Japan Environment and Children's Study (JECS)

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19–22 August 2017
WCE 2017, Saitama, Japan

JECS
Japan Environment and Children's Study

National Institute for Environmental Studies

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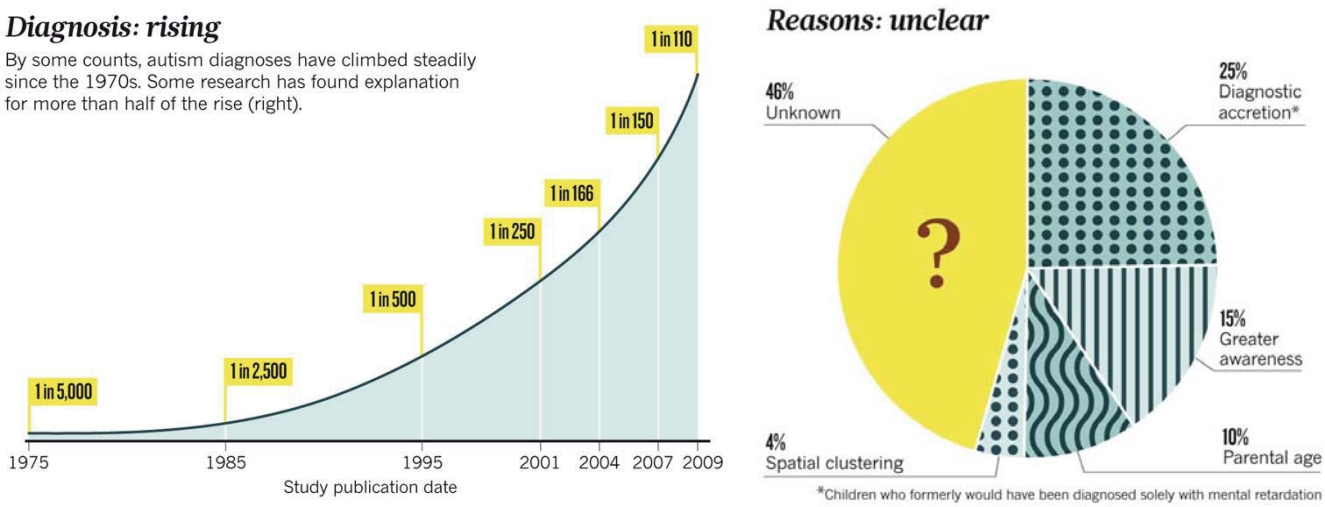
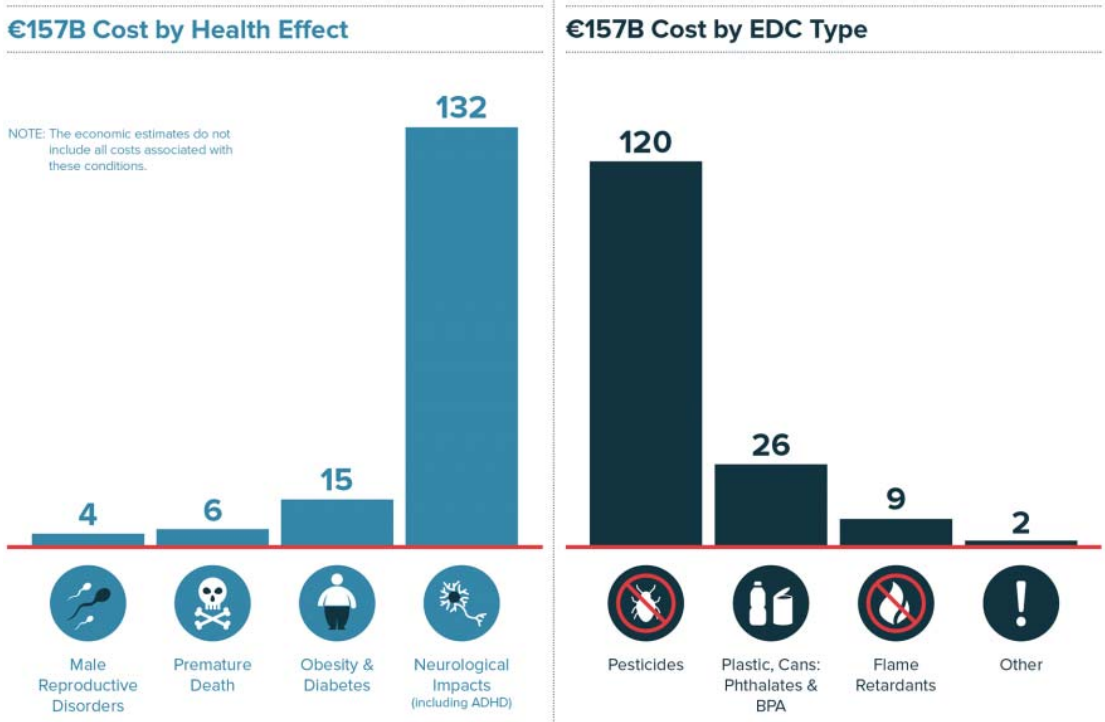
Unknown causes of children's health problems



