Association between regional taxable income and hypertension incidence: a longitudinal analysis

Yuna Sakai (1)
Kohei Yoshida (2), Takafumi Okawa (2), Fumiya Kimura (1), Aina Ozawa (1), Haruka Arai (1), Kaori Hotta (2), Rie Matsui (2) Mai Ishikawa (2), Yumi Sato (2), Nanami Gotoh (2), Takayuki Saitoh (1,2)

1 : Interfaculty Initiative in Public Health, Gunma University
2 : Graduate School of Health Sciences, Gunma University

Health Japan 21 aims to reduce health inequalities. In Prefecture A, we observed marked geographic variation in new-onset hypertension (HTN), suggesting an influence of area-level socioeconomic status (SES). Per-capita municipal taxable income, an SES marker, predicts cause-specific mortality of COPD, but its link to HTN is unknown. We therefore tested whether lower municipal income predicts five-year HTN.

A longitudinal analysis was conducted using Specific Health Checkup data from Prefecture A. Subjects were individuals without HTN, hyperglycemia, or dyslipidemia in 2015 who underwent follow-up checkups in 2020. HTN was defined by National Health and Nutrition Survey criteria. Income was calculated from "2015 Survey on Income Levels by Taxable Income Brackets" by the Ministry of Internal Affairs and Communications by dividing total municipal taxable income by taxpayers. Municipalities were categorized into quartiles (Q1–Q4):

Q1: ¥3,211–3,300k

Q2: ¥2,911–3,088k

Q3: ¥2,795–2,910k

Q4: ¥2,166–2,792k

Logistic regression estimated odds ratios (ORs) for HTN in 2020, with Q1 as reference. Covariates included age, sex, smoking, alcohol, exercise, and BMI. In addition, we tested for a trend. Significance was set at $p < 0.05$. Analyses used Python 3. Approved by the university ethics committee (HS2023-137).

Of 155,690 people checked in 2015, 15,563 met criteria. By 2020, 5,768 (37.1%) developed HTN. Compared to Q1, adjusted ORs were:

Q2: 1.22 (95% CI: 1.11–1.34)

Q3: 1.19 (95% CI: 1.08–1.31)

Q4: 1.22 (95% CI: 1.11–1.33)

A significant trend was found (p for trend < 0.05).

In conclusion, HTN incidence was higher in municipalities with lower income. These results suggest regional socioeconomic factors influence long-term health, highlighting the importance of economic context in public health policies to reduce disparities.

Ozone Amplifies Heat-Related Illness Risk: A Multi-Prefecture Meta-Analysis in Japan

Mustakim Mustakim (1)
Muhammad Abdul Basit Ahmad Tajudin (1), Xerxes Seposo (1,3,4), Asuna Arai (1), Satoru Chatani (6), Hikari Shimadera (7) Shin Araki (7), Kayo Ueda (1,2,5)

1 : Department of Hygiene, Graduate School of Medicine, Hokkaido University
2 : Department of Environmental Engineering, Graduate School of Engineering, Kyoto University, Kyoto, Japan
3 : School of Tropical Medicine and Global Health, Nagasaki University, Nagasaki, Japan
4 : Ateneo Center for Research and Innovation, Ateneo School of Medicine and Public Health, Ateneo de Manila University, Pasig, Philippines
5 : Graduate School of Global Environmental Studies, Kyoto University, Kyoto, Japan
6 : National Institute for Environmental Studies, Tsukuba, Japan
7 : Graduate School of Engineering, Osaka University, Suita, Japan

