



**Online appendix to
Modelling the Early life-course (MELC):
A Microsimulation Model of Child Development in New Zealand**

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Table A1 Equations for modifiable factors and outcomes in the MELC micro-simulation model

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
Change in single-parent status	Logistic	Children aged 2 to 5 and in a single-parent family in previous year	age childethn fage single0 ga age:fage age:single0 ga:childethn
		Children aged 2 to 5 and in a two-parent family in previous year	childethn mage mage ² sesbth single0 bw pregsmk sesbth:childethn single0:childethn bw:childethn
		Children aged 6 to 13 and in a single-parent family in previous year	childethn mage feduc ga twin bthorder bthorder ² interact punish punish2 mage:childethn
		Children aged 6 to 13 and in a two-parent family in previous year	childethn mage fage fage ² feduc sesbth single0 pregsmk interact interact ² punish punish ² fage:childethn childethn:feduc single0:childethn pregsmk:childethn interact:childethn punish:childethn
Change in number of children in household	Standard OLS linear	Children aged 2 to 5	age typeofchange childethn mage meduc sesbth single0 pregsmk twin bthorder age:childethn age:pregsmk age:twin meduc:childethn sesbth_childethn twin:childethn bthorder:childethn
		Children aged 6 to 13	age age ² typeofchange mage mage ² feduc interact interact ² age:mage age:feduc
Change in parents	Logistic	Children aged 2 to 5 and no change of parents in previous year	age age ² childethn mage mage ² feduc sesbth single0 bw pregsmk bthorder bthorder ² householdsize_previous welfare_Previous age:mage age:sesbth age:welfare_previous childethn:feduc bw:childethn
		Children aged 2 to 5 and change of parents in previous year	age mage pregalc pregalc ² single_previous
		Children aged 6 to 13 and change of parents in previous year	age gender childethn mage meduc feduc sesbth single0 pregalc bthorder single_previous punish interact age:mage age:meduc age:single0 age:bthorder meduc:childethn childethn:feduc single_previous:childethn
		Children aged 6 to 13 and no change of parents in previous year	age age ² bw ga pregalc pregalc ² welfare_previous
Change in residence	Logistic	Children aged 2 to 5 years and no change of residence in previous year	age gender childethn mage sesbth pregsmk single_previous kids_previous mhrswrk_previous welfare_previous typeofchange age:mage age:sesbth age:kids_previous age:mhrswrk_previous
		Children aged 2 to 5 years and change of residence in previous year	age age ² mage mage ² meduc feduc bw bw ² breast bthorder single_previous kids_previous householdsize_previous typeofchange age:feduc age:breast age:typeofchange
		Children aged 6 to 13 years and no	gender childethn mage fage meduc feduc ga ga ² single_previous mhrswrk_previous

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
		change of residence in previous year	typeofchange fage:childethn childethn:feduc ga:childethn childethn:typeofchange
		Children aged 6 to 13 years and change of residence in previous year	childethn mage feduc bw ga pregalc kids_previous householdsze_previous welfare_previous typeofchange npresch welfare_previous:childethn
Number of changes in residence for children	Negative binomial	Children aged 2 to 5	age age ² gender childethn mage mage ² single0 chres_previous pregalc fhrswrk_previous fhrswrk_previous ² welfare_previous age:gender age:chres_previous gender:childethn chres_previous:childethn
		Children aged 6 to 13	age childethn fage feduc chres_previous bthorder mhrswrk_previous mhrswrk_previous ² npresch interact age:childethn age:chres_previous age:npresch mhrswrk_previous:childethn
Welfare dependence	Logistic	Children aged 2 to 5 and family not receiving welfare in previous year	gender childethn meduc sesbth single0 pregalc single kids mhrswrk fhrswrk fhrswrk ² gender:childethn sesbth:childethn mhrswrk:childethn
		Children aged 2 to 5 and family receiving welfare in the previous year	age age ² gender fage fage ² feduc sesbth ga ga ² breast pregsmk single householdsze mhrswrk mhrswrk ² fhrswrk age:fage age:ga age:single age:householdsze age:fhrswrk
		Children aged 6 to 13 and family not receiving welfare in previous year	age meduc sesbth ga breast pregsmk single kids householdsze mhrswrk fhrswrk fhrswrk ² age:single age:householdsze age:fhrswrk
		Children aged 6 to 13 and family receiving welfare in previous year	gender childethn meduc feduc sesbth bw ga ga ² pregsmk pregalc pregalc ² single mhrswrk fhrswrk fhrswrk ² interact sesbth:childethn bw:childethn ga:childethn pregsmk:childethn single:childethn interact:childethn
Mother working	Logistic	Children aged 2 to 5, mother not working in previous year, and is birth-mother	age age ² gender childethn mage meduc feduc single0 ga ga ² breast breast ² pregsmk pregsmk ² pregalc twin bthorder age:gender age:mage age:feduc age:pregalc mage:childethn single0:childethn breast:childethn
		Children aged 2 to 5, mother not working in previous year, and is not birth-mother, and is not same mother as in previous year	gender
		Children aged 2 to 5, mother not working in previous year, and is not birth-mother, but is same mother as in previous year	ga
		Children aged 2 to 5, mother working in previous year	age gender mage fage fage ² meduc feduc pregsmk pregalc twin age:gender age:mage age:pregalc
		Children aged 6 to 13, mother not	childethn mage fage meduc sesbth single0 breast breast ² pregsmk pregsmk ² bthorder

