

MATERNAL SMOKING IN PREGNANCY AND HOSPITAL USE UP TO 5 YEARS OF AGE IN A DATA LINKAGE BIRTH COHORT



Supervisors

A/Prof Seana Gall
Dr Costan Magnussen
Dr Amanda Neil
Dr Marie-Jeanne Buscot

PhD Candidate

Vincent Chigozie Ezegbe
November 2019

Background

- Maternal smoking during pregnancy continue to be a global problem. ¹
 - Cross-sectional study of pregnant women in fifteen European countries reported that smoking prevalence ranged from 4.2% in Iceland to 18.9% in Croatia ¹
- In Australia 10.4% of women smoked during pregnancy in 2016 ²
- Health effects on children due to exposure during pregnancy

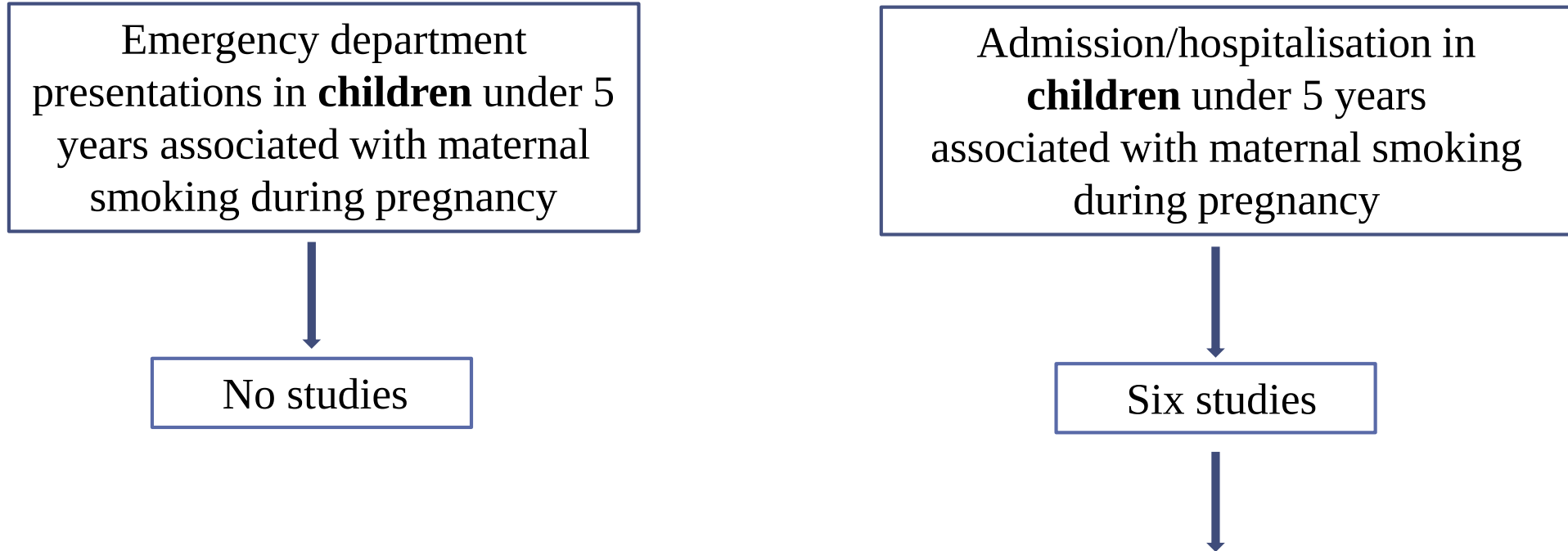
Early term effects

- Preterm delivery and decreased gestational age, low birth weight ³

Longer term effects

- Respiratory illness ⁴, childhood obesity ⁵, hyperactivity and inattentiveness ⁶
- Children aged 0 to 4 years account for 14% (NSW) of Emergency department presentations ⁷

Maternal smoking during pregnancy and emergency department (ED) presentations and admissions through ED