As temperatures rise and air quality deteriorates, the risks to public health from heatstroke and other heat-related illness are increasing. Reactive pollutants like ozone (O_3) can make people more susceptible to heat and worsen thermal stress. This study examines how ambient O_3 affects the link between temperature and heat-related disease in each of Japan's 47 prefectures throughout the summer months of June through September, 2014–2019. We initially used Distributed Lag Nonlinear Models (DLNM) to assess the relationship between daily mean temperature and emergency transports for heat-related illness, taking into account lagged effects, using a two-stage analytical technique for each prefecture. Using fixed and random-effects models to account for regional variability, we performed a meta-analysis in the second step to pool relative risk estimates stratified by high and low O_3 concentrations. The correlation between temperature and the incidence of heat-related illness was consistently nonlinear throughout prefectures, with steeper rises noted in high O_3 situations. Cumulative risk increased significantly at higher temperature percentiles, especially with increased ozone exposure, according to pooled RR curves. Although somewhat diminished with higher centering thresholds, sensitivity tests verified that the size of RR was stable across centering percentiles. Dual-panel scatter plots further demonstrated that, in high O_3 circumstances as opposed to low O_3 situations, heat-related illness instances increased more quickly with temperature. This study highlights the combined impact of heat and ozone pollution on public health. Ozone mitigation and heat readiness should be given top priority in integrated environmental health programs, particularly in susceptible areas. Public advisories and prompt actions during high O_3 occurrences may help lower the increased risk of heat-related illnesses.

Dynamics of diphtheria in the post-vaccination era

Noriko Kitamura (1,2)
Sompob Saralamba (3), Motoi Suzuki (1,2)

1 : Center for Infectious Disease Epidemiology, National Institute of Infectious Diseases, Japan Institute for Health Security
2 : Department of Infectious Disease Dynamics, Institute of Tropical Medicine, Nagasaki University, Japan
3 : Mahidol Oxford Tropical Medicine Research Unit, Bangkok, Thailand

Background : Diphtheria is a classical vaccine-preventable disease. Following the introduction of the toxoid vaccine in the 1920s, the disease was nearly eliminated in temperate regions. However, thousands of cases have been reported annually in Southeast Asia since the late 2010s and in Africa since the 2020s. While high-income countries have incorporated two or three booster doses of the diphtheria–tetanus–pertussis (DTP) vaccine, many low- and middle-income countries have not, leading to ongoing debate regarding the necessity of booster immunization. Despite this, the transmission dynamics of diphtheria have remained largely unexplored due to the substantial decline in case numbers.

Objectives : To estimate the transmissibility of diphtheria, its transmission among vaccinated individuals, and the waning of vaccine-derived immunity.

Methods : We analyzed sera from 500 participants collected during an age-stratified cross-sectional survey conducted in Nha Trang City, Vietnam, in 2017. Antibody prevalence against diphtheria toxin was measured, and a reverse catalytic model was applied to estimate age-specific force of infection and waning immunity parameters.

Results : The force of infection among vaccinated individuals was estimated at 0.005, while the force of infection among those without vaccine-derived immunity was 0.01, as twice as that of the vaccinated individuals. Vaccine-derived immunity was found to wane quickly with an estimated half-life of 2.7 years. Waning rate of the natural infection-derived immunity was 25 times slower than vaccine-derived immunity, though it was probably overestimated based on the natural history of diphtheria.

Conclusions : Diphtheria vaccine-derived immunity wanes rapidly, underscoring the need for booster immunization. These findings provide critical evidence to guide infection control strategies and vaccination policy in diphtheria-endemic regions.

Certain Metabolic syndrome components predict higher CV risk in Taiwanese 5 and 10-year follow-up

CHUN-CHENG LIAO (1)
Tsung-Min Yeh (2), Chia-Lien Chia-Lien (3), Chih-Li Lin

1 : Department of Family Medicine, Taichung Armed Forces General Hospital
2 : Department of Medical Education and Research, Taichung Armed Forces General Hospital

Background : Metabolic syndrome (MetS) affects over 30% of the global population and is closely linked to higher cardiovascular (CV) morbidity and mortality. Although MetS is recognized as a significant CV risk factor, few studies have examined which certain combinations of MetS components drive long-term CV risk. Furthermore, limited evidence exists using established 10-year CV risk prediction models in Asian populations.