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
		working in previous year, and is birth-mother	bthorder ² npresch interact interact ² meduc:childethn sesbth:childethn
		Children aged 6 to 13, mother not working in previous year, and is not birth-mother, and is not same mother as in previous year	childethn sesbth pregsmk pregalc pregalc:childethn
		Children aged 6 to 13, mother not working in previous year, and is not birth-mother, but is same mother as in previous year	gender mage fage ga pregsmk pregsmk ² bthorder npresch
		Children aged 6 to 13 and mother working in previous year	age childethn mage fage fage ² meduc feduc bw bw ² ga breast breast ² pregalc twin npresch age:childethn age:fage age:meduc age:npresch fage:childethn bw:childethn ga:childethn pregalc:childethn twin:childethn
Number of hours worked per week for working mothers	Negative binomial	Children age 2 to 5 and mother is the child's birth-mother	childethn meduc sesbth single0 mhrswrk_previous ga ga ² breast breast ² mhrswrk_previous:childethn ga:childethn
		Children age 2 to 5 and mother is not birth-mother, and is not same mother as in previous year	childethn bw twin bthorder bthorder:childethn
		Children age 2 to 5 and mother is not birth-mother, but is same mother as in previous year	childethn mhrswrk_previous pregsmk pregsmk ² pregalc pregalc:childethn
	Negative binomial with dispersion parameter modelled as quadratic function of age	Children age 6 to 13 and mother is child's birth-mother	age childethn bthorder npresch mhrswrk_previous age:npresch age:mhrswrk_previous
	Negative binomial	Children age 6 to 13 and mother is not birth-mother, and is not same mother as in previous year	childethn meduc feduc sesbth single0 bw ga pregsmk bthorder childethn:feduc bw:childethn ga:childethn bthorder:childethn
		Children age 6 to 13 and mother is not birth-mother, but is same mother as in previous year	gender feduc ga pregsmk pregalc pregalc ² twin bthorder interact interact ²

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
Father working	Logistic	Children aged 2 to 5, father not working in previous year, and is birth-father	age meduc feduc sesbth
		Children aged 2 to 5, father not working in previous year, and is not birth-father, and is not same father as in previous year	age age ² mage single0 bthorder age:single0
		Children aged 2 to 5, father not working in previous year, and is not birth-father, but is same father as in previous year	bw ga ga ²
		Children aged 2 to 5, father working in previous year, and is birth-father	age age ² gender childethn mage mage ² feduc sesbth single0 pregsmk pregsmk ² bthorder age:childethn age:feduc age:sesbth age:single0 age:pregsmk sesbth:childethn
		Children aged 2 to 5, father working in previous year, and is not birth-father, and is not same father as in previous year	fage fage ² single0 bthorder bthorder ²
		Children aged 2 to 5, father working in previous year, and is not birth-father, but is same father as in previous year	age single0 pregsmk pregsmk ² age:single0
		Children aged 6 to 13, father not working in previous year, and is birth-father	age childethn sesbth single0 punish punish ² age:single0 age:punish sesbth:childethn punish:childethn
		Children aged 6 to 13, father not working in previous year, and is not birth-father, and is not same father as in previous year	childethn pregsmk pregalc
		Children aged 6 to 13, father not working in previous year, and is not birth-father, but is same father as in previous year	childethn fage fage ² meduc breast npresch fage:childethn npresch:childethn
		Children aged 6 to 13, father working in previous year, and is birth-father	age childethn mage mage ² feduc sesbth single0 pregalc pregalc ² twin bthorder bthorder ² npresch age:childethn mage:childethn
Children aged 6 to 13, father working in	age fage breast twin age:twin		

