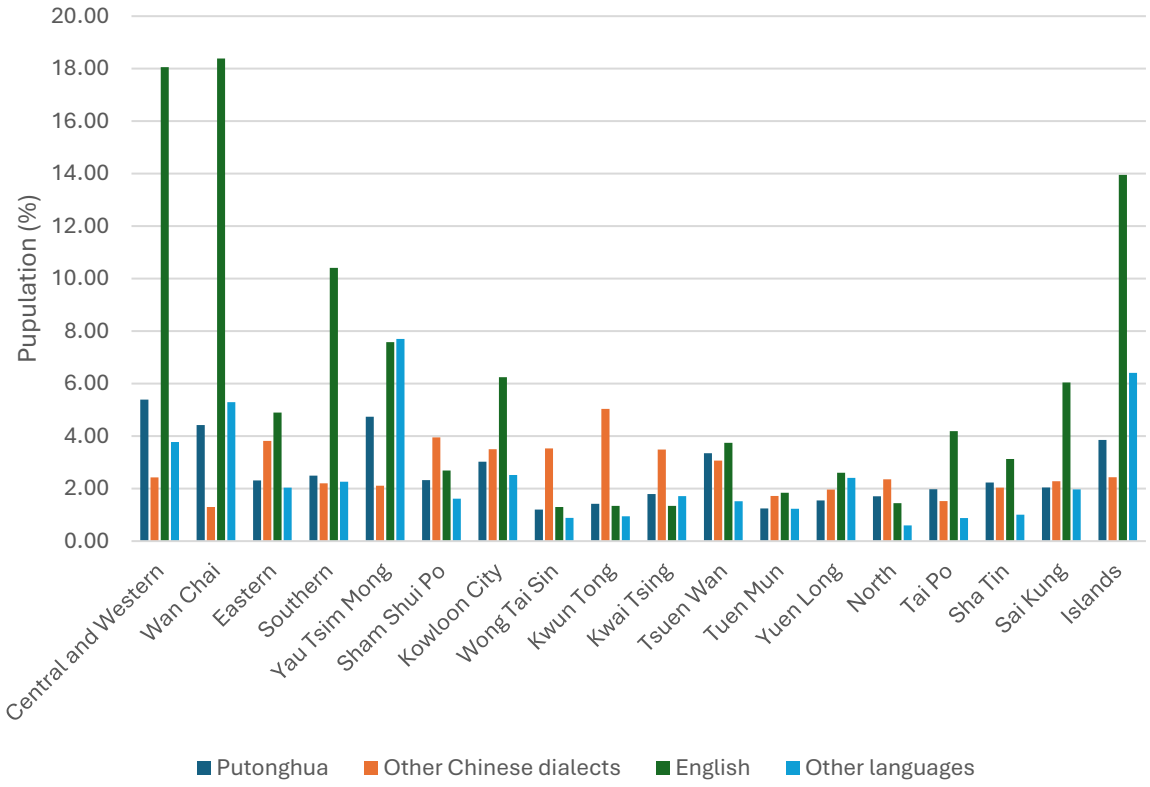


Figure 7. Usual spoken language by district (excluding Cantonese)

Discussion

The analysis of life expectancy at birth (LEB) and age-standardized mortality rates (ASMR) across Hong Kong's 18 districts reveals significant spatial inequalities in health outcomes. Male LEB shows a 2.67-year gap between the highest (Wan Chai, 82.30 years) and lowest (Yau Tsim Mong, 79.63 years) districts, while female LEB exhibits a narrower 1.6-year disparity. ASMRs demonstrate even more pronounced variations, with Yau Tsim Mong's rate (453.12 per 100,000) more than double that of Sham Shui Po (188.18 per 100,000). The consistent inverse relationship between ASMR and LEB confirms that mortality differences are driving life expectancy disparities across districts.

Socioeconomic factors strongly correlate with these observed health disparities. Districts with poverty rates below 20% (Central and Western, Wan Chai, Southern, Eastern, and Sai Kung) generally demonstrate higher life expectancies. However, this relationship is not perfectly linear. Sex ratios appear influential, with districts showing more balanced gender distributions (sex ratios 0.85-0.90) often demonstrating better health outcomes, likely reflecting more stable family structures and social support networks. Age dependency ratios also correlate with health outcomes, as districts with high dependency burdens (Eastern, Kwun Tong) frequently show compromised health metrics despite varying socioeconomic status, suggesting caregiving pressures may impact community health.