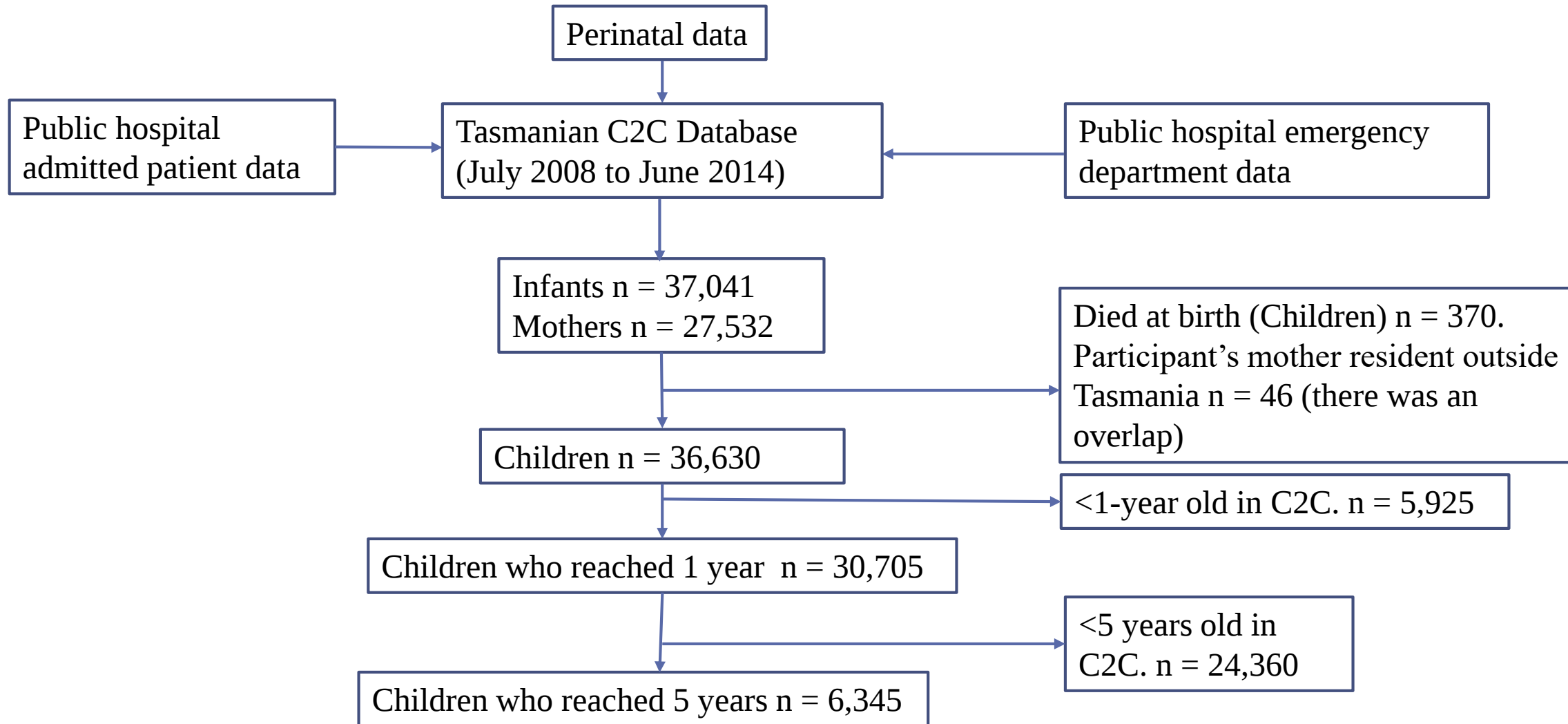


LIMITATIONS

- Reliance on self-report of symptoms and diseases
- Low response proportions
- Most studies from 10 or more years ago