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
		previous year, and is not birth-father, and is not same father as in previous year	
		Children aged 6 to 13, father working in previous year, and is not birth-father, but is same father as in previous year	age gender sesbth single0 npresch
Number of hours worked per week for working fathers	Standard OLS Linear	Children aged 2 to 5	gender childethn mage feduc sesbth single0 bw ga ga ² pregsmk pregalc fhrswrk_previous childethn:feduc sesbth:childethn pregsmk:childethn fhrswrk_previous:childethn
		Children aged 6 to 13 and father is child's birth-father	age gender childethn fage meduc single0 pregsmk pregalc twin npresch fhrswrk_previous age:gender age:childethn age:fage age:pregsmk age:twin gender:childethn pregsmk:childethn fhrswrk_previous:childethn
		Children aged 6 to 13 and father is not birth-father, and is not same father as in previous year	age childethn mage fage sesbth single0 bw pregsmk pregsmk ² pregalc twin npresch interact age:childethn mage:childethn sesbth:childethn single0:childethn pregsmk:childethn twin:childethn npresch:childethn interact:childethn
		Children aged 6 to 13 and father is not birthfather, but is same father as in the previous year	age age ² mage meduc sesbth single0 bw pregalc pregalc ² punish punish ² interact fhrswrk_previous age:single0 age:interact age:fhrswrk_previous
Accomodation type	Logistic	Children aged 2 to 5 and living in detached house in previous year	age childethn mage mage ² meduc ga pregalc bthorder householdsize mhrswrk welfare age:childethn age:mage ga:childethn pregalc:childethn householdsize:childethn
		Children aged 2 to 5 and living in attached house in previous year	age age ² childethn mage single0 breast pregalc twin kids householdsize fhrswrk welfare age:mage age:single age:breast kids:childethn householdsize:childethn fhrswrk:childethn
		Children aged 6 to 13 and living in detached house in previous year	gender childethn meduc pregsmk pregsmk ² bthorder single kids householdsize mhrswrk mhrswrk ² fhrswrk welfare punish interact interact ² single:childethn kids:childethn householdsize:childethn fhrswrk:childethn
		Children aged 6 to 13 and living in attached house in previous year	age gender fage fage ² meduc single0 bw pregsmk pregalc twin single fhrswrk fhrswrk ² punish age:meduc age:pregamk age:pregalc age:fhrswrk age:punish
Home-ownership	Logistic	Children aged 2 to 5 and did not own home in previous year	age childethn mage sesbth bw kids householdsize mhrswrk fhrswrk fhrswrk ² welfare age:mage age:householdsize age:mhrswrk sesbth:childethn welfare:childethn
		Children aged 2 to 5 and did own home in previous year	childethn mage feduc sesbth single0 bthorder bthorder ² single single0:childethn

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
		Children aged 6 to 13 and did not own home in previous year	childethn single kids mage householdsage age age ² fhrswrk meduc kids:childethn householdsage:childethn single:childethn ga ga ² mhrswrk mhrswrk ² pregsmk age:ga breast breast ²
		Children aged 6 to 13 and did own home in previous year	age gender childethn sesbth pregsmk single householdsage fhrswrk fhrswrk ² npresch age:single gender:childethn sesbth:childethn pregsmk:childethn single:childethn fhrswrk:childethn npresch:childethn
Over-crowding	Logistic	Children aged 2 to 5 and lived in overcrowded accommodation in previous year	age age ² gender pregsmk bthorder single kids householdsage welfare age:gender age:single age:kids age:householdsage age:welfare
		Children aged 2 to 5 and did not live in overcrowded accommodation in previous year	age gender childethn mage fage fage ² meduc single0 bthorder kids householdsage fhrswrk age:childethn age:bthorder age:kids age:householdsage age:fhrswrk gender:childethn mage:childethn meduc:childethn kids:childethn householdsage:childethn
		Children aged 6 to 13 and lived in overcrowded accommodation in previous year	age age ² gender meduc bw ga breast breast ² pregsmk pregsmk ² bthorder householdsage welfare npresch interact age:meduc age:bw age:breast age:interact
		Children aged 6 to 13 and did not live in overcrowded accommodation in previous year	householdsage mage kids childethn householdsage:childethn mage:childethn age fhrswrk kids:childethn bthorder meduc fage age:fage mage:age fhrswrk:childethn bthorder:childethn twin mhrswrk mhrswrk ² age:mhrswrk kids:age
Mother smoking	Logistic	Children aged 2 to 5, mother did not smoke in previous year, and is birth-mother	gender childethn mage mage ² breast breast ² pregsmk pregsmk ² mhrswrk gender:childethn mhrswrk:childethn
		Children aged 2 to 5, mother did not smoke in previous year, and is not birth-mother, and is not same mother as in previous year	age fage fhrswrk welfare
		Children aged 2 to 5, mother did not smoke in previous year, and is not birth-mother, but is same mother as in previous year	bthorder
		Children aged 2 to 5 and mother did smoke in previous year	age age ² fage fage ² sesbth breast pregsmk pregsmk ² welfare age:fage
		Children aged 6 to 13 and mother did	age age ² gender childethn mage meduc feduc sesbth bw bw ² ga pregsmk pregsmk ²