Methods : We analyzed data from 111,695 Taiwanese adults aged 30–75 years who underwent health screenings from 2007 to 2022. CV risk was estimated using the Framingham Risk Score (FRS) and Atherosclerotic Cardiovascular Disease (ASCVD) Risk Estimator at baseline and at 5- and 10-year follow-ups. Cox regression models adjusted for clinical variables were applied to evaluate the association between different MetS patterns and changes in estimated 10-year CV risk.

Results : Of the 111,695 participants, 4,435 had MetS defined by the same three components at both baseline and follow-up. Among the MetS combinations, only the TFB pattern (elevated triglycerides, fasting glucose, and blood pressure) consistently showed the highest hazard ratios for increased CV risk over 5 and 10 years in both the FRS (HR = 1.189–1.204) and ASCVD (HR = 1.144–1.146) models (all $p < 0.05$).

Conclusions : The TFB combination was the only MetS pattern consistently linked to elevated 10-year CV risk estimated by both the FRS and ASCVD models. These results highlight the need to consider the specific combination of MetS components rather than just the total number present.

Normal or underweight older male smokers had high risks of cardiovascular and neoplasm death.

Masaki Ohsawa (1)
Kozo Tanno (3), Hiroshi Akasaka (3), Yuka Kotozaki (3), Yuki Yonekura (4), Toru Kuribayashi (5), Nobuyuki Takanashi (3)
Megumi Utsugi Tsubota (6), Toshiyuki Onoda (7), Akira Okayama (5)

1 : Morioka Tsunagi Onsen Hospital/ Department of Internal Medicine
2 : Iwate Medical University/ Division of Cardiology/ Department of Internal Medicine
3 : Iwate Medical University/ Department of Hygiene and Preventive Medicine
4 : St. Luke's International University/ College of Nursing
5 : The Research Institute of Strategy for Prevention
6 : Teikyo University/ Department of Hygiene and Public Health
7 : Iwate University/ Health Service Center

Background : Obesity and smoking are important risk factors of cardiovascular and neoplasm-related diseases among young and middle-aged people. However, whether these risk factors contribute to an increase in the risk of the outcomes has not been fully examined in older people.

Subjects and methods : A total of 2644 male individuals (aged 70 years to 84 years) without prevalent cardiovascular diseases (myocardial infarction, stroke, atrial fibrillation or heart failure) were enrolled. Participants were divided into eight groups by smoking status (current smoker or not) and body mass index (BMI, <18.5 (underweight); 18.5-24.9 (normal), 25-27.4 (mild overweight), 27.5+ (overweight or obese)). Age-adjusted mortality rate (AdR (1000 person-years)) and rate ratios (RR) of all-cause (ACD), cardiovascular (CVD) and neoplasm-related death (NPD) were estimated by Poisson regression analysis using the risk of controls (non-smoker with normal BMI) as a reference.

Results : AdR; RRs (95% confidence intervals) of ACD, CVD and NPD were 89.7; 2.55 (1.63-3.99), 8.67; 1.24 (0.31-5.03) and 23.2; 2.03 (0.83-4.95) in underweight smokers, 49.0; 1.39 (1.18-1.65), 10.7; 1.53 (1.07-2.20) and 17.5; 1.54 (1.15-2.04) in smokers with normal BMI, 35.7; 1.02 (.071-1.46), 3.47; 0.50 (0.16-1.57) and 11.3; 0.99 (0.52-1.88) in mild overweight smokers, 46.3; 0.74 (0.56-0.99), 10.0; 1.43 (0.45-4.53) and 9.63; 0.84 (0.27-2.65) in overweight or obese smokers, 63.8; 1.81 (1.30-2.53), 14.2; 2.03 (1.02-4.03) and 12.6; 1.10 (0.52-2.35) in underweight non-smokers. No elevated risks of outcomes were found in non-smokers with normal or overweight BMI.

Conclusion : Older male smokers with normal body weight or underweight had high risks of ACD, CVD and NPD, while overweight older male smokers did not have high risks of these outcomes. Older male non-smokers with underweight had also high risks of ACD and CVD. No elevated risks of outcomes were found in non-smokers with normal or overweight.