Methods

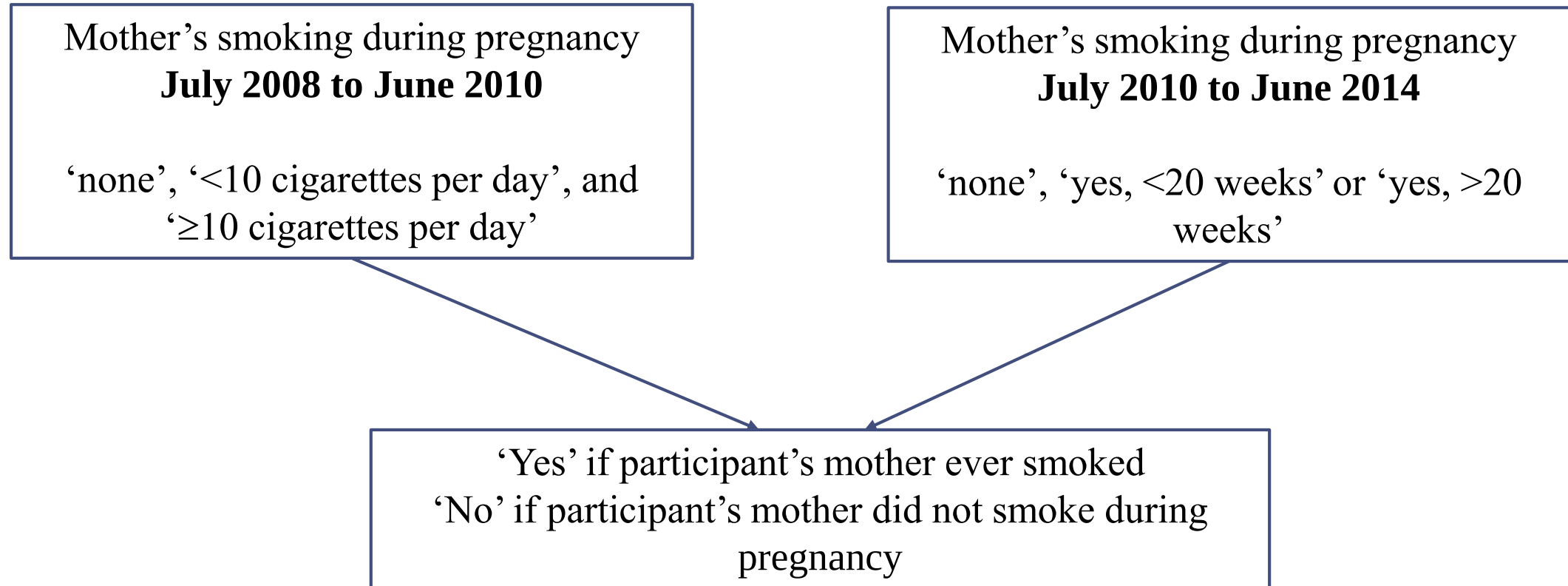
- Participants were sourced from the Tasmanian Conception to Community (C2C) Study database



Outcome measures

- Count of emergency department (ED) presentations at 1 year and 5 years
 - Total
 - Each disease category
 - 28 major diagnostic block categories (diseases) of the Urgency Related Groups (URG) classification recategorized to 9 categories:
 - *Poisoning and injuries
 - * Respiratory
 - * Digestive system
 - * Neuromuscular
 - * Blood and immune system
 - * Eyes, ear, nose and throat
 - * Reproductive and urological system
 - * Systemic and parasitic infections
 - * Psychosocial/other presentation

Exposure measures



Analysis

- Negative binomial regression analysis of count of ED presentations by maternal smoking status with covariates
- Multiple Imputation by Chained Equation (MICE) to estimate missing data on maternal smoking (10 imputations) with year of birth, birthweight, Index of Relative Socio-economic Disadvantage (IRSD) score, maternal age at birth and gestational age
- Purposeful model building
- Covariates – infant sex, birth weight, gestational age, maternal alcohol consumption during pregnancy, maternal age at birth and IRSD score
- Poisoning and Injuries as negative control to account for any effect of residual confounding
- Stata version 15 (StataCorp, TX, USA).