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
		not smoke in the previous year	twin single householdsize welfare age:gender age:childethn age:mage age:feduc age:sesbth single:childethn welfare:childethn
		Children aged 6 to 13, mother did smoke in previous year, and is birth-mother	age childethn fage meduc sesbth bw breast breast ² pregsmk pregsmk ² bthorder mhrswrk interact interact ² age:sesbth age:mhrswrk meduc:childethn sesbth:childethn bthorder:childethn
		Children aged 6 to 13, mother did smoke in previous year, and is not birth-mother, and is not same mother as in previous year	pregsmk pregalc mhrswrk
		Children aged 6 to 13, mother did smoke in previous year, and is not birth-mother, but is same mother as in previous year	age childethn sesbth ga pregsmk pregsmk ² single mhrswrk npresch interact interact ² age:npresch age:interact ga:childethn single:childethn npresch:childethn interact:childethn
Number of cigarettes smoked per day for smoking mothers	Standard OLS linear	Children aged 2 to 5	age childethn feduc msmoke_previous ga pregsmk pregsmk ² single fhrswrk mhrswrk welfare age:msmoke_previous age:ga ga:childethn pregsmk:childethn fhrswrk:childethn welfare:childethn
		Children aged 6 to 13 and mother is child's birth-mother	age mage mage ² fage fage ² meduc bw bw ² pregsmk bthorder interact interact ² msmoke_previous householdsize mhrswrk welfare age:pregsmk age:msmoke_previous age:mhrswrk
		Children aged 6 to 13 and mother is not birth-mother, and is not same mother as in previous year	age mage meduc sesbth single0 ga breast pregsmk pregsmk ² pregalc npresch msmoke_previous mhrswrk age:pregsmk
		Children aged 6 to 13 and mother is not birth-mother, but is same mother as in previous year	age childethn mage fage fage ² ga pregsmk pregalc twin interact msmoke_previous age:childethn age:pregalc mage:childethn ga:childethn msmoke_previous:childethn
Father smoking	Logistic	Children aged 2 to 5, father did not smoke in previous year, and is birth-father	childethn meduc sesbth single0 bw ga breast breast ² twin kids fhrswrk mhrswrk single0:childethn bw:childethn breast:childethn twin:childethn fhrswrk:childethn
		Children aged 2 to 5, father did not smoke in previous year, and is not birth-father, and is not same father as in previous year	childethn fage meduc pregsmk pregalc bthorder single kids mhrswrk mhrswrk ²
		Children aged 2 to 5, father did not	age childethn fage meduc feduc

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
		smoke in previous year, and is not birth-father, but is same father as in previous year	
		Children aged 2 to 5, father did smoke in previous year, and is birth-father	age gender childethn mage sesbth bw pregsmk single kids fhrswrk fhrswrk ² welfare age:pregsmk age:single age:welfare bw:childethn
		Children aged 2 to 5, father did smoke in previous year, and is not birth-father, and is not same father as in previous year	single0 pregalc householdsize
		Children aged 2 to 5, father did smoke in previous year, and is not birth-father, but is same father as in previous year	childethn sesbth single0 ga ga ² pregsmk fhrswrk sesbth:childethn single0:childethn ga:childethn pregsmk:childethn
		Children aged 6 to 13, father did not smoke in previous year, and is birth-father	age age ² gender childethn fage feduc sesbth bw ga ga ² breast pregalc single householdsize fhrswrk mhrswrk mhrswrk ² welfare npresch interact age:feduc age:mhrswrk gender:childethn childethn:feduc sesbth:childethn bw:childethn householdsize:childethn
		Children aged 6 to 13, father did not smoke in previous year, and is not birth-father, and is not same father as in previous year	age fage feduc pregsmk single kids householdsize mhrswrk welfare npresch interact age:fage
		Children aged 6 to 13, father did not smoke in previous year, and is not birth-father, but is same father as in previous year	age feduc pregsmk pregalc kids fhrswrk mhrswrk mhrswrk ² punish
		Children aged 6 to 13, father did smoke in previous year	gender childethn meduc feduc bw bw ² pregsmk bthorder single kids fhrswrk mhrswrk npresch interact childethn:feduc fhrswrk:childethn
Number of cigarettes smoked per day for smoking fathers	Standard OLS linear	Children aged 2 to 5 and father is child's birth-father	age childethn fsmoke_previous ga pregsmk bthorder welfare age:fsmoke_previous age:ga age:pregsmk age:welfare fsmoke_previous:childethn pregsmk:childethn
		Children aged 2 to 5 and father is not birth-father, and is not same father as in previous year	childethn bw fsmoke_previous bw bw ² pregsmk pregsmk ² welfare
		Children aged 2 to 5 and father is not birth-father, but is same father as in	age mage mage ² single0 fsmoke_previous pregalc pregalc ² age:single0

