Fás Aníos in Éirinn
Growing Up in Ireland

Pregnancy Complications and Child Mental Health

Emma Butler (RCSI), Michelle Spirtos (TCD), Linda O Keeffe (UCC), Mary Clarke (RCSI) and Niamh Dooley (RCSI).

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HRB

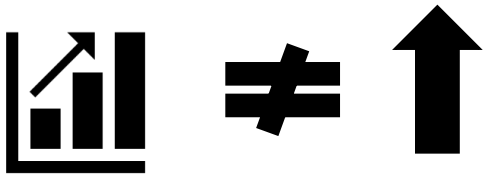
RCSI UNIVERSITY OF MEDICINE AND HEALTH SCIENCES

SPHeRE
Structured Population health, Policy and Health-services Research Education

Specific pregnancy complications have been found to associate with increased odds of mental health difficulties in the offspring

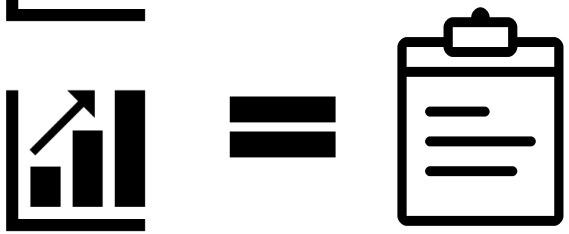
Robinson, 2021; Lee 2020; Nielsen 2016; Parboosing 2013; Nomura 2012

Cumulative pregnancy/obstetric complications?