The cost of inaction

- Health effects from endocrine disrupting chemicals cost the EU €157B a year, which may be the tip of the iceberg



World commitment to the children's environmental health

- Miami Declaration (1997) by G8 Environmental Minister
  - Danish National Birth Cohort, 1996–
  - Norwegian Mother and Child Cohort Study, 1999–
  - US National Children's Study, Vanguard, 2005– (cancelled)
  - JECS planning started, 2006
- G8 Environmental Ministers Meeting (Banff, 2002)
- G8 Environmental Ministers Meeting (Syracusa, 2009) highlighted research on children's environmental health
  - JECS pilot, 2009–
  - JECS, 2010–
  - UK Life Study, 2015– (cancelled)
  - Korean birth cohort study (Ko-CHENS), 2015–
- G7 Environmental Ministers Meeting (Toyama, 2016)

JECS Japan Environment and Children's Study

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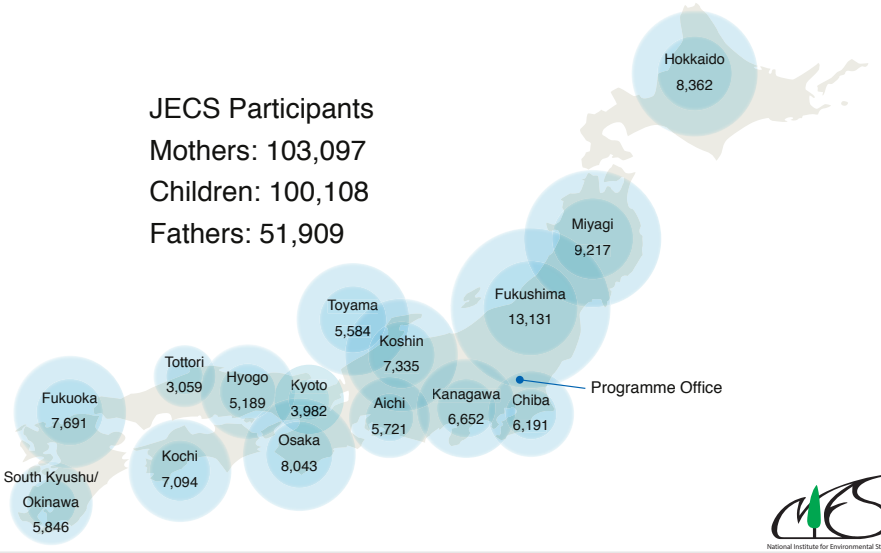
Japan Environment and Children's Study (JECS)

The Japan Environment and Children's Study

For the future crew of the Earth

How can we keep the environment healthy and hand it over to the next generations? The Japan Environment and Children's Study (JECS) started in 2011 is to answer such a question by investigating a wide range of environmental factors that could affect children's health and development.