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
		previous year	
		Children aged 6 to 13 and father is child's birth-father	childethn mage fage feduc sesbth breast breast ² pregsmk pregsmk ² pregalc interact interact ² fsmopke_previous single mage:childethn fage:childethn breast:childethn interact:childethn single:childethn
		Children aged 6 to 13 and father is not birth-father, and is not same father as in previous year	meduc bw pregsmk pregsmk ² pregalc npresch punish interact fsmoke_previous single kids householdsize mhrswrk welfare
		Children aged 6 to 13 and father is not birth-father, but is same father as in previous year	gender single0 bw bthorder interact fsmoke_previous kids fhrswrk mhrswrk mhrswrk ²
Mother's emotional responsiveness	Negative binomial	Children at age 5	gender childethn mage mage ² sesbth single0 bw breast breast ² pregsmk meankids1_5 meanmhrswrk1_5 meanwelfare1_5 meanaccom1_5 meanovercrowd1_5 meanchpar1_5 meanchres1_5 breast:childethn meankids1_5:childethn
Number of years of preschool education	Standard OLS linear	Children at age5	meduc feduc sesbth breast meanhouseholdsize1_5 meanaccom1_5 meanchres1_5 meanmsmoke1_5
Mother's punitiveness	Poisson	Children at age5	gender childethn fage meduc meanmhrswrk1_5 meanhomeown1_5 meanchpar1_5 meduc:childethn meanmhrswrk1_5:childethn meanhomeown1_5:childethn
Total family doctor visits	Negative binomial	Children aged 2 years	childethn fage fage ² meduc feduc sesbth gptotvis_previous kids_previous fage:childethn gptotvis_previous:childethn
		Children aged 3 to 5 years	age age ² childethn meduc single0 bthorder gptotvis_previous householdsize_previous fhrswrk_previous overcrowd_previous age:bthorder age:fhrswrk_previous meduc:childethn single0:childethn
		Children aged 6 years	childethn meduc single0 pregsmk npresch punish punish ² gptotvis_previous kids_previous accom_previous overcrowd_previous punish:childethn gptotvis_previous:childethn
		Children aged 7 to 10 years	age age ² childethn punish interact gptotvis_previous kids_previous fhrswrk_previous age:gptotvis_previous age:kids_previous punish:childethn interact:childethn fhrswrk_previous:childethn
Number of visits to a GP for a morbidity	Negative binomial	Children aged 2	childethn single_previous chpar_previous gptotvis gpresp chpar_previous:childethn gptotvis:childethn
		Children aged 3 and 4	age gender childethn feduc single_previous kids_previous welfare_previous accom_previous gptotvis gpresp age:welfare_previous gender:childethn