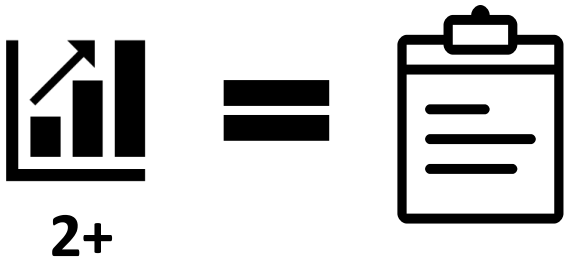


ADHD or conduct disorder

ADHD diagnosis

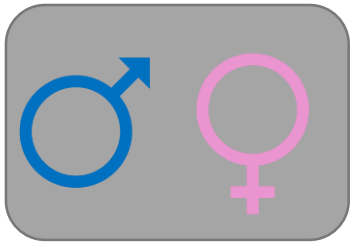


CBCL total problems score @ 8years

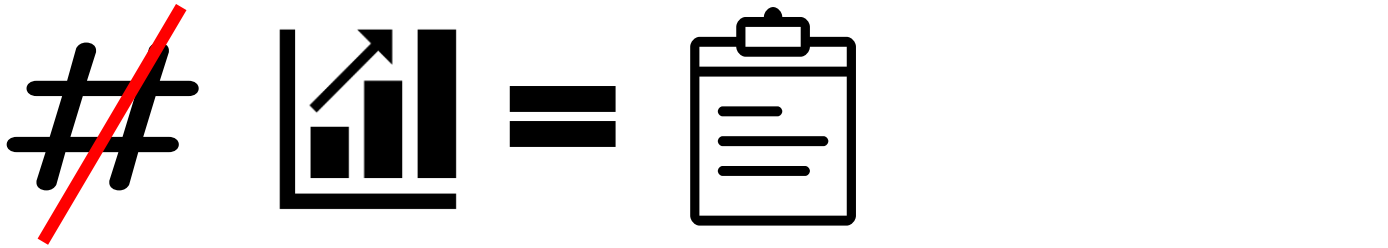


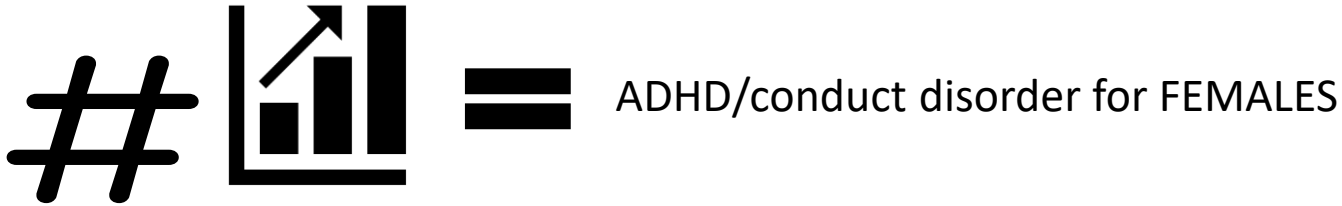
Dose-response between the number of prenatal exposures and the odds of ***clinically*** elevated CBCL scores

Wagner et al 2009; Milberger et al 1997; Fuchs et al 2022; Roffman et al 2021



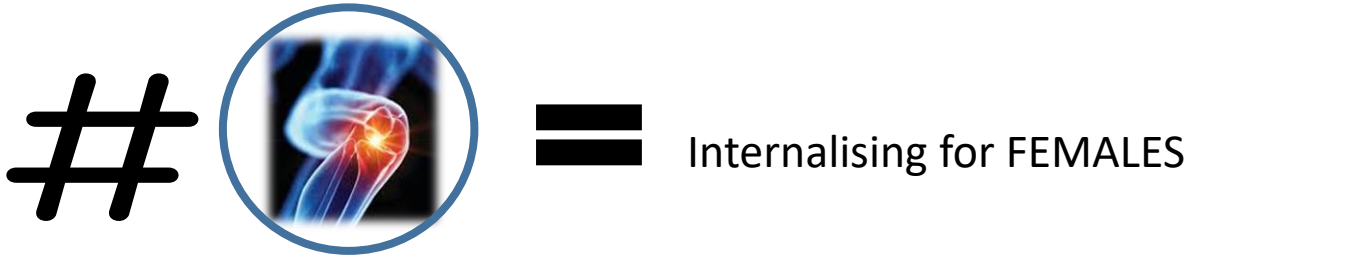
Subgroups?