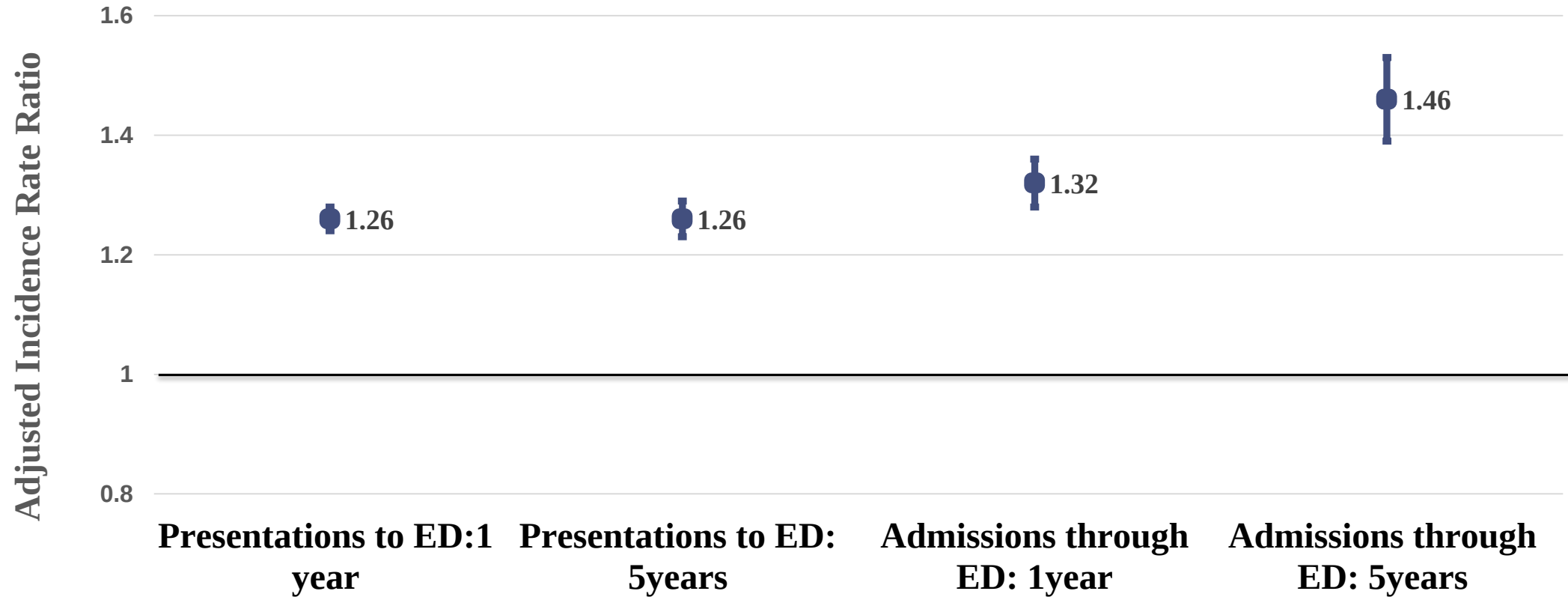
Participant characteristics

Participant characteristics	Not exposed N (Mean)	% (SD)	Exposed N (Mean)	% (SD)
Sex				
Male	13,765	78.9	3,675	21.1
Female	13,028	78.8	3,500	21.2
Birthweight mean (gram)	(3428.4)	(624)	(3126.3)	(660.3)
Birth weight				
Low birth weight (< 2500g)	1,618	62.5	969	37.5
Normal birthweight (>=2500g)	25,176	80.2	6,208	19.8
Gestational age				
Preterm (< 37 weeks)	2,399	71.1	977	28.9
Term (>=37 weeks)	24,395	79.7	6,201	20.3
Apgar score at five minutes				
Less than 7	595	73.6	214	26.4
Equal to or greater than 7	26,205	79.0	6,964	21.0