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
			childethn:feduc single_previous:childethn welfare_previous:childethn accom_previous:childethn gptotvis:childethn gpresp:childethn
		Children aged 5	childethn mage meduc twin bthorder fhrrwrk_previous welfare_previous gptotvis gpresp gptotvis:childethn gpresp:childethn
		Children aged 6 and 7	age childethn meduc gpmorb_previous single_previous fhrrwrk_previous fhrrwrk_previous ² overcrowd_previous gptotvis gpresp age:fhrrwrk_previous age:overcrowd_previous meduc:childethn fhrrwrk_previous:childethn overcrowd_previous:childethn gptotvis:childethn gpresp:childethn
Number of preventative visits to a GP	Standard OLS linear	Children aged 2	childethn mage bthorder welfare_previous gptotvis gpresp gpmorb welfare_previous:childethn gptotvis:childethn gpresp:childethn gpmorb:childethn
	Poisson	Children aged 3 and 4	age childethn mage fage single0 bw breast bthorder gptotvis gpresp gpmorb age:bw age:breast age:bthorder age:gptotvis age:gpresp age:gpmorb mage:childethn fage:childethn gptotvis:childethn gpresp:childethn gpmorb:childethn
		Children aged 5	mage meduc bw ga pregsmk ² welfare_previous fsmoke_previous fsmoke_previous ² gptotvis gpresp gpmorb
		Children aged 6 and 7	age meduc sesbth single0 breast chpar_previous gptotvis gpresp gpmorb age:meduc age:sesbth age:single0 age:breast age:chpar_previous age:gptotvis age:gpresp age:gpmorb
Number of visits to a GP for a respiratory condition	Negative binomial	Children aged 2 to 5	age age ² childethn feduc sesbth gpresp_previous fhrrwrk_previous homeown_previous fsmoke_previous gptotvis age:childethn age:gptotvis childethn:feduc sesbth:childethn fhrrwrk_previous:childethn gptotvis:childethn
		Children aged 6 to 10	age age ² childethn pregalc gpresp_previous welfare_previous npresch gptotvis age:childethn age:gpresp_previous age:gptotvis gpresp_previous:childethn npresch:childethn gptotvis:childethn
Number of hospital admission	Poisson	Children aged 2 to 5	age gender hadm_previous chres_previous fsmoke_previous age:hadmtot_previous age:fsmoke_previous
		Children aged 6 to 10	age age ² gender childethn fage sesbth bw ga punish hadmtot_previous kids_previous householdsize_previous mhrwrk_previous mhrwrk_previous ² age:gender age:childethn age:fage age:sesbth age:bw age:ga age:punish age:hadmtot_previous age:kids_previous age:householdsize_previous age:mhrwrk_previous hadmtot_previous:childethn kids_previous:childethn

Modifiable factor of outcome	Type of model	Subset of data on which model was estimated	Predictors
Number of hospital outpatient visits	Negative binomial	Children aged 2 to 5	age gender childethn fage meduc breast bthorder houtp_previous fhrrwrk_previous welfare_previous homeown_previous overcrowd_previous chpar_previous fage:childethn meduc:childethn houtp_previous:childethn fhrrwrk_previous:childethn homeown_previous:childethn overcrowd_previous:childethn chpar_previous:childethn
		Children aged 6 to 10	age meduc bw bthorder punish houtp_previous kids_previous welfare_previous accom_previous overcrowd_previous chpar_previous msmoke_previous age:punish age:houtp_previous age:welfare_previous age:chpar_previous age:msmoke_previous
Conduct score	Logistic	Children aged 4	age gender childethn mage fage meduc breast breast2 bthorder chres meanmhrswrk1_3 meanwelfare1_3 meanhomeown1_3 age:fage mage:childethn fage:childethn chres:childethn
		Children aged 5 years and no conduct problem in the previous year	gender childethn feduc sesbth breast single fhrrwrk fhrrwrk2 accom single:childethn
		Children aged 5 years and with conduct problem in the previous year	age childethn fage ga chpar homeown:childethn chpar:childethn
		Children aged 6 to 13 years and with conduct problem in the previous year	age gender childethn feduc sesbth single0 breast kids accom fsmoke msmoke msmoke ² npresch age:fsmoke single0:childethn kids:childethn
Reading score	Standard OLS linear	Children aged 8 years	gender childethn mage meduc bw bw ² breast bthorder bthorder ² householdsize fhrrwrk msmoke interact punish meansingle1_7 meanwelfare1_7 meanfsmoke1_7 mage:childethn
		Children aged 9 to 13 years	age childethn mage sesbth ga ga ² breast bthorder bthorder ² homeown overcrowd reading_previous npresch interact interact ² age:bthorder age:overcrowd age:reading_previous age:npresch age:interact

NOTES

'_previous' suffix denotes that the variable is the value for the year prior to the current year.

² superscript denotes that the variable has been squared.