JECS Participants
Mothers: 103,097
Children: 100,108
Fathers: 51,909



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JECS Study design

- **Main Study** = 100,000
  - Biological sample collection from mothers, children and fathers
  - Questionnaire administration during pregnancy, at birth, 1 month, 6 month, and every 6 month after that until children reach 13 years of age
  - Medical record, resident registry and school record transcription
- **Sub-Cohort Study** = 5,000
  - Home visit—Indoor and outdoor air quality, particulate matter, house dust, noise, dwelling inspection… at 1.5 and 3 years
  - Psychological development test, physical examination, blood and urine collection at 2 and 4 years
- **Adjunct Studies** conducted with extramural funding
- **Pilot Study** to evaluate the feasibility, acceptability and cost of the proposed procedures and processes to be used in the Main Study

Priority outcomes

- Priority outcomes

Reproduction and pregnancy complication	Stillbirth, preterm delivery, low birth weight
Congenital anomalies	Cleft lip and palate, ventricular septal defect, hypospadias, cryptorchidism, Down syndrome
Neuropsychiatric and developmental disorders	Autism spectrum disorders, learning disability, ADHD
Allergy and immune system disorders	Asthma, atopic dermatitis, food allergy, Kawasaki disease
Metabolism and endocrine system dysfunction	Glucose metabolism disorder, obesity
(Cancers for international co-operation)	Leukaemia, solid cancers

