Table 3. Odds ratio (OR) and 95% confidence interval (CI) for risk of overweight and underweight relative to normal weight in girls

	Overweight		*Underweight*	
	Model 1	*Model 2*	*Model 1*	*Model 2*
	OR (95% CI)	*OR (95% CI)*	*OR (95% CI)*	*OR (95% CI)*
Observations	92,267	92,267	92,267	92,267
Age (years)	0.99 (0.97–1.00)	0.99 (0.97–1.00)	0.94 (0.93–0.95)	0.94 (0.93–0.95)
Household income quartile before 2008				
1 (lowest)	1.14 (1.01–1.29)	0.90 (0.79–1.03)	1.08 (0.99–1.18)	1.09 (0.99–1.21)
2	1.00 (0.88–1.13)	0.86 (0.76–0.98)	1.10 (1.01–1.20)	1.10 (1.00–1.22)
3	0.91 (0.81–1.04)	0.85 (0.74–0.96)	1.05 (0.96–1.15)	1.05 (0.95–1.15)
4 (highest)	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
>30% negative income change during economic crisis				
No	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Yes	0.98 (0.84–1.13)	0.92 (0.80–1.07)	0.96 (0.86–1.07)	0.96 (0.86–1.07)
Step term				
Before September 2008	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
After September 2008	1.06 (0.97–1.17)	1.06 (0.97–1.17)	1.50 (1.39–1.61)	1.50 (1.39–1.61)
Interaction between income change and step term				
⩽30% negative income change after September 2008	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
>30% negative income change after September 2008	1.22 (1.08–1.37)	1.23 (1.09–1.38)	1.00 (0.91–1.11)	1.00 (0.91–1.11)
Interaction between income quartile and step term				
Income quartile 1 after September 2008	1.35 (1.22–1.49)	1.35 (1.23–1.49)	0.90 (0.83–0.98)	0.90 (0.83–0.98)
Income quartile 2 after September 2008	1.25 (1.13–1.38)	1.25 (1.13–1.38)	0.94 (0.87–1.02)	0.94 (0.87–1.02)
Income quartile 3 after September 2008	1.18 (1.07–1.31)	1.18 (1.07–1.31)	0.99 (0.92–1.08)	0.99 (0.92–1.08)
Income quartile 4 after September 2008	1.00 (ref)	1.00 (ref)	1.00 (ref)	1.00 (ref)
Father's education				
Junior high school		1.00 (ref)		1.00 (ref)
High school		0.93 (0.78–1.10)		1.04 (0.90–1.20)
Vocational school		0.90 (0.74–1.09)		1.11 (0.95–1.30)
Higher education		0.79 (0.65–0.95)		1.05 (0.90–1.22)
Missing		0.98 (0.64–1.50)		0.92 (0.65–1.31)
Mother's education				
Junior high school		1.00 (ref)		1.00 (ref)
High school		0.63 (0.51–0.78)		0.88 (0.73–1.07)
Vocational school		0.51 (0.41–0.64)		0.89 (0.73–1.08)
Higher education		0.47 (0.36–0.60)		0.86 (0.70–1.07)
Missing		0.58 (0.35–0.96)		1.22 (0.80–1.84)
Single parent household				
No		1.00 (ref)		1.00 (ref)
Yes		1.06 (0.75–1.50)		0.97 (0.73–1.29)
Missing		1.38 (0.13–14.13)		5.17 (1.53–17.49)
Three generation household				
No		1.00 (ref)		1.00 (ref)
Yes		1.27 (1.15–1.39)		0.95 (0.88–1.02)
Residential area				
20 designated cities		1.00 (ref)		1.00 (ref)
Other cities		1.17 (1.06–1.29)		0.92 (0.86–0.99)
Rural		1.41 (1.21–1.63)		0.86 (0.76–0.97)
Missing		0.77 (0.32–1.85)		0.79 (0.46–1.34)
Father's age				
<20 years		1.00 (ref)		1.00 (ref)
21–25 years		0.85 (0.39–1.85)		0.55 (0.30–1.00)
26–30 years		0.94 (0.43–2.08)		0.62 (0.34–1.13)
>30 years		1.11 (0.50–2.46)		0.63 (0.34–1.14)
Missing		0.80 (0.32–1.98)		0.59 (0.29–1.18)
Mother's age				
<20 years		1.00 (ref)		1.00 (ref)
21–25 years		1.22 (0.69–2.18)		1.53 (0.93–2.52)
26–30 years		1.14 (0.63–2.04)		1.35 (0.81–2.23)
>30 years		1.24 (0.69–2.23)		1.32 (0.80–2.19)