Hong Kong's ethnic composition and linguistic diversity provide important context for understanding these health disparities. Districts with higher proportions of non-Chinese residents and non-Cantonese speakers show distinctive health patterns that cannot be explained by socioeconomic factors alone. Central and Western, Wan Chai, and Islands districts demonstrate both high ethnic diversity (HHI <6200) and elevated English usage (14-18%), they maintain favourable health outcomes despite their distinctive demographic structures. These affluent districts offer instructive models of favourable health determinants. Despite their low proportions of Cantonese speakers (approximately 70%) and high ethnic diversity, they maintain excellent health outcomes through robust public infrastructure, superior access to healthcare facilities, lower population density in residential areas, enhanced green space access, and better air quality compared to Kowloon districts. The experience of these districts suggests that ethnic diversity itself is not detrimental to population health when accompanied by strong socioeconomic resources and supportive infrastructure.

Conversely, Yau Tsim Mong presents a contrasting case where high ethnic diversity (HHI 6901) and linguistic variety (22% non-Cantonese speakers) coincide with the territory's lowest life expectancy. This district's exceptionally high mortality rates across multiple causes demand explanation beyond demographic composition. Despite having a younger population (only 17.08% elderly) and moderate poverty rate (20.8%), the district shows dramatically elevated ASMR (453.12 per 100,000), particularly for lung cancer, cerebrovascular diseases, and respiratory conditions.

Several interconnected factors likely contribute to Yau Tsim Mong's health disadvantage. The district experiences Hong Kong's highest traffic density, creating concentrated exposure to nitrogen oxides and fine particulate matter (PM2.5), at the same time, its narrow streets between tall buildings creates street canyons that trap pollutants at pedestrian level (Mak & Ng, 2021; Wong et al., 2008). The district's exceptionally high lung cancer mortality (38.14 per 100,000) aligns with evidence linking these pollutants to respiratory malignancies. Additionally, the district contains some of Hong Kong's oldest building stock with inadequate ventilation, potential mold issues, and limited infrastructure maintenance, potentially exacerbating respiratory conditions and cardiovascular stress (Kwok, 2005).

The distinctive ethnic profile of Yau Tsim Mong, with the largest Nepalese community in Hong Kong and substantial Indian and Indonesian populations, presents complex health dynamics. The "healthy immigrant effect" suggests that migrants are typically younger, healthier, and more educated than native populations, which accounts for their initially better health outcomes (Brabete, 2017). However, this health advantage may deteriorate more rapidly due to challenging living and working conditions in this district. Additionally, the "salmon effect" describes how migrants often return to their countries of origin when their health status worsens, creating a selection bias where younger residents appear to die at higher rates from conditions typically affecting older populations.

Sham Shui Po presents a compelling counterexample to expected patterns, demonstrating the territory's highest female life expectancy (83.49 years) and lowest ASMR (188.18 per 100,000) despite having a 26.5% poverty rate and aging population. The relatively high proportion of other Chinese dialects speakers (3.96%) suggests historical migration from diverse regions of China, potentially bringing varied dietary and lifestyle patterns that could confer health benefits. Its well-established community networks and social service infrastructure developed over decades may create protective social capital.

These findings demonstrate that health disparities in Hong Kong reflect complex interactions between socioeconomic status, environmental conditions, migration patterns, and community resources rather than simple correlations with poverty or demographic structure. While affluent districts generally enjoy health advantages, exceptions like Sham Shui Po show that community resilience and targeted infrastructure investments can support positive health outcomes even in economically challenged areas. Conversely, districts like Yau Tsim Mong demonstrate that moderate economic resources cannot overcome intense environmental stressors and challenging urban conditions. This multifactorial understanding is essential for developing targeted public health interventions that address the specific challenges faced by residents in each district.

Conclusion

This study reveals significant disparities in life expectancy across Hong Kong's 18 districts, with variations of 2.67 years for males and 1.6 years for females, reflecting broader inequalities in health outcomes and social determinants. Our findings demonstrate that these disparities follow distinct spatial patterns that correlate with, but are not fully explained by, socioeconomic gradients.