Exposures of interest

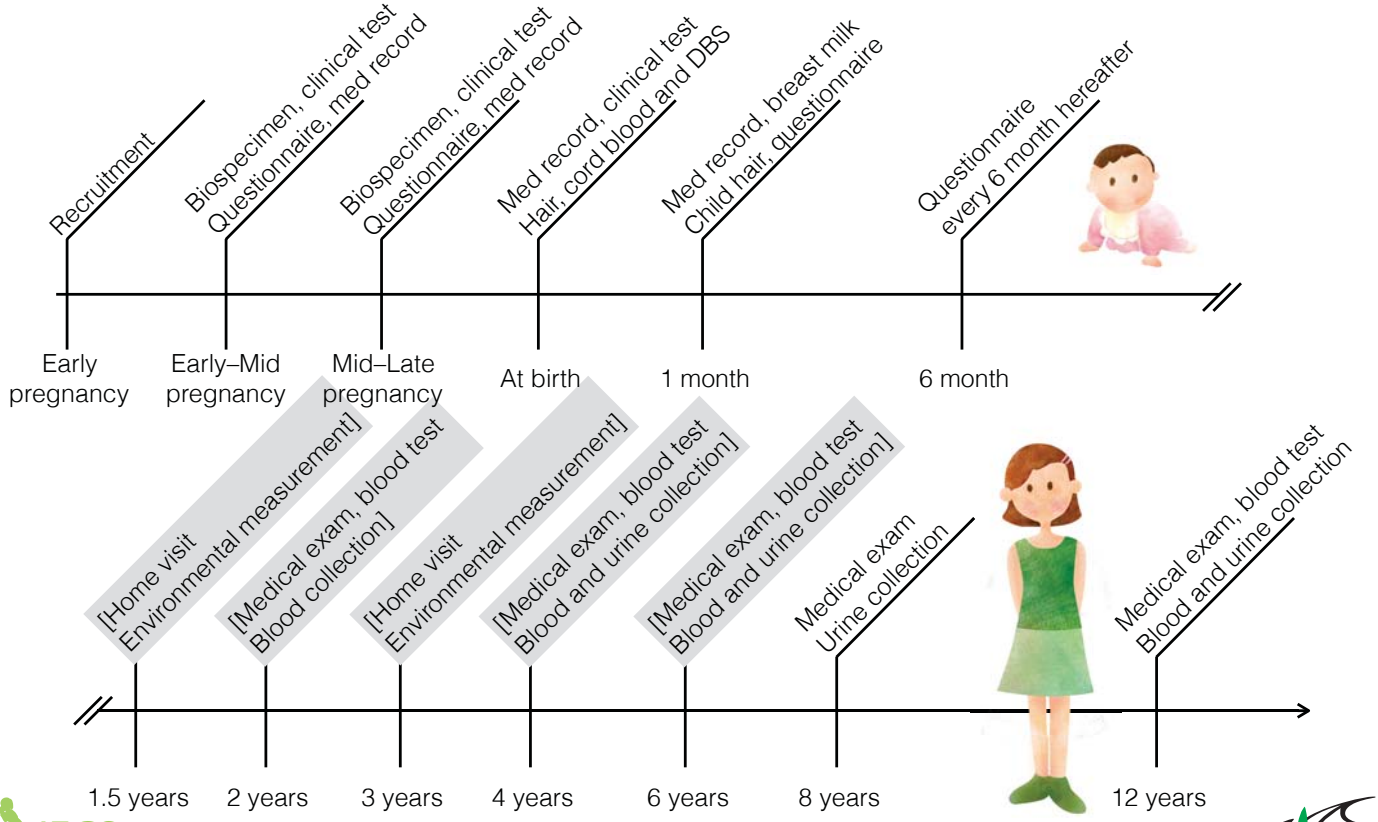
- Exposures of interest

Chemicals from environment/ occupation	Metals, POPs, pesticides, organofluorine compounds, aroma compounds, phthalate metabolites, phenols, others
Physical environment	Noise, heat, ionising radiation, housing condition, neighbourhood
Lifestyle	Stress, nutrition, daily rhythm, smoking and alcohol, infections, medications
Socio-economic status	Education, house-hold income, social bonding, community support
Genetics/-omics (when new funding available)	Genomics, epigenetics, metabolomics, aductomics