Participant characteristics

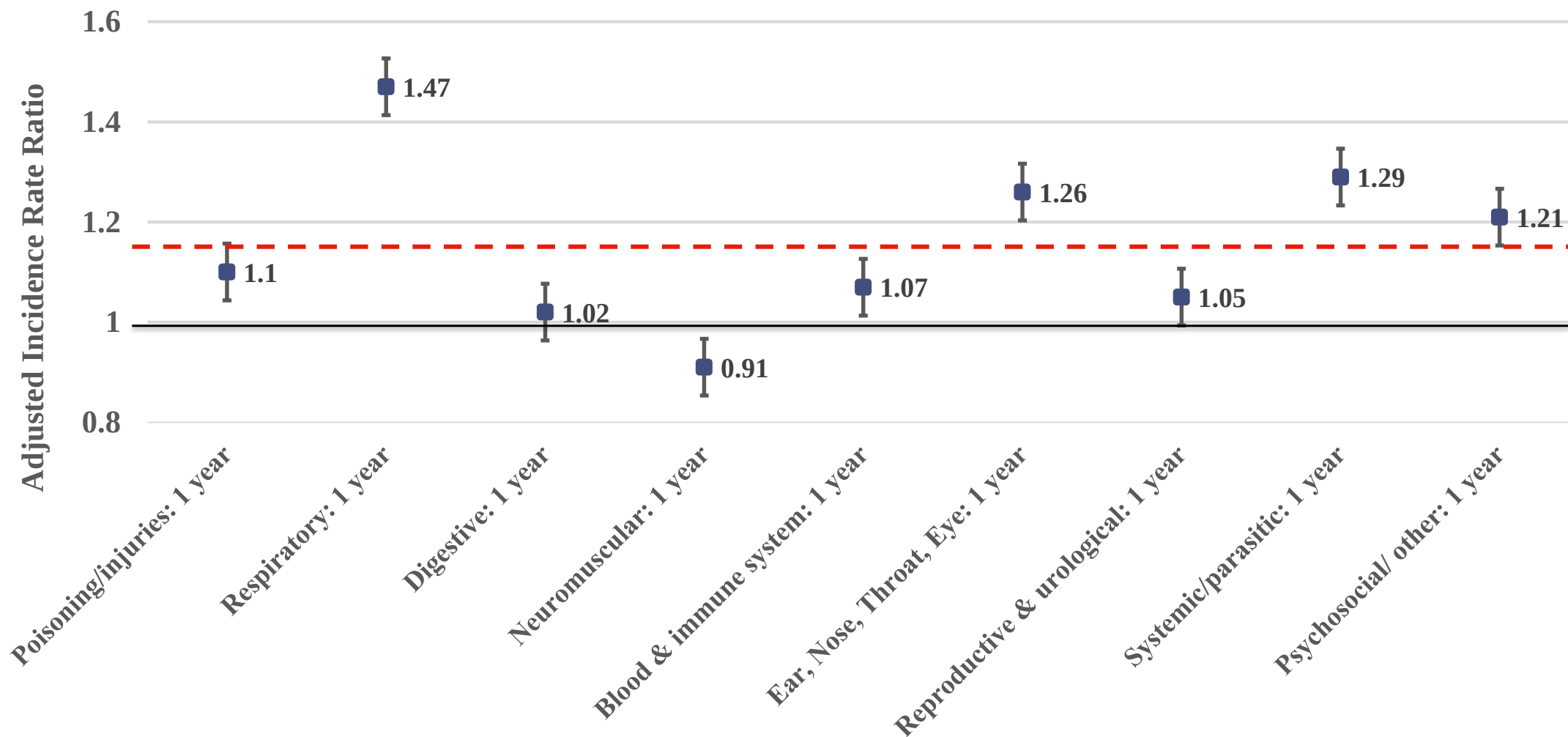
Participant characteristics	Not exposed N (Mean)	% (SD)	Exposed N (Mean)	% (SD)
Maternal age at birth (years)	(29.7)	(5.7)	(26.2)	(5.9)
Socioeconomic advantage (Index of Relative Socio-economic Disadvantage score [IRSD score])				
Highly Disadvantaged	5,510	65.1	2,958	34.9
Moderately Disadvantaged	6,718	74.8	2,264	25.2
mildly Disadvantaged	7,070	84.7	1,276	15.3
Least Disadvantaged	7,487	91.7	680	8.3
Maternal alcohol consumption during pregnancy				
Yes	1,940	58.1	1,401	41.9
No	24,714	81.3	5,688	18.7

Association between maternal smoking during pregnancy and total ED presentations and ED admissions