ADHD/conduct disorder for FEMALES

ADHD



Internalising for FEMALES

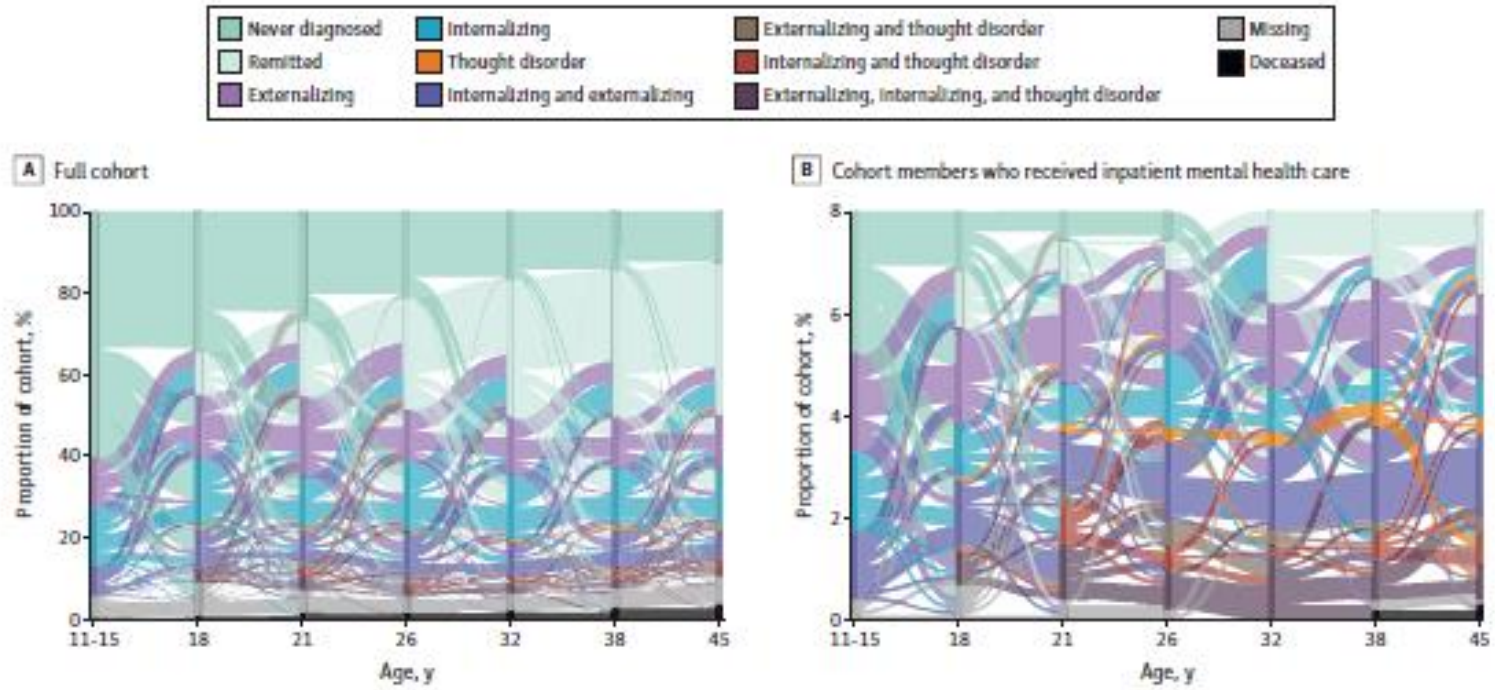
Psychosis in MALES

Laucht et al (2000); Wagner et al (2009); Nomura et al (2012); MacGiollabhui et al (2019); Lee (2020).

SDQ-total not binary specific diagnosis

P

Figure 4. Ebb and Flow of Mental Disorders



Sankey diagrams show cohort members' shifting diagnoses from 1 assessment phase to the next, from ages 11 to 15 years to age 45 years. The colors of the horizontal bands divide the diagram into different psychiatric statuses, as indicated in the key. The heights of the horizontal bars show the prevalence of different statuses at each assessment phase. A, Information for the full cohort of 1037 participants. B, Analysis restricted to 83 participants who received inpatient mental-health services (8% of the cohort). Note that it is possible to follow groups across contiguous adjacent assessments, not across the entire panel.

Caspi et al (2020); Healy et al (2022); Morales et al (2023); Nees et al 2021

AIMS OF CURRENT STUDY

QUESTION 1:

Dose-response ***cumulative PCs*** & child mental health as measured by SDQ-total?

QUESTION 2:

Cumulative PCs & ***clinically significant*** SDQ-total scores?

QUESTION 3:

Moderation by sex or social risk?

11,134 recruited at 9-months

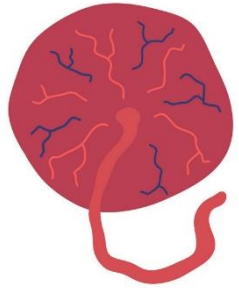
- Exclusions:
- N=1 no PC
- N=38 respondent at 9-months not mother
- N=1794 did not have SDQ @ 5 OR 9 years