A generalized estimating equation model,[24] with an exchangeable correlation structure was used for the analysis.

AUTHOR CONTRIBUTIONS

NK, PU and TF conceived the study. PU and KN conducted the statistical analysis. PU, NK and TF wrote the manuscript. KN is the guarantor.

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Estimation of the burden of disease in Japan

Stuart Gilmour, Ver Bilano, Yi Liao, Kenji Shibuya

February 23rd, 2015

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Introduction and Objectives: JBD

Japanese administrative divisions:
- Prefectures
- Municipalities

Japanese geographical and cultural divisions:
- Four islands + Okinawa
- North/south variation in weather and history
- Megalopolis vs. ageing coast
- Inequality

Need to understand sub-national patterns of illness and risk

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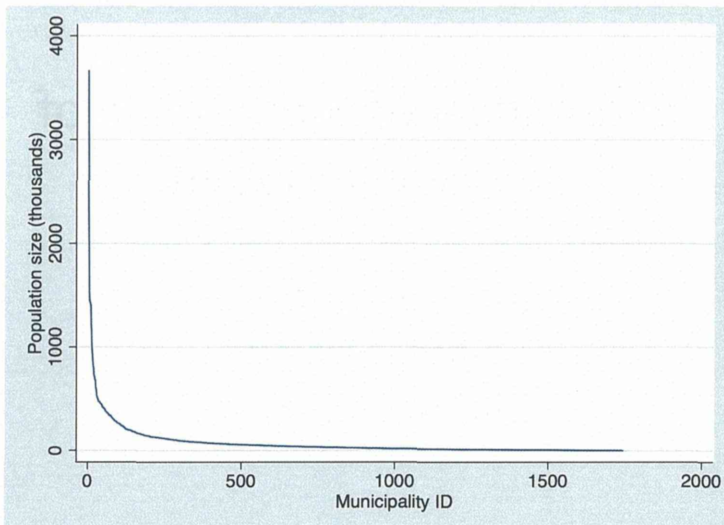
The megalopolis



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3

Patterns of inequality

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4

Objectives

Japan Sub-national Burden of Disease study aims to understand:

- Geographical variation in burden of disease by major causes
- Differences in disease burden between regions and by latitude
- Effect of inequality and urban/rural divide on burden of disease and patterns of risk factors

Methods: Data sources

Japan vital registration data
- Deaths and births
- Five year age categories, combine infant/early neonatal/child
- From 1979 – 2011
- With Prefecture and municipality identifiers
- Garbage code redistribution by IHME

Japan census
- Measures of prefecture- and municipal-level wealth, industry, facilities and inequality
- Population data: every 5 years (+ predictions)

IHME Estimate of DALYs
- Provided from GBD 2013 study
- Only available at national level, 5 year age groups, cause

Methods: Mortality and YLLs

Initial model at IHME Cause level 2

Semi-parametric smoothed model :

- Natural logarithm of population rates
- Separate random effects regression model by cause
- Smooth residuals
- Scale back to mortality envelope

YLLs calculated from IHME model life-table

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Methods: YLDs and DALYs

Limited sub-national data in Japan

Only robust data is for cancer incidence

Estimate Indicative YLDs only

Use IHME estimate of national YLDs

- Linear model of ln(YLD rate) by cause
- Age/sex, age/year, sex/year interaction model
- Estimate predicted values at Prefecture level