While affluent Hong Kong Island districts generally demonstrate favourable health outcomes, the relationship between wealth and health is not straightforward. Districts like Sham Shui Po achieve remarkable health metrics despite high poverty rates, suggesting that stable housing, community cohesion, and established social infrastructure can mitigate economic disadvantages. Conversely, Yau Tsim Mong exhibits the territory's poorest health outcomes despite moderate poverty rates, highlighting how environmental stressors, urban morphology, and population dynamics can compromise health even in economically intermediate areas.

Ethnic and linguistic diversity produce complex effects on health outcomes. When coupled with strong socioeconomic resources, as in Central and Western and Wan Chai districts, diversity associates with positive health indicators. However, in contexts of environmental stress and precarious living conditions, diverse migrant communities may experience accelerated deterioration of the initial "healthy immigrant effect," as observed in Yau Tsim Mong.

Age-standardized cause-specific mortality analysis reveals that health challenges vary substantially across districts. While some areas struggle predominantly with cardiovascular diseases, others face elevated cancer mortality or respiratory conditions, suggesting that tailored, district-specific public health approaches are necessary rather than territory-wide interventions.

Future research should explore these patterns at finer geographic scales to identify neighbourhood-level factors that promote health resilience despite economic challenges. Additionally, longitudinal studies tracking how recent urban renewal and housing initiatives affect health outcomes could provide valuable policy insights. Finally, qualitative investigations of community-level protective factors in high-performing districts like Sham Shui Po could reveal transferable practices for health promotion in socioeconomically challenged areas.

By addressing the social, environmental, and structural determinants identified in this study, Hong Kong can work toward reducing health inequities and ensuring that its remarkable overall life expectancy is shared more equitably across all districts and populations, advancing the goal of health for all embedded in the Sustainable Development Goals agenda.

Personal Reflection

Being a Laidlaw Scholar has given me the valuable opportunity to do research in real life scenarios. Being part of Professor David Bishai's lab, I have had the opportunity to be involved in projects with significant public health policy value. As a public health and development student, this experience has deepened my understanding of how social determinants shape health outcomes within urban environments.

Working with spatial health data has transformed my perspective on public health interventions. The finding that Yau Tsim Mong faces such severe health challenges despite moderate poverty rates was particularly eye-opening, highlighting how socioeconomic backgrounds and built environments can significantly impact population health.

The research process itself has enhanced my analytical skills tremendously. From standardizing mortality rates to calculating diversity indices and creating geospatial visualizations, I've developed technical competencies that will serve me throughout my career. Perhaps more importantly, I've learned to approach data with both rigor and nuance, recognizing that numbers alone cannot tell the full story of community health.

Collaborating with my research team has taught me valuable lessons in teamwork and scientific communication. Our diverse perspectives strengthened our analysis and helped us identify patterns that might otherwise have been overlooked. I'm grateful for the mentorship from Professor Bishai, whose guidance helped me navigate methodological challenges while keeping our focus on generating evidence that could inform real policy decisions.

This Laidlaw experience has solidified my commitment to addressing health inequities through evidence-based approaches. As I continue my academic journey, I hope to build on this research to develop interventions that account for the complex determinants of health in urban settings. Most importantly, I've gained confidence in my ability to contribute meaningfully to public health research that can drive positive change in communities facing health challenges.

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Appendices

Appendix A. LEB by sex and district

District	LEB Males	LEB Females
Central and Western	82.09	83.07
Eastern	82.30	83.41
Islands	81.78	83.09
Kowloon City	81.74	83.00
Kwai Tsing	79.63	81.89
Kwun Tong	82.27	83.49
North	81.23	82.82
Sai Kung	81.11	82.88
Sha Tin	81.25	83.12
Sham Shui Po	80.97	82.78
Southern	81.76	83.01
Tai Po	81.17	82.66
Tsuen Wan	81.08	82.87
Tuen Mun	81.06	82.89
Wan Chai	81.32	82.87
Wong Tai Sin	81.90	83.18
Yau Tsim Mong	81.88	83.08
Yuen Long	81.92	83.33