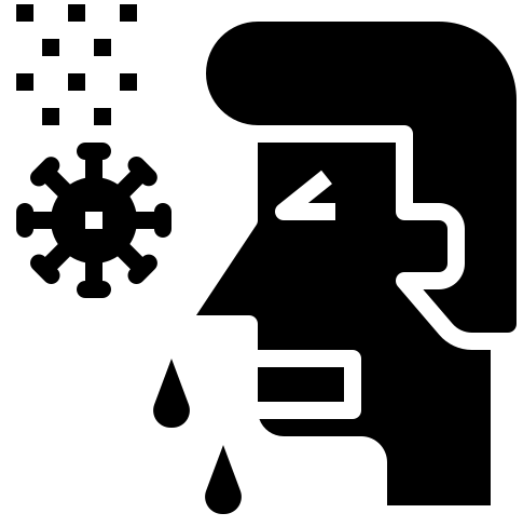
9,301 had at least one SDQ-total

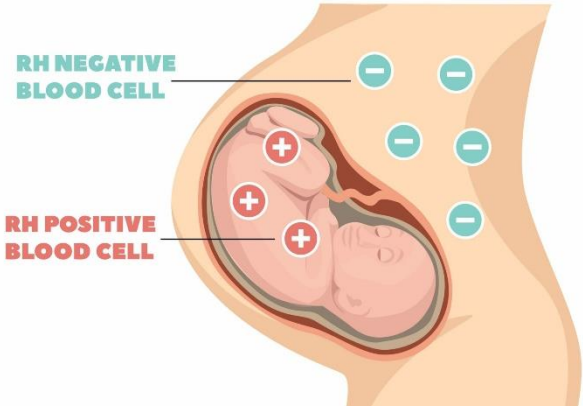
- Exclusions (missing covariates):
- N=663 missing cumulative SR
- N=155 missing smoking

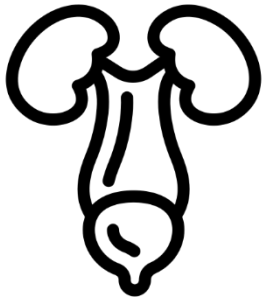
8,483 included in fully-adjusted models

Were there any of the following complications with the pregnancy? Tick all that apply:
Raised blood pressure (In isolation)
Raised blood pressure and protein in the urine (pre-eclampsia)
Urinary or kidney infection
Persistent vomiting or nausea
Gestational diabetes (diet treated)
Gestational diabetes (insulin treated)
Bleeding during second half of pregnancy
Vaginal infection during pregnancy
Intrauterine growth restriction
Rhesus incompatibility
Influenza
Placenta Previa
Miscarriage in a multiple pregnancy
Other (please specify)