x:y denotes an interaction between variable x and variable y

VARIABLES

accom	accommodation type
age	age of child
breast	breast-feeding
bthorder	birth order
bw	birthweight
childethn	ethnicity of child
chpar	change in parents
chres	number of changes in residence
cond	conduct problems
fage	father's age at child's birth
feduc	father's education level at child's birth
fhrswrk	father's hours worked
fsmoke	father's smoking
ga	gestational age
gender	gender of child
gpmorb	number of GP visits for a morbidity for the year
gpresp	number of GP visits for a respiratory condition for the year
gptotvis	total number of GP visits for the year

hadm	number of hospital admissions for the year
homeown	home ownership
householdsize	number of people in household
houtp	number of hospital outpatient visits for the year
interact	maternal receptiveness
kids	number of children in household
mage	mother's age at child's birth
meanaccom1_n	proportion of years that the child was living in an attached house over the period when the child was age 1 to n
meanchpar1_n	proportion of years in which the child experienced a change in parents over the period when the child was aged 1 to n
meanfhrrwrk1_n	mean number of hours worked by father over period when the child was aged 1 to age n
meanfsmoke1_n	mean number of cigarettes smoked by the father over the period when the child was aged 1 to age n
meanhomeown1_n	proportion of years that the child was living in a house that was not owned or mortgaged over the period when the child was age 1 to n
meanhouseholdsize1_n	mean number of people living in the household over the period when the child was aged 1 to n
meankids1_n	mean number of children in the family over the period when the child was aged 1 to n
meanmhrrwrk1_n	mean number of hours worked by mother over period when the child was aged 1 to age n
meanmsmoke1_n	mean number of cigarettes smoked by the mother over the period when the child was aged 1 to age n
meanovercrowd1_n	proportion of years that the child was living in overcrowded conditions over the period when the child was aged 1 to n
meansingle1_n	proportion of years the that the child was in a single parent family from age 1 to age n inclusive
meanwelfare1_n	proportion of years that the child was in family on welfare from age 1 to age n inclusive
meduc	mother's educational level at child's birth

mhrswrk	mother's hours worked
msmoke	mother's smoking
npresch	number of years of preschool education
overcrowd8	whether the child was in overcrowded accommodation when aged 8
pregalc	drinking in pregnancy
pregsmk	smoking in pregnancy
punish	maternal punitiveness
read	reading ability
sesbth	family's socio-economic position at child's birth
single	single-parent status
single0	single-parent status at child's birth
twin	singleton or twin birth
typeofchange	change in family type from previous to current year (e.g. father left, same number of parents)
welfare	welfare dependence

Table A2 Missing Data: Time-Invariant Variables - Christchurch Health and Development Study (N= 1265)

Variable	Number of missing values	%
Gender	0	0%
Ethnicity	0	0%
Age of mother at child's birth	2	0.2%
Age of father at child's birth	4	0.3%
Mother's education at child's birth	2	0.2%
Father's education at child's birth	0	0%
Family's SES at child's birth	0	0%
Single-parent status at the child's birth	0	0%
Birth weight	3	0.2%
Multiple birth	0	0%
Gestational age	37	2.9%
Birth order	0	0%
Smoking during pregnancy	0	0%
Drinking during pregnancy	1	0.1%
Breastfeeding	85	6.7%
Maternal responsiveness	115	9.1%
Maternal punitiveness	115	9.1%
Early childhood education	234	18.5%

Table A3 Missing Data: Time-Varying Variables by Year - Christchurch Health and Development Study (N=1265)

Variable	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10		Year 11		Year 12		Year 13	
	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%
Single-parent status	102	8.1	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
Number of children	102	8.1	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
Number of household members	102	8.1	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
Mother's working hours	106	8.4	133	10.5	150	11.9	188	14.9	184	14.5	209	16.5	215	17	252	19.9	280	22.1	305	24.1	342	27	398	31.5	426	33.7
Father's working hours	112	8.9	145	11.5	159	12.6	183	14.5	204	16.1	216	17.1	206	16.3	254	20.1	283	22.4	309	24.4	343	27.1	399	31.5	427	33.8
Welfare dependent	102	8.1	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	253	20	279	22.1	304	24	342	27	398	31.5	426	33.7
Change of parents	105	8.3	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
Mother smoking	105	8.3	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
Father smoking	102	8.1	128	10.1	145	11.5	176	13.9	181	14.3	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
Accommodation type	105	8.3	133	10.5	152	12	180	14.2	186	14.7	202	16	200	15.8	252	19.9	279	22.1	304	24	344	27.2	400	31.6	427	33.8
Housing tenure (owned/rented)	102	8.1	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
Overcrowding	102	8.1	128	10.1	141	11.1	174	13.8	180	14.2	202	16	200	15.8	252	19.9	279	22.1	304	24	342	27	398	31.5	426	33.7
GP visits	111	8.8	136	10.8	142	11.2	179	14.2	182	14.4	204	16.1	200	15.8	252	19.9	279	22.1	305	24.1	-	-	-	-	-	-
Hospital admissions	105	8.3	122	9.6	139	11	174	13.8	178	14.1	202	16	200	15.8	252	19.9	279	22.1	304	24	-	-	-	-	-	-
Hospital outpatient attendances	105	8.3	122	9.6	139	11	175	13.8	179	14.2	203	16	200	15.8	252	19.9	279	22.1	304	24	-	-	-	-	-	-
Reading ability	-	-	-	-	-	-	-	-	-	-	-	-	-	-	260	20.6	289	22.8	315	24.9	349	27.6	408	32.3	437	34.5
Conduct problems	-	-	-	-	-	-	-	-	-	-	203	16	200	15.8	252	19.9	279	22.1	305	24.1	-	-	-	-	-	-