Closer look at the target chemicals

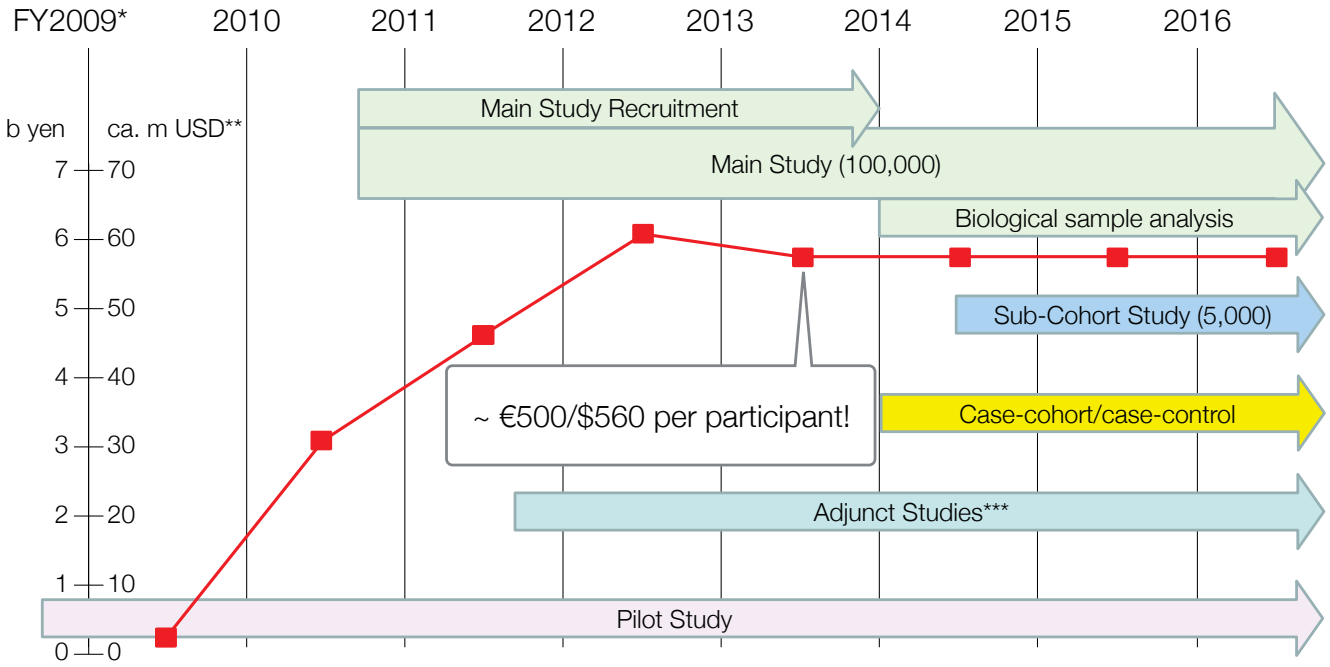
Group	Target compounds
Metals	Lead, cadmium, total mercury, methyl mercury, arsenics and its compounds including, arsenobetaine, metylarsonic acid, dimethylarsinic acid, trimethylarsine oxide, etc.
Inorganic substances	Iodine, perchlorate, nitrate nitrogen, etc
Chlorinated POPs (Persistent organic pollutants)	Polychlorinated biphenysl (PCBs), hydroxylated polychlorinated biphenyl (OH-PCB), dioxins (PCDDs, PCDFs, Co-PCBs), pexachlorobenzene (HCB), pentachlorobennzene (PeCB), etc.
Pesticides (including pesticide-POPs)	Chlordanes, DDT and its metabolites (DDE, etc.), drin compounds for agriculture (dieldrin, etc.), heptachlor, hexachlorocyclohexaxne (HCH), mirex, chlordecone, toxaphene, organophophorus pesticide metabolites (DMP, DEP, DMTP, DETP, etc.), fenitrothion metabolite (methylnitrophenol), acephate metabolite (methamidophos), pyrethroid metabolites (PBA, DCCA, etc.), dithiocarbamate fungicide metabolites (ethylene thiourea, etc.), neonicotinoid metabolites, pentachlorophenol (PCP), atrazine, dymron, glyphosate, flutolanil, iprodione, flusulfamide, etc.
Brominated POPs	Polybromodiphenylethers (PBDEs), polybromobiphenyls (PBBs), hexabromocyclododecan (HBCD), etc.
Organofluorine compounds	Perfluorooctanoic acid (PFOA), perfluorooctane sulfonate (PFOS), perfluorononanoic acid (PFNA), etc.
Aroma compounds	Nitromusks, cyclic musks, etc.
Phthalate metabolites	Mono (2-ethylhexyl) phthalates, etc.
Phenols	Bisphenol A, Nonyphenols, Parabens, etc.
Others	Triclosan, benzophenone, N, N-diethyl-meta-toluamide (DEET), polyaromatic hydrocarbons (PAHs) and their metabolites (1-hydroxypyrene, 3-hydroxyphenanthrebe, etc.), cotinine, thiocyanate, dichlorobenzene, phytoestrogen, caffeine, pyridine, acrylamide, tributyl phosphate, tributoxyethl phosphate, 8-hydroxydeoxyguanosine (8-OHdG), etc.

Mile stones



[Sub-Cohort Study]

Funding and study structure



* FY: Fiscal year starts in 1 April, ** Approximation: 100 yens = 1 USD, *** Extramural funding required

Follow-up programme

- Neuropsychiatric development
  - ASQ, SRS, SDQ, ADHD-RS, PSAI, LD (TBD), developmental tests, paediatrician's exam, …
- Immune system
  - ISAAC, food allergy, Kawasaki disease, immunoglobulin, …
- Metabolic/endocrine system
  - Growth/body measurements, puberty, hormones, …
- Exposure
  - Chemicals (questionnaire and biomonitoring), air pollution (modelling and questionnaire), noise/physical factors (questionnaire, modelling and measurements), …
- Covariates
  - K6, PSI, bonding scale, SF-8, school record, biomonitoring, …