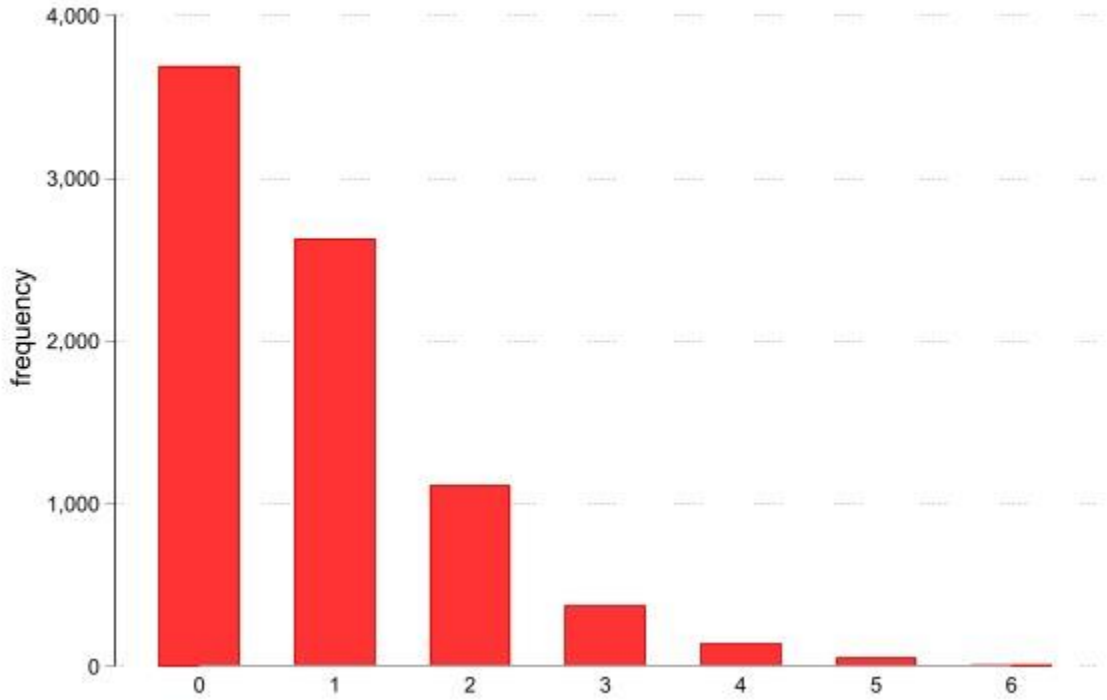






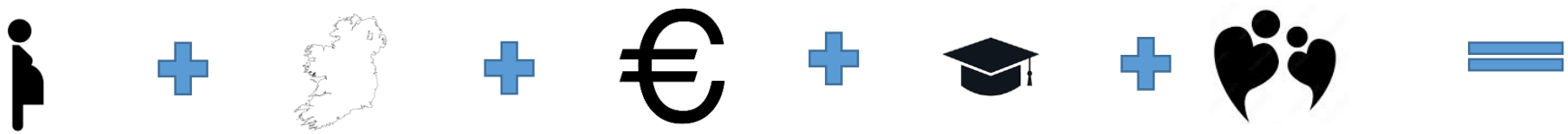
Cumulative PCs

Specific Pregnancy Complications (n=8483)	(% yes)
Placenta complications	3.24
Pre-eclampsia	7.50
Urinary Tract Infection	15.17
Persistent vomiting	17.64
Late bleeding	6.70
Vaginal infection	3.44
Intra-uterine growth restriction	2.24
Rhesus	3.67
Influenza	3.76
“Other” blood conditions	2.29
“Other” pains	2.44
“Other” high/moderate risk condition	2.39
Maternal condition not thought to impact the fetus	2.83
Gestational Diabetes Mellitus	3.00
Blood pressure problem but not pre-eclampsia	10.32
“Other” problem but not-specified	1.2



Cumulative Social Risk

	0 No risk(n%)	1 Low risk(n%)	2 Moderate risk(n%)	3 High risk(n%)
Maternal Age	59.39	40.61	N/A	N/A
Migrancy	81.05	18.95	N/A	N/A
Income	38.60	20.08	41.31	N/A
Maternal Education	10.97	16.35	27.87	44.73
Maternal Relationship	83.90	16.10	N/A	N/A
SR totals	14.55	29.76	31.44	24.25



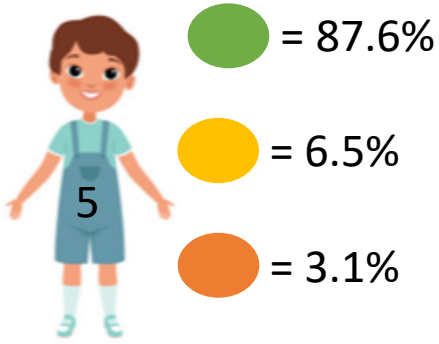
Social Risk

SR inc as difficulty inc

For validity: "How easy/difficult is it for the household to make ends meet?"			
	Wave 1 – 9 months SR mean(SD)	Wave 3 – 5 years SR mean(SD)	Wave 5 – 9 years SR mean(SD)
With great difficulty	2.48 (.62)	2.22 (.78)	2.23 (.79)
With difficulty	2.32 (.71)	1.91 (.91)	2.18 (.84)
With some difficulty	1.96 (.88)	1.69 (.95)	1.85 (.93)
Fairly easily	1.39 (.98)	1.33 (1.04)	1.50 (.98)
Easily	1.20 (1.02)	1.14 (1.04)	1.26 (1.02)
Very easily	.85 (.93)	1.02 (1.09)	1.01 (1.05)

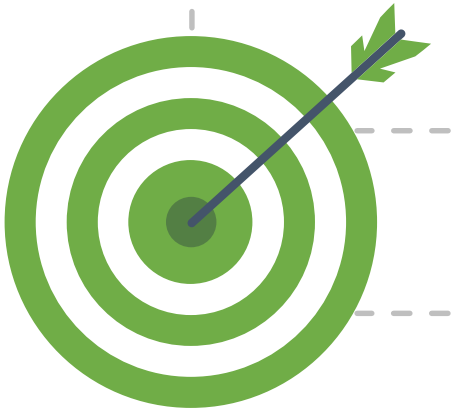
"Answer on your child's behaviour over the past 6 months/school year"
Response options:
Not true, somewhat true, certainly true

OUTCOME: SDQ-total x/40



= 87.6%
= 6.5%
= 3.1%
= 2.8%

= 85.5%
= 6.2%
= 4.0%
= 4.3%



EMOTIONAL PROBLEMS X10

Often unhappy, nervous in new situations, many fears, many worries, gets headaches often.