Appendix B. ASMR of 10 Predominant NCDs

District	C18-C21	C22	C33-34	F01-F03	I20,I23-I25	I21-I22	I60-I69	J00-J06, J30-J39, J60-J98	N17-N19	S00-T98
Central and Western	9.49	8.42	19.31	8.76	13.15	6.09	15.57	4.75	5.93	18.34
Wan Chai	10.56	4.06	13.46	6.23	9.10	3.64	14.23	3.71	8.71	15.44
Eastern	14.56	7.48	21.69	4.52	11.56	7.24	15.37	2.40	6.24	14.02
Southern	10.80	7.18	20.77	8.09	13.98	6.21	15.10	6.49	6.43	15.56
Yau Tsim Mong	20.39	12.99	38.14	12.58	17.62	12.06	29.05	8.19	12.60	24.46
Sham Shui Po	8.79	6.71	17.23	2.73	9.97	7.10	10.32	2.15	3.46	12.44
Kowloon City	13.52	11.35	23.91	4.41	11.84	6.35	13.94	3.59	8.07	14.63
Wong Tai Sin	14.00	9.61	26.30	3.01	14.11	9.59	15.10	4.63	7.11	18.42
Kwun Tong	14.77	8.72	27.38	3.81	13.18	6.80	14.74	4.94	9.36	19.00
Kwai Tsing	11.57	8.47	26.42	3.28	12.10	9.49	17.77	4.32	9.89	17.95
Tsuen Wan	12.91	8.12	15.43	2.81	9.88	6.08	14.70	4.65	6.62	11.98
Tuen Mun	12.80	9.22	27.11	11.76	13.71	8.73	15.21	5.72	10.00	17.03
Yuen Long	14.03	10.85	23.70	6.67	14.00	7.51	16.21	4.69	9.05	18.17
North	11.57	9.97	25.28	5.18	14.08	6.07	16.56	4.01	11.05	14.70

Tai Po	10.62	6.75	20.89	4.99	17.79	7.19	20.37	5.98	6.86	16.07
Sha Tin	11.99	8.16	22.97	3.76	12.79	5.38	13.00	5.68	7.25	16.68
Sai Kung	13.03	6.54	21.28	3.83	10.26	7.73	15.18	4.87	5.68	16.01
Islands	14.43	7.95	24.06	2.25	9.34	9.99	11.45	3.27	5.72	13.60

Notes:
Malignant neoplasm of trachea, bronchus and lung (C33-C34)
Remainder of diseases of the respiratory system (J00-J06, J30-J39, J60-J98)
Cerebrovascular diseases (I60-I69)
Other ischaemic heart diseases (I20, I23-I25)
Injury, poisoning and certain other consequences of external causes (S00-T98)
Malignant neoplasm of colon, rectum and anus (C18-C21)
Renal failure (N17-N19)
Dementia (F01-F03)
Acute myocardial infarction (I21-I22)
Malignant neoplasm of liver and intrahepatic bile ducts (C22)

Appendix C. Age and Sex Profiles of Hong Kong Districts ('000)