International collaboration

- International Childhood Cancer Cohort Consortium (I4C)
  - 100,000 is not enough for child cancer study
  - Aiming > 500,000 pooled data
- Environment and Children's Health International Birth Cohort Group (ECHIBCG), former WHO Working Group for Next Generation Large Scale Birth Cohort Harmonisation
  - France, Germany, Japan, Shanghai (China) and US
  - IARC co-ordination
  - Korean Study invited (KoCHENS)
  - Aimed to pool exposure and outcome data

JECS current status

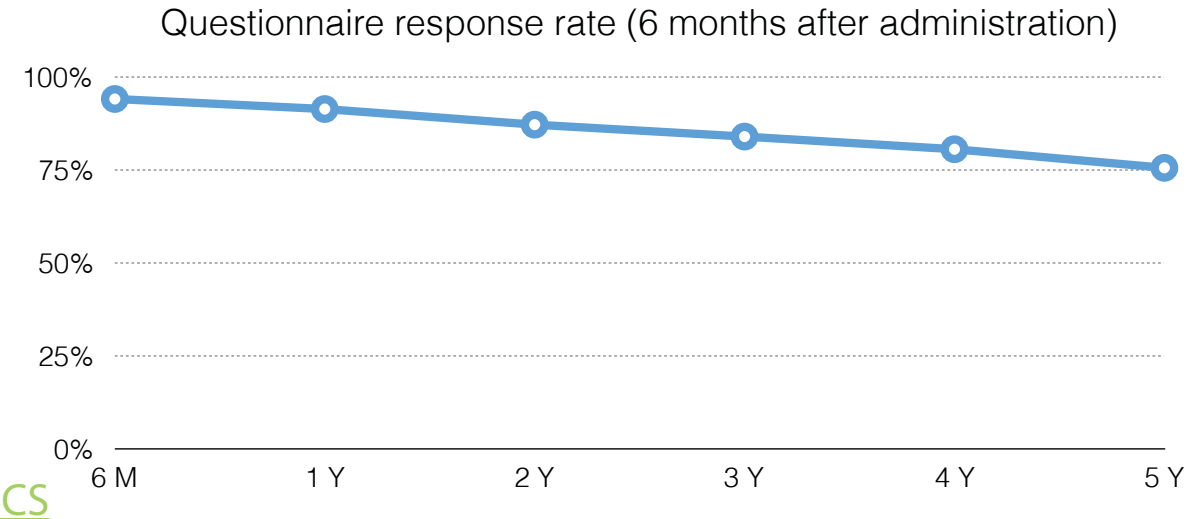
- Recruitment completed in March 2014
  - Mother: 103,097 (~80% consent rate)
  - Father: 51,909
  - Birth: 100,108
- Questionnaire
  - Through pregnancy to 6 years old (every 6 months)
- Biological samples > 5,000,000 tubes
  - Maternal blood, urine, breast milk, cord blood, hair, blood spots, paternal blood, …
- Sub-Cohort Study (n = 5,000) started in November 2014
  - Home visit (1.5 and 3 y/o): VOCs, aldehyde, PM, house dust, dwelling observation
  - Developmental test, physician's exam, blood (2 and 4 y/o) and urine (4 y/o) collection

JECS current status: Sub-cohort

- Sub-Cohort Study, November 2014–
  - Home visit
    - 18 m completed (5,004), 3 y on-going (3,846)
    - VOCs/Aldehydes/Acid gases and PM measurements
    - House dust collection for allergens and chemical analyses
    - Dwelling inspection
  - Medical checkup (2 y and 4 y)
    - 2 y completed (4,724), 4y on-going
    - Paediatricians' examination
    - Developmental test
    - Blood collection for clinical tests (IgE/G/A, TSH, fT4 and 25(OH)VitD) and chemical analyses
    - Urine collection for chemical analyses (4 y)

JECS current status: Retention

	Registered participants	Current number	Retention
Mothers	103,097	96,043	93.2%
Children	100,108	97,051	96.9%
Fathers	51,909	49,549	95.6%



