Identifying critical gestational windows of heat exposure linked to increased risk of preterm birth

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Background : As climate change intensifies, research on the health impacts of heat exposure has surged. While short-term associations between high ambient temperatures and the risk of preterm birth (PTB) are well documented, the long-term associations, particularly the specific gestational weeks of heightened vulnerability, known as critical windows, remain poorly understood. We aimed to identify critical gestational windows during which heat exposure is associated with increased risk of PTB.

Methods : We analyzed 986,910 singleton live births recorded in the Japan Perinatal Registry Network between 2016 and 2020. PTB was defined as delivery between 22 and 36 weeks of gestation. Weekly heat exposure was defined as the weekly mean temperature exceeding the prefecture-specific 90th percentile threshold for heat from May to September. Logistic regression models were fitted separately for each gestational week from -12 to 35, adjusting for age, parity, pre-pregnancy body mass index, smoking status, history of preterm birth, a 7-day moving average of relative humidity, and the month and year of conception. Critical windows were identified via Bayesian hierarchical modeling with smoothing and variable selection. PTB was further classified into extremely (<28 weeks), very (28–31), and moderate to late (32–36) preterm.

Results : Heat exposure was significantly associated with higher PTB risk during gestational weeks 16–21, with the greatest impact at week 18 (odds ratio 1.12; 95% credible interval, 1.09–1.15). Subtype analyses showed peak susceptibility at week 15 for extremely preterm, week 16 for very preterm, and week 18 for moderate or late preterm.

Conclusions : The second trimester, especially weeks 16–21, may be a critical window for heat-related PTB. Targeting preventive measures to these weeks could maximize the public health impact of targeted interventions and climate adaptation efforts, particularly in heatwave preparedness.

Rainfall patterns and feeding practices among children aged 6-23 months in the Philippines

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Climate variability is increasingly recognized as a determinant of child nutrition, yet its influence on infant and young child feeding (IYCF) practices remains underexplored. This study investigates the relationship between rainfall patterns and feeding practices among children aged 6–23 months in the Philippines, using nationally representative data from the 2022 Demographic and Health Survey (DHS) linked with high-resolution climate data from the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS). We examined four key IYCF indicators: Minimum Dietary Diversity (MDD, ≥5 out of 8 food groups in the past 24 hours), Minimum Meal Frequency (MMF, age-appropriate number of feedings), Minimum Acceptable Diet (MAD, meeting both MDD and MMF), and Introduction of Solid, Semi-Solid or Soft Foods (ISSSF, at least one such food for 6–8-month-olds). Appropriate feeding practices were defined as meeting any of these criteria.Spline-based logistic regression models revealed non-linear relationships between rainfall and feeding indicators. Moderate rainfall was associated with higher probabilities of meeting MDD, MMF, MAD, and appropriate feeding criteria, while excessive rainfall reduced these probabilities. The strength and shape of these associations varied by rainfall accumulation period: one-month rainfall showed sharper peaks, indicating short-term sensitivity, whereas six-month rainfall exhibited broader curves, reflecting longer-term environmental influences. MDD and appropriate feeding practices were more responsive to sustained rainfall, while MMF showed greater sensitivity to short-term changes.These findings underscore the need to integrate climate resilience into nutrition programming and policy. Strengthening early warning systems, promoting climate-adaptive agriculture, and ensuring continuity of nutrition services during climate shocks are critical to safeguarding child nutrition in climate-vulnerable settings.

The relationship between area deprivation and stillbirth and child mortality rates in Japan

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Background : While the association between area deprivation and child mortality in Japan is documented through 2014, evidence from the recent pre-pandemic (2015–2019) and pandemic (2020–2022) periods is limited. This study aims to describe trends in stillbirth and child mortality rates (neonatal, infant, and child mortality) across different levels of the municipal-level area deprivation index (ADI) during these key periods.

Method : We calculated the ADI for each municipality using data from the 2015 and 2020 Japanese Censuses, applying them to the analysis periods of 2015–2019 and 2020–2022, respectively. We then stratified municipalities into quintiles based on the ADI, and calculated the stillbirth, neonatal, infant, and child mortality rates for each quintile from 2015 to 2022 using data from the Vital Statistics of Japan and a three-year moving average.