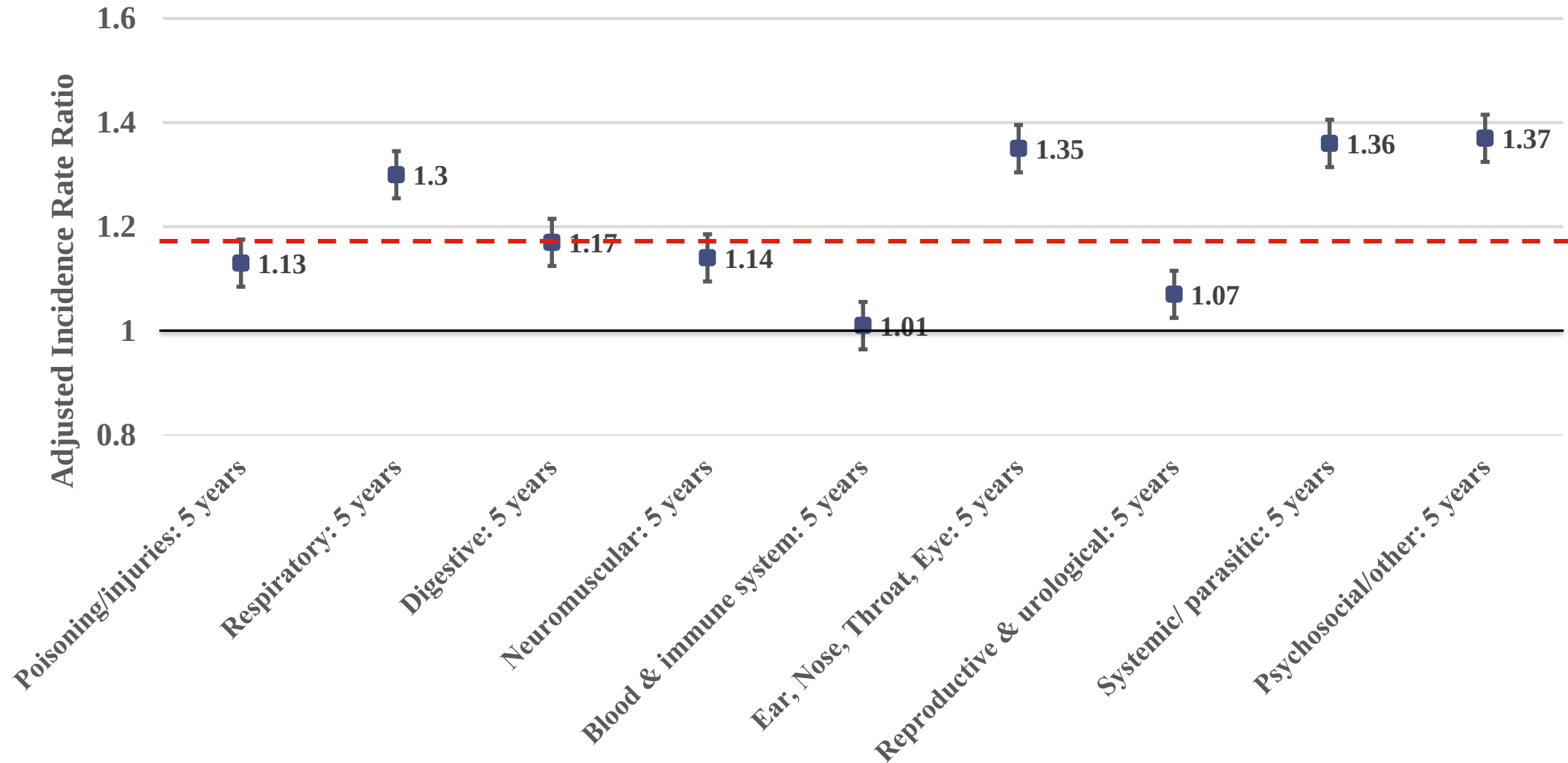
* Adjusted for sex and socioeconomic position (IRSD score), region of residence and maternal age at birth

Association between maternal smoking during pregnancy and ED presentations for various disease categories at 1 year



* Adjusted for sex and socioeconomic position (IRSD score), region of residence and maternal age at birth

Association between maternal smoking during pregnancy and ED presentations for various disease categories at 5 years