District Council district (DCD)		*0 - 14*	*15 - 24*	*25 - 34*	*35 - 44*	*45 - 54*	*55 - 64*	*Over 65*	*Total*
Central and Western	*Male*	12.0	7.8	12.6	14.9	14.4	15.7	20.2	97.6
	Female	12.2	9.0	23.0	27.3	22.4	18.6	23.4	135.9
	Both	24.2	16.7	35.5	42.2	36.8	34.3	43.6	233.4
Wan Chai	*Male*	8.3	4.7	7.6	9.7	10.5	10.3	15.2	66.3
	Female	8.8	5.0	15.2	21.3	16.3	13.5	18.8	98.9
	Both	17.1	9.7	22.7	31.0	26.8	23.8	34.1	165.1
Eastern	*Male*	26.5	18.1	26.6	30.6	33.9	41.1	54.2	231.0
	Female	25.0	17.8	35.3	51.2	48.6	50.3	65.8	294.1
	Both	51.5	35.9	62.0	81.8	82.5	91.4	120.0	525.1
Southern	*Male*	13.7	9.4	12.4	14.7	17.7	20.5	24.0	112.3
	Female	13.3	9.1	17.9	26.3	24.9	24.0	28.3	143.8
	Both	27.0	18.5	30.3	40.9	42.5	44.5	52.4	256.1
Yau Tsim Mong	*Male*	18.2	11.1	18.3	21.1	21.8	21.2	25.0	136.8
	Female	17.9	12.0	27.5	33.9	29.4	21.9	27.4	170.0
	Both	36.2	23.1	45.8	55.0	51.2	43.1	52.4	306.8
Sham Shui Po	*Male*	25.6	17.9	24.8	26.6	28.2	31.8	39.1	193.9
	Female	23.4	17.2	30.1	40.2	39.5	35.1	44.5	230.1
	Both	49.0	35.1	55.0	66.8	67.6	66.9	83.6	424.0
Kowloon City	*Male*	25.9	15.5	21.7	24.3	27.4	26.9	35.0	176.7
	Female	24.3	15.7	31.4	44.0	38.4	31.3	42.4	227.5
	Both	50.1	31.2	53.0	68.3	65.8	58.2	77.5	404.2
Wong Tai Sin	*Male*	18.6	17.3	24.9	22.1	26.6	36.6	40.7	186.8
	Female	17.4	16.3	25.7	30.8	36.3	40.3	49.5	216.2
	Both	36.0	33.6	50.6	52.9	62.9	76.8	90.2	403.0
Kwun Tong	*Male*	36.6	30.7	38.5	38.7	46.2	52.7	66.1	309.6
	Female	33.2	29.2	42.2	54.5	61.9	59.0	77.7	357.9
	Both	69.8	59.9	80.7	93.3	108.2	111.7	143.8	667.4
Kwai Tsing	*Male*	25.4	21.9	29.7	29.9	34.4	38.3	48.4	228.0
	Female	23.6	20.5	31.9	39.9	43.7	44.1	55.4	259.2

	Both	49.1	42.3	61.7	69.8	78.2	82.4	103.8	487.2
Tsuen Wan	*Male*	19.4	12.2	18.5	21.1	23.5	24.3	25.9	145.0
	Female	18.4	12.2	23.0	32.6	29.5	26.9	29.0	171.4
	Both	37.8	24.4	41.5	53.7	53.0	51.2	54.9	316.4
Tuen Mun	*Male*	27.7	19.7	33.1	36.6	30.7	41.4	46.6	235.9
	Female	26.3	18.4	35.2	46.3	42.2	47.4	46.8	262.5
	Both	54.0	38.1	68.3	82.9	72.9	88.8	93.4	498.4
Yuen Long	*Male*	40.1	29.9	47.7	45.4	41.7	56.5	49.0	310.3
	Female	37.1	28.9	54.2	63.6	60.6	60.1	47.2	351.7
	Both	77.3	58.8	101.9	108.9	102.3	116.6	96.2	662.0
North	*Male*	17.2	13.8	20.5	18.4	17.9	28.5	27.3	143.5
	Female	16.1	13.6	21.8	26.6	27.0	30.8	25.6	161.5
	Both	33.3	27.4	42.3	44.9	44.9	59.3	52.9	305.1
Tai Po	*Male*	17.7	11.4	20.5	21.6	18.7	27.1	27.7	144.6
	Female	16.9	11.6	24.7	30.5	24.6	32.3	27.9	168.4
	Both	34.5	22.9	45.2	52.1	43.3	59.4	55.6	313.0
Sha Tin	*Male*	41.3	27.3	39.8	46.6	43.6	53.7	64.3	316.6
	Female	37.9	26.1	48.2	66.5	59.6	62.2	71.3	371.7
	Both	79.2	53.4	88.0	113.1	103.2	115.8	135.6	688.2
Sai Kung	*Male*	29.0	20.2	30.2	31.7	34.2	39.4	36.5	221.3
	Female	27.3	19.6	38.9	48.9	47.4	44.0	38.9	264.9
	Both	56.3	39.8	69.1	80.6	81.6	83.4	75.4	486.2
Islands	*Male*	11.8	8.8	11.7	12.0	12.0	13.9	13.5	83.6
	Female	11.9	8.3	15.3	19.3	16.8	15.0	12.8	99.4
	Both	23.7	17.0	27.0	31.3	28.8	28.9	26.3	183.0
Whole Territory	*Male*	414.9	297.4	439.2	466.1	483.3	579.9	658.9	3,339.8
	Female	391.1	290.4	541.4	703.5	669.0	656.7	732.8	3,984.8
	Both	806.0	587.8	980.5	1,169.6	1,152.3	1,236.6	1,391.7	7,324.6