DALYs calculated from this YLD estimate + YLLs

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Results: Overview

Year	Deaths	YLLs	DALYs
1995	925,585	15,453,000	28,550,000
2000	965,099	14,829,000	28,579,000
2005	1,088,273	14,856,000	29,296,000
2010	1,202,309	14,352,000	29,458,000

YLL rate in 2010 (crude, per 1000): 113.17
DALY rate in 2010 (crude, per 1000): 232.30

Leading cause: Cancer, in all years

Variation from IHME Estimates:

- Deaths: Underestimate by 2%
- YLLs: Underestimate by 8%

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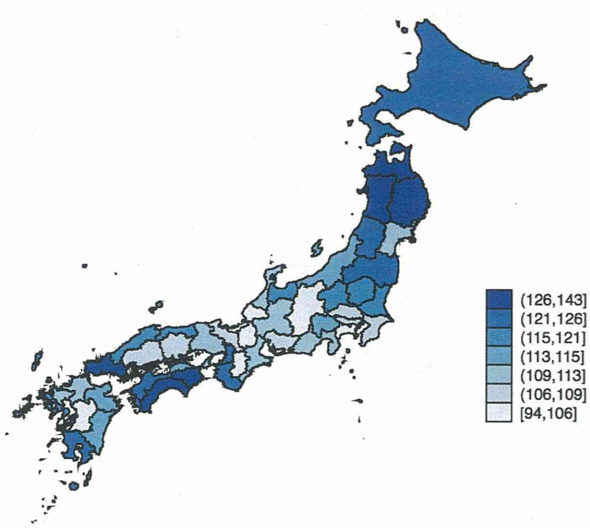
Results: YLLs per 1000 population (crude)



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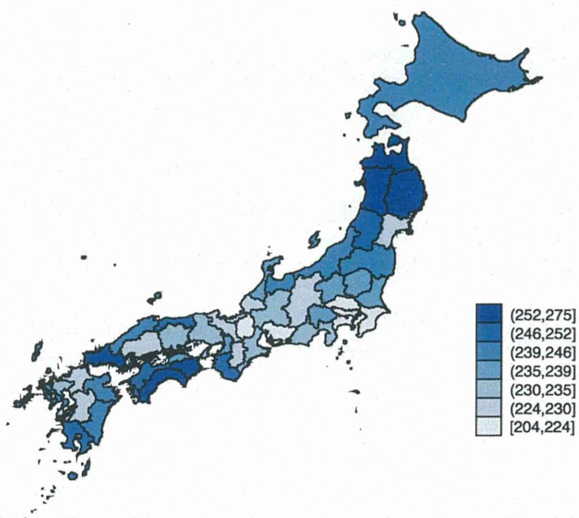
Results: DALYs per 1000 population (crude)



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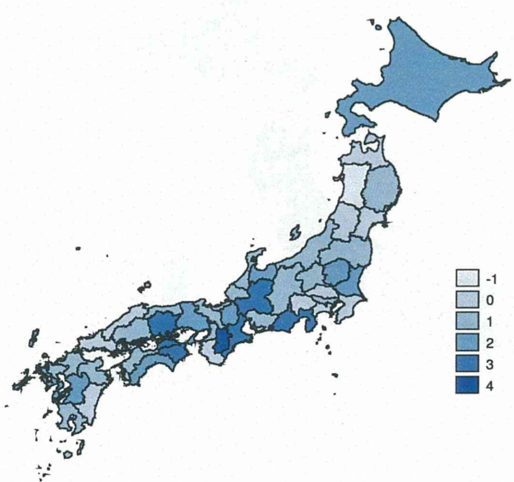
Results: Change in cause ranking for suicide, 1995-2010



Largest increase in:
- Nara
- Tokushima
- Okayama
- Gifu
- Shizuoka
- Kagawa
- Mie

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Further research

- Small area Bayesian analysis
  - Spatial patterns of mortality
  - Effect of local economic and social factors
- Sub-analyses
  - Individual occupation
  - Area inequality
- Uncertainty
  - Monte Carlo simulation or parametric models?
- Level 3 causes

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Estimating the burden of disease from the Great East Japan Tsunami and nuclear accident

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Introduction

Disasters have effects on different time frames

- Acute: initial mortality
- Short term: Evacuation and resettlement
- Medium term: Instability and stress
- Long term: Effects of disruption and loss

Can we quantify them?