* Adjusted for sex and socioeconomic position (IRSD score), region of residence and maternal age at birth

Strengths & Limitations

- Strengths
 - Statewide record on emergency department presentations
 - All possible diseases categories rather than only respiratory illnesses
- Limitations
 - We could not discriminate between children exposed to maternal smoking during pregnancy and those who continue to be exposed during postnatal period and during childhood
 - Area level measures of socioeconomic position  Good correlation with individual level socioeconomic position⁸

Discussion

- Summary of findings
 - * Respiratory
 - * Eyes, ear, nose and throat
 - * Systemic and parasitic infections
 - * Psychosocial/other presentation
- Low birth weight and pre-term birth are also causally related to exposure to maternal smoking during pregnancy and to some disease conditions⁹
- Epigenetic modifications leading to immune system functioning suppression^{10, 11}
- Interventions that reduce maternal smoking during pregnancy may likely have impact on rate of presentation of children under five years to ED

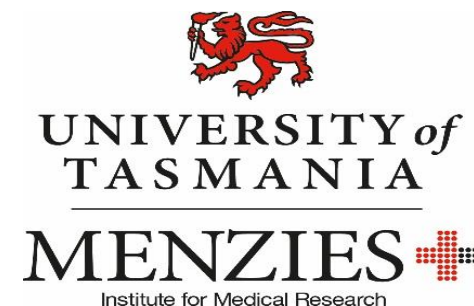
Acknowledgement

Supervisors:

- Assoc. Prof Seana Gall
- Dr. Amanda Neil
- Dr. Costan Magnussen
- Dr Marie-Jeanne Buscot

C2C Team:

- Prof Fiona Judd
- Dr. Fiona Wagg
- Prof Kristy Sanderson



Statistical Adviser

- Katherine Chappell

DOH Data custodian

- Peter Mansfield

Tasmania Data Linkage Unit

- Brian Stokes
- Nadine Wiggins



THANK YOU

REFERENCES

1. Smedberg, J., et al., *Characteristics of women who continue smoking during pregnancy: a cross-sectional study of pregnant women and new mothers in 15 European countries*. BMC Pregnancy and Childbirth, 2014. 14(1): p. 213.
2. Australian Institute for Health and Welfare. Perinatal data. 2016. Available from: <http://www.aihw.gov.au/perinatal-data/>
3. U.S. Department of Health and Human Services, *The Health Consequences of Smoking-50 Years of Progress: A Report of the Surgeon General*. 2014, Centers for Disease Control and Prevention (US): Atlanta (GA).
4. Kukla, L., D. Hrubá, and M. Tyrlik, *Influence of prenatal and postnatal exposure to passive smoking on infants' health during the first six months of their life*. Cent Eur J Public Health, 2004. 12(3): p. 157-60.
5. Toschke, A.M., et al., *Childhood obesity is associated with maternal smoking in pregnancy*. Eur J Pediatr, 2002. 161(8): p. 445-8.
6. Tanaka, K., et al., *Perinatal smoking exposure and behavioral problems in Japanese children aged 5 years: The Kyushu Okinawa Maternal and Child Health Study*. Environ Res, 2016. 151: p. 383-388.
7. Siminski P, Bezzina AJ, Lago LP, Eagar K. Primary care presentations at emergency departments: rates and reasons by age and sex. Australian health review : a publication of the Australian Hospital Association. 2008;32(4):700-709.
8. Diez-Roux, A.V., et al., Area characteristics and individual-level socioeconomic position indicators in three population-based epidemiologic studies. Ann Epidemiol, 2001. 11(6): p. 395-405.
9. Shi, T., et al., Risk factors for respiratory syncytial virus associated with acute lower respiratory infection in children under five years: Systematic review and meta-analysis. J Glob Health, 2015. 5(2): p. 020416.
10. Rotroff, D.M., et al., Maternal smoking impacts key biological pathways in newborns through epigenetic modification in Utero. BMC Genomics, 2016. 17(1): p. 976.
11. Ammenheuser, M.M., et al., Elevated frequencies of hprt mutant lymphocytes in cigarette-smoking mothers and their newborns. Mutat Res, 1994. 304(2): p. 285-94.