Table A4 Missing Data: Time-Invariant Variables - Dunedin Multidisciplinary Health and Development Study (N= 1037)

Variable	Number of missing values	%
Gender	0	0%
Ethnicity	3	0.3%
Age of mother at child's birth	4	0.4%
Age of father at child's birth	28	2.7%
Mother's education at child's birth	4	0.4%
Father's education at child's birth	51	4.9%
Family's SES at child's birth	97	9.4%
Single-parent status at the child's birth	0	0%
Birth weight	2	0.2%
Multiple birth	122	11.8%
Gestational age	0	0%
Birth order	2	0.2%
Smoking during pregnancy	7	0.7%
Drinking during pregnancy	2	0.2%
Breastfeeding	49	4.7%
Maternal responsiveness	2	0.2%
Maternal punitiveness	261	25.2%
Early childhood education	0	0%

Table A5 Missing Data: Time-Varying Variables by Year - Dunedin Multidisciplinary Health and Development Study (N = 1037)

Variable	Year 3		Year 5		Year 7		Year 9		Year 11		Year 13	
	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%
Number of children	0	0	-	-	90	8.7	-	-	133	12.8	-	-
Number of household members	0	0	-	-	-	-	-	-	-	-	-	-
Mother's working hours	0	0	51	4.9	90	8.7	107	10.3	135	13.0	-	-
Change of parents	-	-	-	-	-	-	-	-	133	12.8	-	-
Change of residence	4	0.4	59	5.7	91	8.8	89	8.6	133	12.8	-	-
Mother smoking	-	-	-	-	-	-	244	23.5	142	13.7	-	-
Father smoking	-	-	-	-	-	-	289	27.9	157	15.1	-	-
Accommodation type	5	0.5	-	-	-	-	-	-	-	-	-	-
Housing tenure (owned/rented)	16	1.5	-	-	-	-	-	-	-	-	-	-
GP visits	-	-	-	-	163	15.7	223	21.5	147	14.2	-	-
Hospital admissions	3	0.3	52	5.0	162	15.6	222	21.4	184	17.4	215	20.7
Hospital outpatient attendances	1	0.1	51	4.9	-	-	-	-	142	13.7	-	-
Reading ability	-	-	-	-	95	9.2	85	8.2	118	11.4	210	20.3
Conduct problems	-	-	25	2.4	86	8.3	89	8.6	117	11.3	48	4.6

Table A6 Missing Data: Time-Invariant Variables - Pacific Islands Families Study (N= 1398)

Variable	Number of missing values	%
Ethnicity	17	1.2
Age of mother at child's birth	1	0.1
Age of father at child's birth	565	40.4
Mother's education at child's birth	0	0
Father's education at child's birth	565	40.4
Birth weight	17	1.2
Multiple birth	0	0
Gestational age	19	1.4
Birth order	17	1.2
Smoking during pregnancy	6	0.4
Drinking during pregnancy	0	0
Maternal punitiveness	94	6.7
Early childhood education	539	38.6

Table A7 Missing Data: Time-Varying Variables by Year - Pacific Islands Families Study (N = 1398)

Variable	Year		Year 2		Year 4		Year 6		Year 9	
	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%	N. Miss	%
Single-parent status	563	40.3	-	-	-	-	-	-	-	-
Number of household members	0	0	-	-	-	-	-	-	-	-
Mother smoking	162	11.6	244	17.5	340	24.3	393	28.1	-	-
Father smoking	570	40.8	-	-	-	-	-	-	-	-
Accommodation type	1	0.1	-	-	-	-	-	-	-	-
Housing tenure (owned/rented)	157	11.2	236	16.9	332	23.7	381	27.3	424	30.3
Overcrowding	0	0	-	-	-	-	-	-	-	-
GP visits for a morbidity	157	11.2	237	17.0	334	23.9	379	27.1	385	27.5
Hospital admissions	158	11.3	237	17.0	332	23.7	379	27.1	386	27.6
Conduct problems	-	-	-	-	333	23.8	-	-	420	30.0