HYPERACTIVITY/INATTENTION X10

Doesn't finish what they start, doesn't think before acting, restless, easily distracted, constantly fidgeting.

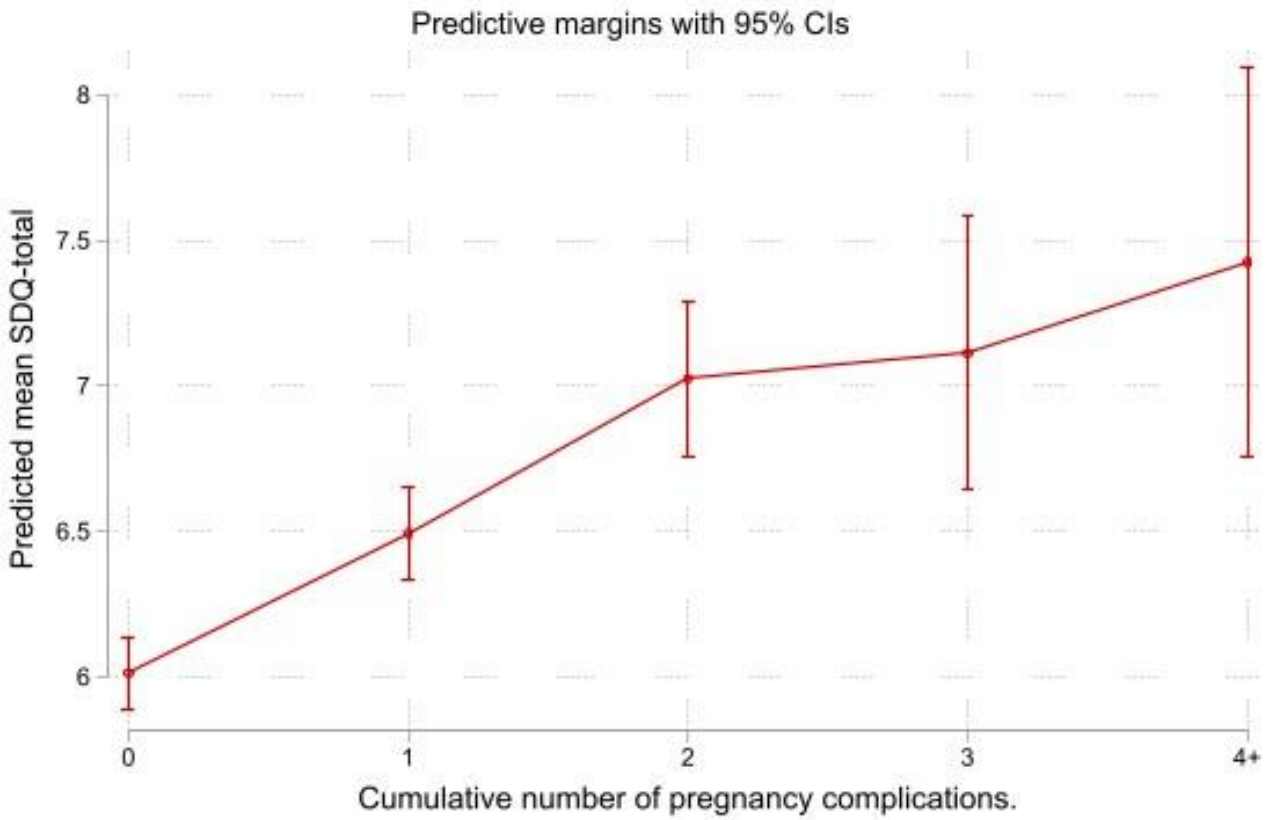
PEER PROBLEMS X10

Has no good friends, usually on their own, not generally liked by peers, picked on, gets on better with adults.