JECS current status: Biospecimen

Sample type	Collected from		Number
Blood/urine	Mother	Early pregnancy	91,935
		Mid–late pregnancy	97,979
		At birth	98,818
	Father	Ad libitum	49,796
Cord blood		At birth	87,802
Blood spot	Child	1 month old	94,841
Brest milk	Mother	1 month	89,364
Hair	Mother	At birth	78,719
	Child	1 month old	94,990
Blood	Child	2 y/o	4,727
Blood/urine	Child	4 y/o	on going

JECS current status: Exposure

Sample type	Analyte	Number
Maternal blood (mid–late term)	Metallic elements (Hg, Pb, Cd, Mn, Se)	95,811
Cord blood	Metallic elements (Hg, Pb, Cd, Mn, Se)	3,897 (sub-cohort)
Maternal urine (early term)	Cotinine, 8-OHdG	75,000
Maternal blood (mid–late term)	Perfluoroalkyl substances	on-going (25,000)
Home visit (1.5 y)	VOCs Aldehydes NOx, SOx, O3 PM2.5	Indoor (outdoor) 5,006 (4,990) 5,005 (4,993) 5,006 (4,992) 5,006 (4,993)
Home visit (3 y)	VOCs Aldehydes NOx, SOx, O3 PM2.5	Indoor (outdoor) 3,216 (3,215) 3,219 (3,215) 3,219 (3,215) 3,219 (3,215)
House dust (1.5 y)	Mite allergen/endotoxin	5,009
Vacuum dust	Sieved	4,920