Appendix D. Socio-economic characteristics of poor households by District

Districts	*Poor Households ('000)*	*Poor population ('000)*	*Poverty rate (%)*
Central and Western	17.1	35.8	16.9
Wan Chai	12.8	26.2	17.0
Eastern	44.9	97.4	19.4
Southern	19.6	43.4	18.2
Yau Tsim Mong	29.5	62.9	20.8
Sham Shui Po	46.9	109.5	26.5
Kowloon City	37.7	83.5	21.5
Wong Tai Sin	43.9	108.2	27.1
Kwun Tong	77.6	191.5	28.8
Kwai Tsing	52.8	133.3	27.5
Tsuen Wan	26.8	62.3	21.2
Tuen Mun	49.7	115.1	24.0
Yuen Long	64.4	156.8	25.6
North	33.2	82.1	27.0
Tai Po	28.5	67.8	23.5

Sha Tin	65.9	154.2	23.7
Sai Kung	33.0	77.7	17.6
Islands	19.1	44.7	25.7
Total Land	**703.4**	**1,652.5**	**23.6**

Appendix E. Ethnicity Profiles of Hong Kong Districts

Part I	*Chinese*	*Filipino*	*Indonesian*	*Indian*	*Nepalese*	*Pakistani*	*Other South Asian*
Central and Western	183,502	18,584	5,950	4,171	614	307	255
Wan Chai	126,271	15,845	5,478	1,866	1,743	225	118
Eastern	481,013	18,362	13,646	2,346	422	1,456	159
Southern	226,568	14,087	5,705	2,417	264	391	227
Yau Tsim Mong	257,189	11,980	7,215	8,000	12,560	1,184	1,250
Sham Shui Po	404,228	8,310	6,937	1,268	1,382	2,381	194
Kowloon City	366,580	17,830	10,411	4,668	518	1,446	403
Wong Tai Sin	390,871	4,047	6,157	536	289	1,139	231
Kwun Tong	646,218	7,060	9,621	1,417	149	1,839	36
Kwai Tsing	473,126	4,966	6,712	1,890	473	4,400	198
Tsuen Wan	297,897	8,629	6,774	642	847	716	128
Tuen Mun	483,173	6,716	6,965	719	916	1,766	100
Yuen Long	622,408	12,535	12,696	2,057	8,391	3,259	195
North	297,915	3,097	5,117	119	2	576	48
Tai Po	295,002	8,241	6,751	185	15	152	266
Sha Tin	653,268	14,702	13,138	1,645	41	772	359
Sai Kung	442,447	16,524	10,107	2,600	110	958	595
Islands	144,717	9,773	2,685	6,023	965	1,418	552
Total Land	6,792 ,393	201,288	142,065	42,569	29,701	24,385	5,314

Part II	*Thai*	*Japanese*	*Korean*	*Other Asian*	*White*	*Others*	*Sub-Total*
Central and Western	555	815	1,243	849	13,408	5,700	235,953
Wan Chai	978	1,002	604	572	7,338	4,655	166,695
Eastern	854	1,712	1,309	453	2,227	5,644	529,603
Southern	490	350	656	571	7,144	4,408	263,278
Yau Tsim Mong	630	1,485	1,133	1,601	2,902	3,518	310,647
Sham Shui Po	689	277	126	1,336	830	3,132	431,090
Kowloon City	1,032	1,549	596	438	998	4,165	410,634
Wong Tai Sin	789	164	12	186	287	2,094	406,802
Kwun Tong	1.392	250	127	570	450	4,037	673,166
Kwai Tsing	692	83	85	359	435	2,379	495,798
Tsuen Wan	293	278	220	249	836	2,585	320,094
Tuen Mun	891	156	133	546	1,460	3,338	506,879
Yuen Long	577	63	227	410	1,141	4,121	668,080
North	343	81	40	106	486	1,701	309,631
Tai Po	671	171	31	78	1,807	3,100	316,470
Sha Tin	837	602	417	568	1,567	4,890	692,806
Sai Kung	612	569	653	851	7,348	5,663	489,037
Islands	647	684	1,083	828	10,915	4,992	185,282
Total Land	12,972	10,291	8,695	10,571	61,579	70,122	7,411,945