2011 Great East Japan Earthquake, Tsunami and Nuclear Accident: triple disaster with effects across all time frames

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The 3.11 Disaster: Acute effects

- Deaths: 18,894
- Missing: 3,305
- YLLs: 472,981
- Homes lost: 127,531

Standard modeling underestimates mortality and YLLs from "forces of nature" in Japan

Are there indirect effects and can we calculate them?

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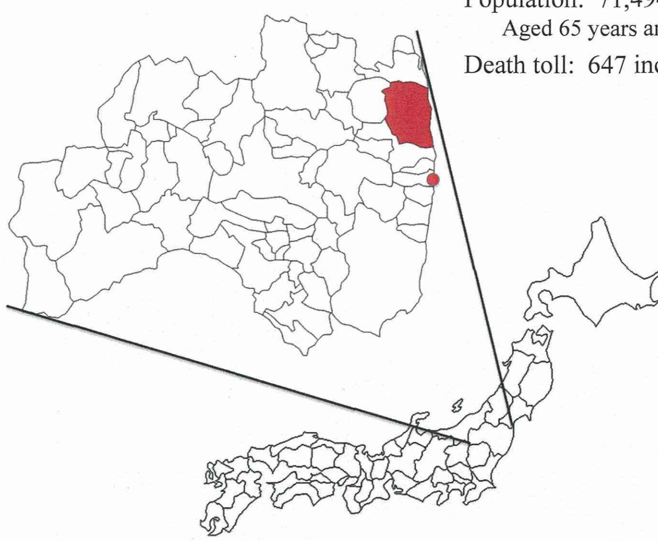
Minamisoma City

Population: 71,494
Aged 65 years and over: 18,536 (25.9%)
Death toll: 647 including missing



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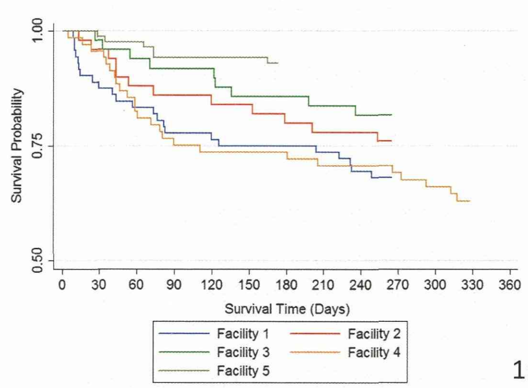
Results:
Facility-specific hazard ratio after the earthquake



1: 2.88 (1.74, 4.76) – significant
2: 2.40 (1.24, 4.67) – significant
3: 1.39 (0.69, 2.81)
4: 2.36 (1.49, 3.76) – significant
5: 0.77 (0.34, 1.76)

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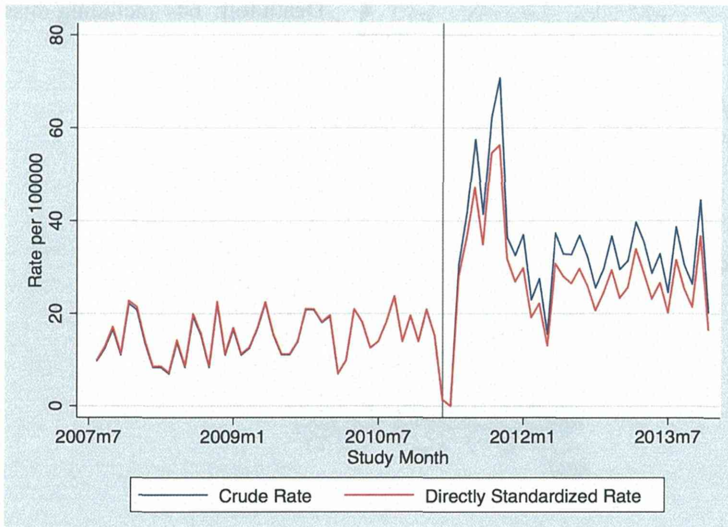
Results: Stroke hospitalization rates, 2008 - 2013