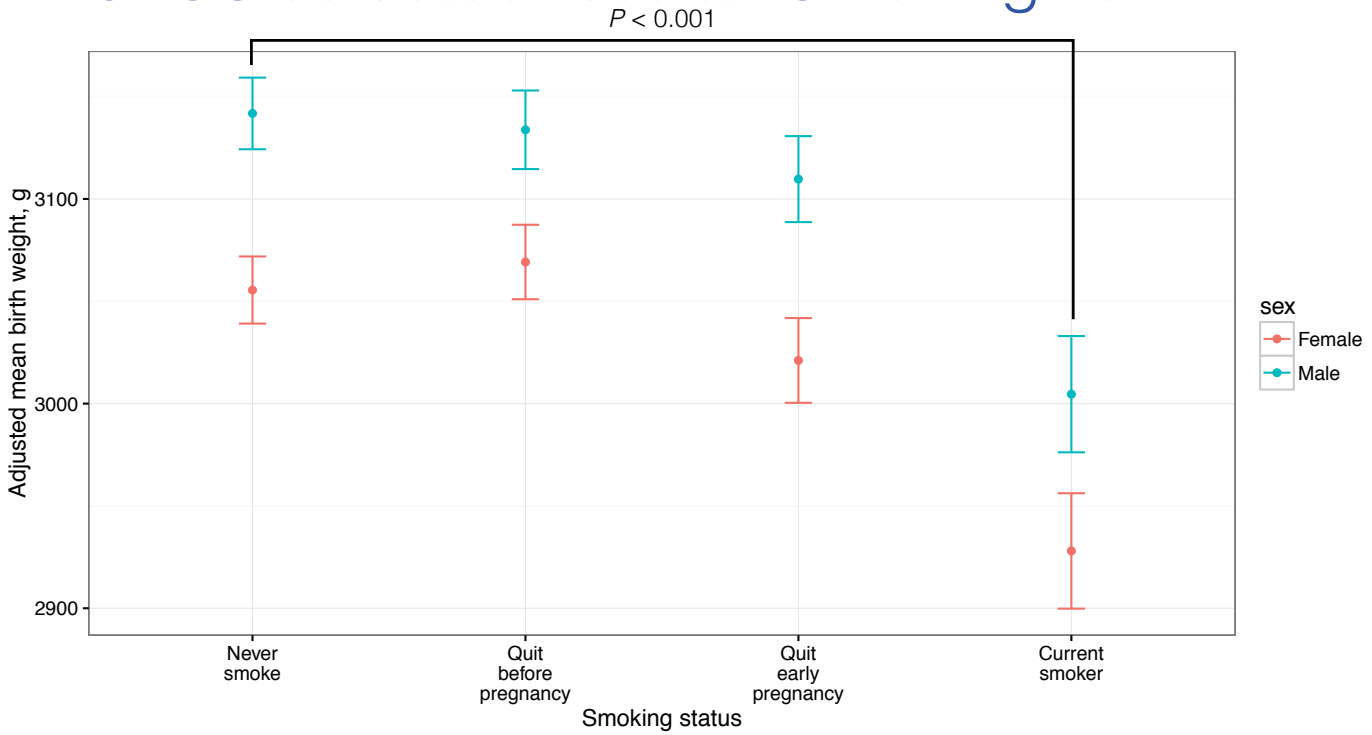
JECS publication

- As of 1 July 2017, 28 scientific articles (3 in Japanese) have been published:
  - 14 from the Main Study;
  - 5 from the Adjunct Study; and
  - 6 from the Pilot Study.
- Analyses of the association between metallic elements (lead, mercury, cadmium, manganese and selenium) and pregnancy/reproduction complications are under way.

JECS representativeness

	JECS (2011–2014)	National statistics (2013)
Maternal age at delivery		
20–29	36.6%	36.3%
30–39	57.8%	57.8%
Singleton live births	98.1%	98.1%
Term births (37–41)	94.2%	94.0%
Infant sex		
Male	51.2%	51.2%
Female	48.8%	48.8%
Caesarean rate	20.1%	19.7%
Birth weight (g)		
< 2,500	8.1%	8.3%
2,500 to < 3,000	38.7%	39.0%
3,000 to < 3,500	42.1%	41.8%
≥ 3,500	11.1%	10.9%

JECS selected results: Smoking vs BW



- Adjusted for partners' smoking status, annual household income, birth order of children, pregnancy-induced hypertension, diabetes mellitus/gestational diabetes mellitus, maternal weight before pregnancy, maternal weight gain during pregnancy, maternal age group at delivery, and gestational duration; calculated by least squares mean adjustment
- *P*-value was calculated using Dunnett's test by least squares mean adjustment

JECS selected results: Metallic elements

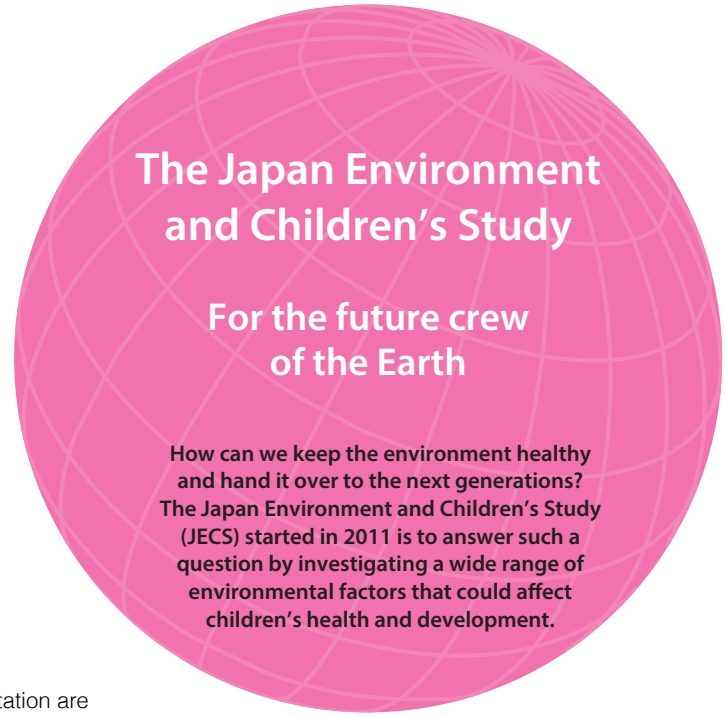
Under submission

JECS selected results: Metallic elements

Under submission

Acknowledgement

- Participating families
- Regional Centre staff
- Programme Office staff
- International partners
- Taxpayers



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