CONDUCT PROBLEMS X10

Disobedient, often gets angry, steals, lies or cheats, fights with peers.

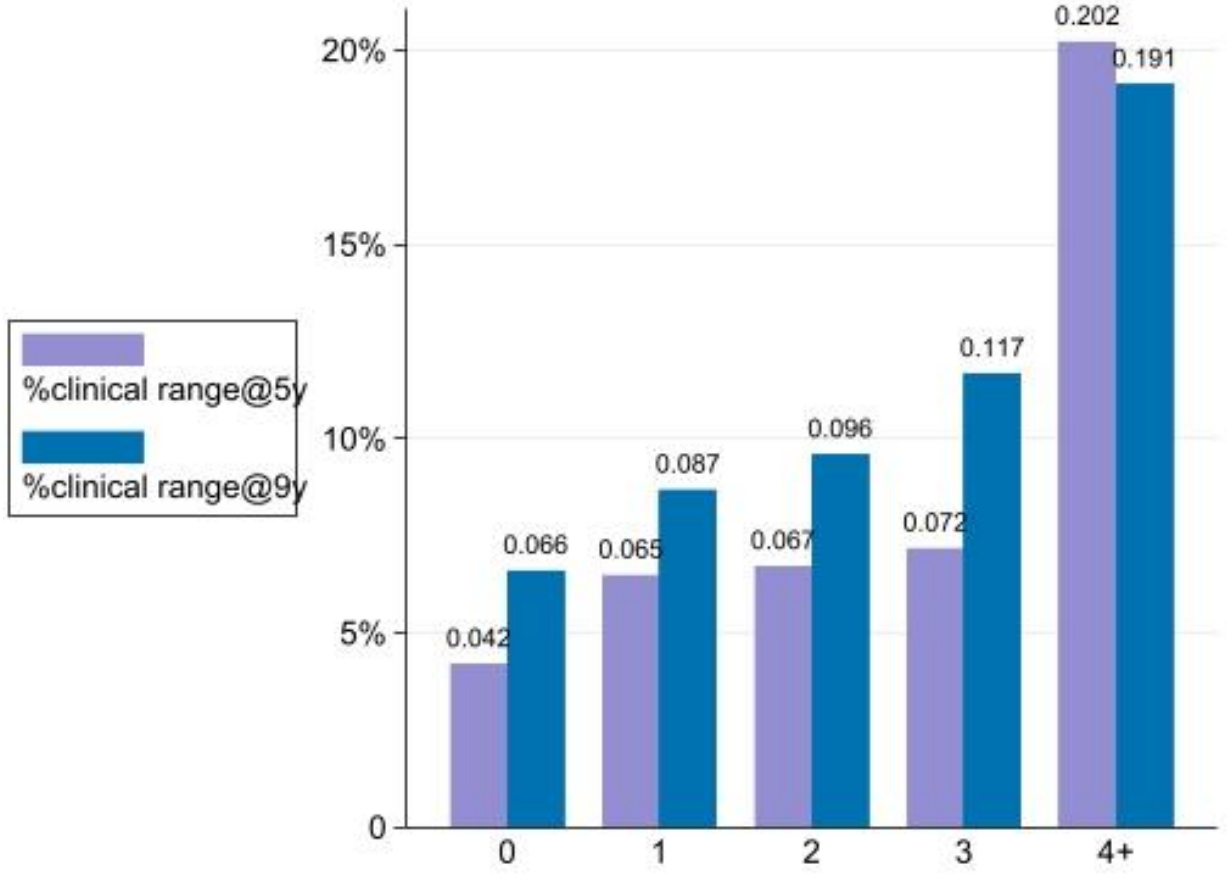
Aim 1:dose-response relationship between cumulative pregnancy complications and offsprings mental health in middle childhood