Appendix F. Usual Spoken Languages by District (above 5 years old)

Districts	*Cantonese*	*Putonghua*	*Other Chinese dialects*	*English*	*Other languages*
Central and Western	70.35	5.39	2.43	18.06	3.77
Wan Chai	70.59	4.42	1.30	18.39	5.30
Eastern	86.93	2.32	3.82	4.90	2.04
Southern	82.63	2.50	2.20	10.41	2.26
Yau Tsim Mong	77.87	4.74	2.11	7.58	7.70
Sham Shui Po	89.41	2.32	3.96	2.69	1.62
Kowloon City	84.71	3.03	3.50	6.24	2.52
Wong Tai Sin	93.08	1.20	3.53	1.30	0.89
Kwun Tong	91.24	1.42	5.04	1.35	0.95
Kwai Tsing	91.67	1.79	3.49	1.34	1.71
Tsuen Wan	88.31	3.35	3.07	3.75	1.52
Tuen Mun	93.96	1.24	1.72	1.84	1.23
Yuen Long	91.47	1.55	1.97	2.60	2.41
North	93.90	1.71	2.35	1.44	0.60
Tai Po	91.42	1.98	1.53	4.19	0.88
Sha Tin	91.60	2.23	2.03	3.13	1.01
Sai Kung	87.66	2.04	2.28	6.04	1.97
Islands	73.34	3.86	2.44	13.96	6.41
Land total	88.16	2.30	2.85	4.61	2.08

Bibliography

Brabete, A. C. (2017). Chapter 8 - Examining Migrants' Health From a Gender Perspective. In M. P. Sánchez-López & R. M. Limiñana-Gras (Eds.), *The Psychology of Gender and Health* (pp. 231–250). Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-803864-2.00008-0

Braveman, P. (2006). Health disparities and health equity: concepts and measurement. *Annu Rev Public Health*, *27*, 167–194. https://doi.org/10.1146/annurev.publhealth.27.021405.102103

Census and Statistics Department. (2021a). *Hong Kong Poverty Situation Report 2020*. https://www.commissiononpoverty.gov.hk/eng/pdf/Hong_Kong_Poverty_Situation_Report_2020.pdf

Census and Statistics Department. (2021b). *Statistics by District Council District*. Hong Kong Special Administrative Region Retrieved from https://www.census2021.gov.hk/en/district_profiles.html

Census and Statistics Department. (2022). *Table 110-06811 : Land-based non-institutional population by District Council district, sex and age*. Hong Kong Special Administrative Region Retrieved from https://www.censtatd.gov.hk/en/web_table.html?id=110-06811

Census and Statistics Department. (2023a). *Hong Kong 2021 Population Census - Thematic Report: Household Income Distribution in Hong Kong* (Population Census, Issue. https://www.censtatd.gov.hk/en/EIndexbySubject.html?scode=600&pcode=B1120108

Census and Statistics Department. (2023b). *the Interactive Data Dissemination Service*. https://idds.census2021.gov.hk/app/idds.html

Census and Statistics Department. (2025a). *District Profiles (Population and Households)*. Hong Kong Special Administrative Region Retrieved from https://www.censtatd.gov.hk/en/map_ghs.html

Census and Statistics Department. (2025b). Table 110-02001 : Land area, mid-year population and population density by District Council district. In *Population estimates*. Hong Kong Special Administrative Region.

Chen, X., Chen Sun, C., Cao, Y., Liu, Z., Chan, S. S., & Bishai, D. (2024). *Spatial Variation of Life Expectancy in Hong Kong: Is it Socioeconomic Geospatial Integration or Segregation?* . School of Public Health, LKS Faculty of Medicine, The University of Hong Kong.