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Disaster-related deaths

- Deaths arising due to disasters but not directly caused by them
- Examples:
  - Diabetes and heart disease mortality due to medication disruption (Katrina)
  - Increased stroke and myocardial infarction due to stress (Hanshin earthquake)
  - Infectious disease due to disruption of civil society (Haiti)
  - Suicide arising from stress

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Disaster-related deaths in Japan

- Japanese government policy
  - 災害関連死弔慰金 (*saigai kanrenshi choikin*)
  - System of compensation for deaths arising from disasters
  - Families receive compensation for lost members
- Can we use this data to identify burden of disease?
  - Judgment made by a committee
  - Inconsistent system
  - Differing standards of evidence
  - No assessment of illness – only mortality

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Possible disaster-related morbidity in Minamisoma

- Direct effects from disruption:
  - Depression, stress, other mental disorders
  - Radiation-related cancers
  - Long-term sequela of injury (largely unmeasured)
- Indirect effects:
  - Behavioral disorders in the elderly
  - Secondary sequela of suicide and mortality
  - Increased risk factors (hypertension, physical inactivity)

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Conclusion

- Direct mortality and YLLs easily quantifiable
- Direct YLDs not yet understood
  - Need comprehensive survey of survivors
  - Evacuation->Population redistribution-> Unidentifiable
- Indirect YLLs and YLDs probably unmeasurable
- Compensation schemes may enable quantification of some indirect burden
  - Not operating in many settings
  - Often poorly documented and arbitrary
  - Welfare focused
- Quantification of the complete burden due to disasters is still largely impossible

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Future research

- Break point analysis
  - Trends in cardiovascular and stroke mortality in small areas
  - Identify objectively quantifiable mortality increase
- Investigation of behavioral/mental health burden:
  - Assess in small study site
  - Generalizable?
- Recommendations re: systematization of disaster-related deaths system

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Appendices

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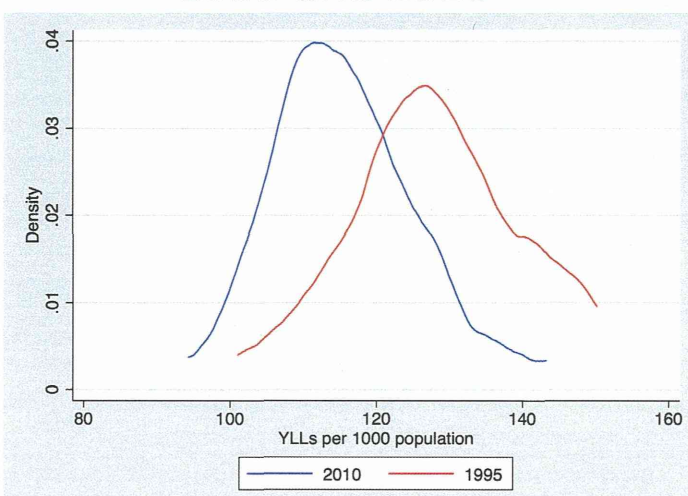
Density of YLLs by Prefecture (rate): 1995 and 2010



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Kita M, Gilmour S, Ota E. Trends in perinatal mortality and its risk factors in Japan. 20th World Congress on Controversies in Obstetrics and Gynecology. Paris, December 4-7, 2014.

Trends in perinatal mortality and its risk factors in Japan

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Background

The perinatal mortality rate (PMR) has decreased rapidly in Japan since the 1950s. Perinatal death consists of fetal death (stillbirths after 22 weeks of gestational age), or early neonatal mortality (ENM), which occurs within 7 days after birth, and reducing the PMR requires action on both stillbirths and ENM. This study aimed to: 1) provide the most up-to-date estimate of the trend in perinatal mortality, and 2) identify its risk factors.

Figure 1. Trend in perinatal mortality rate by sex.