Result : Throughout the period covered, stillbirth rates were higher in areas with a higher ADI. Stillbirth rates decreased across all quintiles during the COVID-19 pandemic, but disparities by ADI remained. Among neonates, infants, and children, no clear association was observed between ADI and mortality rates before the COVID-19 pandemic. However, mortality rates became higher in areas with higher ADI levels during the COVID-19 pandemic.

Conclusion : Higher stillbirth rates were consistently observed in municipalities with higher deprivation levels from 2015 to 2022. While such associations were not apparent for other outcomes (neonatal, infant, and child mortality) before the COVID-19 pandemic (2015-2019), they emerged during the pandemic period (2020–2022), suggesting that the pandemic may have exacerbated inequalities in perinatal and child health outcomes at the municipal level.

Effects of air pollution levels on the risk of small- and large-for-gestational-age births in Japan

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Background : Small-for-gestational-age (SGA) and large-for-gestational-age (LGA) births are major adverse birth outcomes related to newborn health. In contrast, the association between ambient air pollution levels and SGA or LGA births has not been investigated in Japan; hence, the purpose of our study is to investigate this association.

Methods : We used live birth data from Vital Statistics in Japan from 2017 to 2021 and municipality-level data on air pollutants, including nitrogen dioxide (NO_2), sulfur dioxide (SO_2), photochemical oxidants, and particulate matter 2.5 ($PM_{2.5}$). Ambient air pollution levels throughout the first, second, and third trimesters, as well as the whole pregnancy, were calculated for each birth. The association between SGA/LGA and ambient levels of the air pollutants was investigated using crude and adjusted log-binomial regression models. In addition, a regression model with spline functions was also used to detect the non-linear association.

Results : Data from 2,434,217 births were used in the analysis. Adjusted regression analyses revealed statistically significant and positive associations between SGA birth and SO_2 level, regardless of the exposure period. Specifically, the risk ratio for average SO_2 values throughout the whole pregnancy was 1.014 (95% confidence interval: 1.009–1.019) per 1 ppb increase. In addition, regression analysis with spline functions indicated that an increase in risk ratio for SGA birth depending on SO_2 level was linear. Furthermore, statistically significant and negative associations were observed between LGA birth and SO_2 except for the third trimester.

Conclusions : It was suggested that ambient level of SO_2 during the pregnancy term is a risk factor for SGA birth in Japan.

The Duration of Smoking Cessation Before Pregnancy Influences Postpartum Relapse

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Background : It is scientifically clear that smoking during pregnancy and while caring for children has adverse effects. This study uses prospective cohort data to clarify the association between the duration of smoking cessation prior to pregnancy and smoking relapse during childcare.

Methods : The study population consisted of 2,370 women who submitted pregnancy notifications to one city and five towns within the jurisdiction of the Gobo Public Health Center, Wakayama Prefecture, over a five-year period from April 1, 2006, to March 31, 2011. Of those women, we analyzed 1,985 women who were prospectively observed at four time points (at pregnancy notification, 4-month infant health checkup, 18-month infant health checkup, and 3-year-old health checkup) and who provided complete responses to smoking-related questionnaires.

First, we described the maternal smoking history, including the age at which smoking was initiated and the length of the smoking period, as well as the smoking status of family members. Next, we used a Cox proportional hazards model, adjusted for maternal age, to calculate the hazard ratio for relapse among those with a smoking cessation period of less than one year (reference: one year or more) (n=446). Then, we created Kaplan-Meier curves with relapse time as the endpoint. To compare the survival curves, we used log-rank tests.

Results : At the time of pregnancy registration, maternal smoking status was categorized as follows: nonsmoker (n = 1,377); former smoker, type 1 (having quit smoking for at least one year before pregnancy; n = 265); past smoker, type 2 (having quit smoking less than one year before pregnancy; n = 181); or current smoker (n = 162). Mothers started smoking at 19 or 20 years old (57%) or at 18 years old or younger (32%). Current smokers had the highest proportion of smoking partners or cohabiting family members (78% and 89%, respectively), while nonsmokers had the lowest proportion (45% and 53%, respectively). The hazard ratio of smoking relapse for the type 2 former smoker group compared to the type 1 group was 2.6 (95% confidence interval: 1.5–4.5). This group had a statistically higher incidence of relapse than the nonsmoker and type 1 former smoker groups.

Conclusion : A smoking cessation period of less than one year prior to pregnancy increases the risk of relapse by the age of three. Health nurses should interview former smokers at the time of pregnancy registration to focus on the smoking cessation period.