Chung, R. Y., Lai, F. T. T., Chung, G. K. K., Yip, B. H. K., Wong, S. Y. S., & Yeoh, E. K. (2018). Socioeconomic disparity in mortality risks widened across generations during rapid economic development in Hong Kong: an age-period-cohort analysis from 1976 to 2010. *Annals of Epidemiology*, *28*(11), 743–752.e744. https://doi.org/https://doi.org/10.1016/j.annepidem.2018.06.004

HealthyHK Department of Health. (2025). *Death Statistics - by sex, age and residential district, causes of death in tabulation list of the International Classification of Diseases (from 2001 onwards)*. https://www.healthyhk.gov.hk/phisweb/enquiry/mo_ysad10_e.html

Hosseinpoor, A. R., Bergen, N., Schlotheuber, A., & Grove, J. (2018). Measuring health inequalities in the context of sustainable development goals. *Bull World Health Organ*, *96*, 654–659. https://doi.org/http://dx.doi.org/10.2471/BLT.18.210401

Kwok, S. M. (2005). *Analysis on the links between housing and respiratory health of residents in Hong Kong* The University of Hong Kong]. Hong Kong Special Administrative Region. https://hub.hku.hk/R44qNl1U9S/eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJuYW1lIjoiMjk4NDcyYjY4NGNjZWQyOGYxOGZmYjAxZjViZmZkMzM6YWIyNmU4YjhkOTQ4NjU1MDA0YjZlZDViMDM2NjhiZGQiLCJlbWFpbCI6ImIxZGQyYWRjNDVmNDE3ZDQzNDQ2ZGYxN2RhYzA3YTIyOjQxY2NjZGM3Y2FjNTRjZjQ1MmMxYmVlOGI2ZWJmNmFkYWY2NDJmMzFhNmQ4ZjUiLCJoYW5kbGUiOiIxMDcyMi80ODg3MSIsInNlcSI6IjEiLCJpYXQiOjE3NTgyOTAwNzUsImV4cCI6MTc1ODM3NjQ3NX0.7E_l9XdYUttRMQiL9_Ld--WMqT_B_tg5ls7uSv7z4e8/b3793563x.pdf

Mak, H. W. L., & Ng, D. C. Y. (2021). Spatial and Socio-Classification of Traffic Pollutant Emissions and Associated Mortality Rates in High-Density Hong Kong via Improved Data Analytic

Approaches. *International Journal of Environmental Research and Public Health*, *18*(12), 6532. https://doi.org/10.3390/ijerph18126532

OXFAM Hong Kong. (2024). *Pathways out of adversity - Embracing change through transformation* (Hong Kong Poverty Report, Issue. https://www.oxfam.org.hk/en/f/news_and_publication/115439/POVERTy%20Rerport%202024_Eng.pdf

Taulbut, M., Walsh, D., McCartney, G., Parcell, S., Hartmann, A., Poirier, G., Strniskova, D., & Hanlon, P. (2014). Spatial inequalities in life expectancy within postindustrial regions of Europe: a cross-sectional observational study. *BMJ Open*, *4*(6), e004711. https://doi.org/10.1136/bmjopen-2013-004711

The Centre for Heath Protection. (2025). Life expectancy at birth, 1971-2024. In *Statistics*. Hong Kong Special Administrative Region.

Wami, W., Walsh, D., Hennig, B. D., McCartney, G., Dorling, D., Galea, S., Sampson, L., & Dundas, R. (2021). Spatial and temporal inequalities in mortality in the USA, 1968–2016. *Health & Place*, *70*, 102586. https://doi.org/10.1016/j.healthplace.2021.102586

Wong, C.-M., Ou, C.-Q., Chan, K.-P., Chau, Y.-K., Thach, T.-Q., Yang, L., Chung, R. Y.-N., Thomas, G. N., Peiris, J. S. M., Wong, T.-W., Hedley, A. J., & Lam, T.-H. (2008). The Effects of Air Pollution on Mortality in Socially Deprived Urban Areas in Hong Kong, China. *Environmental Health Perspectives*, *116*(9), 1189–1194. https://doi.org/10.1289/ehp.10850

Wong, S.-l. M., Markéta, & Chin, J. K. (2008). *Hong Kong: Demographic Change and International Labor Mobility* PECC-ABAC Conference on Demographic Change and International Labor Mobility in the Asia Pacific Region, Seoul, Korea. https://www.old.pecc.org/resources/labor/679-hong-kong-demographic-change-and-international-labor-mobility/file

World Health Organization. (2025). Social determinants of health. In *Health Topics*.