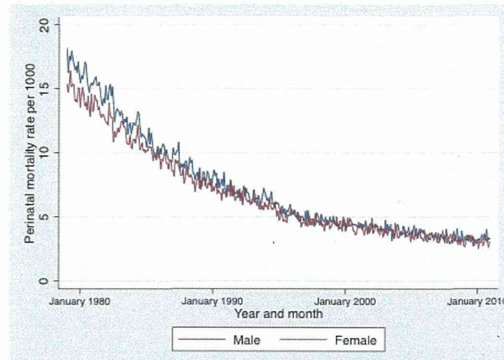

Table 1. ARIMA time series analysis of perinatal mortality rate by sex.

	Risk ratio	95% CI	P value
Male			
Rate ratio (Annual)	0.949	0.936 – 0.961	<0.001
AR (1)	-0.128	-0.571 – 0.316	0.573
Female			
Rate ratio (Annual)	0.950	0.940 – 0.960	<0.001
AR (1)	-0.036	-0.557 – 0.486	0.894

Methods

We used a full dataset of singleton mortality records from the Japan national vital registration system for the period 1979 - 2010. We conducted an ARIMA time series analysis of the annual PMR, by sex, from 1979 to 2010. Risk factors for perinatal mortality were analyzed using multi-level Poisson regression with a random effect for prefecture.

Findings

Between 1979 and 2010 there were 40,833,957 pregnancies, and 355,193 perinatal deaths. We found an annual decrease in PMR of 5% (95%CI: 4 – 7%) for both sexes, adjusting for serial dependence (Table 1). Key perinatal mortality risk factors are shown in Table 2.

Table 2. Multilevel regression model of key risk factors for perinatal mortality

	Risk ratio	95% CI	P value
Birth weight			
Normal (2500 – 4000g)	1.00		N/A
High (>4000g)	2.51	2.20 – 2.85	<0.01
Low (2000 – 2499g)	4.39	4.19 – 4.60	<0.01
Very low (1500 – 1999g)	5.72	5.39 – 6.08	<0.01
Extremely low (<1500g)	4.16	3.94 – 4.41	<0.01
Maternal age			
25-29	1.00		N/A
15-19	0.94	0.88 – 1.01	0.08
20-24	1.07	1.03 – 1.11	<0.01
30-34	1.09	1.06 – 1.12	<0.01
35-39	1.39	1.34 – 1.44	<0.01
40-49	1.90	1.79 – 2.01	<0.01
50-63	1.55	0.39 – 6.18	0.54
Gestational age			
Term (37 – 41 weeks)	1.00		N/A
Premature (<37 weeks)	2.68	2.56 – 2.81	<0.01
Post mature (>41 weeks)	4.25	3.81 – 4.73	<0.01
Household occupation			
Large company	1.00		N/A
Farmer	1.36	1.28 – 1.45	<0.01
Self-employed	1.30	1.24 – 1.35	<0.01
Small company	0.89	0.87 – 0.92	<0.01
Casual/other	1.24	1.20 – 1.29	<0.01
Unemployed or unknown	1.64	1.56 – 1.72	<0.01

Interpretation

We identified a constant annual percentage decline in PMR. Postmature neonates were at higher risk of death, as were the infants of older mothers. To continue to reduce the PMR, further targeting of risk factors is needed.

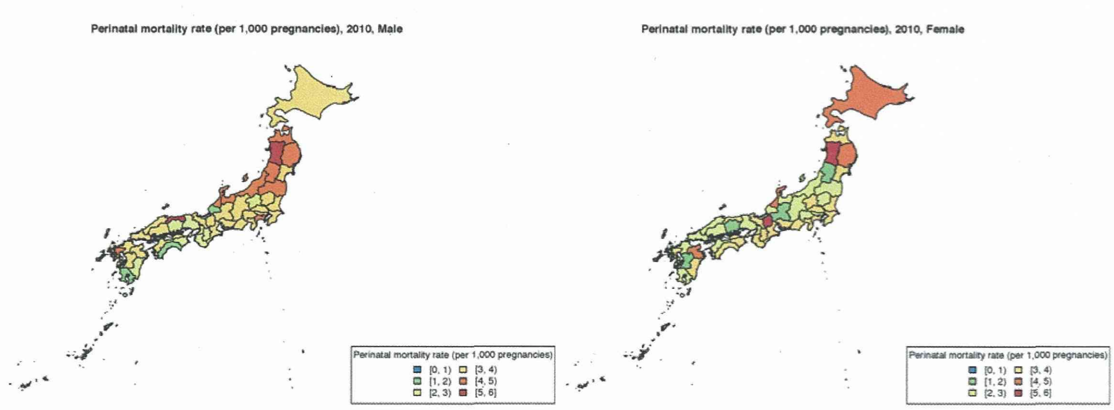

Figure 2. Subnational mapping of perinatal mortality rate (left: male, right: female)

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Global trends and projections for tobacco use, 1990–2025: an analysis of smoking indicators from the WHO Comprehensive Information Systems for Tobacco Control

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Summary

Background Countries have agreed on reduction targets for tobacco smoking stipulated in the WHO global monitoring framework, for achievement by 2025. In an analysis of data for tobacco smoking prevalence from nationally representative survey data, we aimed to provide comprehensive estimates of recent trends in tobacco smoking, projections for future tobacco smoking, and country-level estimates of probabilities of achieving tobacco smoking targets.

Methods We used a Bayesian hierarchical meta-regression modelling approach using data from the WHO Comprehensive Information Systems for Tobacco Control to assess trends from 1990 to 2010 and made projections up to 2025 for current tobacco smoking, daily tobacco smoking, current cigarette smoking, and daily cigarette smoking for 173 countries for men and 178 countries for women. Modelling was implemented in Python with DisMod-MR and PyMC. We estimated trends in country-specific prevalence of tobacco use, projections for future tobacco use, and probabilities for decreased tobacco use, increased tobacco use, and achievement of targets for tobacco control from posterior distributions.

Findings During the most recent decade (2000–10), the prevalence of tobacco smoking in men fell in 125 (72%) countries, and in women fell in 156 (88%) countries. If these trends continue, only 37 (21%) countries are on track to achieve their targets for men and 88 (49%) are on track for women, and there would be an estimated 1·1 billion current tobacco smokers (95% credible interval 700 million to 1·6 billion) in 2025. Rapid increases are predicted in Africa for men and in the eastern Mediterranean for both men and women, suggesting the need for enhanced measures for tobacco control in these regions.

Interpretation Our findings show that striking between-country disparities in tobacco use would persist in 2025, with many countries not on track to achieve tobacco control targets and several low-income and middle-income countries at risk of worsening tobacco epidemics if these trends remain unchanged. Immediate, effective, and sustained action is necessary to attain and maintain desirable trajectories for tobacco control and achieve global convergence towards elimination of tobacco use.

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Introduction

Tobacco control is a global health priority. The WHO Framework Convention on Tobacco Control, which entered into force in 2005, formalised global commitment,[1] and so far has been ratified by 180 parties.[2] However, country-specific progress varies substantially, with very high prevalence of smoking among both men and women in many countries.[3] WHO estimates that about 6 million people worldwide die each year from causes attributed to smoking, with most of these deaths occurring in low-income and middle-income countries.[4] The 2011 UN political declaration on non-communicable diseases provided additional impetus both for urgent and sustained control of tobacco use and for preventive action against other risk factors for non-communicable diseases.[5] In 2013, the World Health Assembly endorsed the WHO global monitoring framework for non-communicable diseases and an associated voluntary global target of a 30% relative reduction in tobacco use worldwide among people aged 15 years or older by 2025 (with 2010 levels as baseline). This target was officially agreed on by WHO member states on the basis of experience from countries that had successfully implemented at the highest level of achievement at least three of the demand reduction measures outlined in the WHO Framework Convention, and will account for varying initial starting points for tobacco control in assessment of national progress.[6] This target was endorsed at the Sixth Meeting of the Convention of Parties in Moscow in October, 2014.[7] Monitoring of progress towards these targets will be of enormous benefit to individual