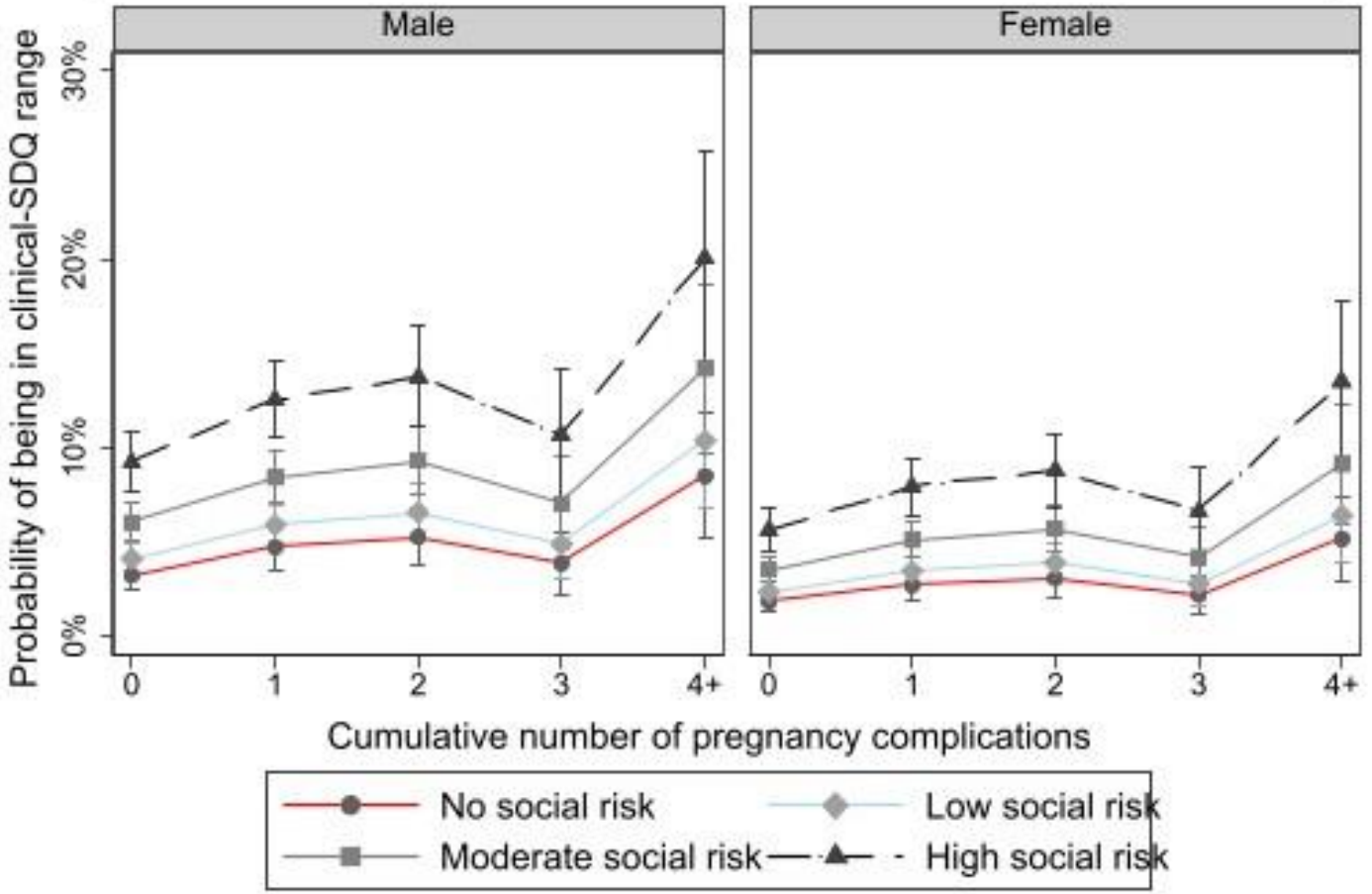
	Unadjusted (fixed PCs + random effect)	Fully Adjusted model
N=	8483	8483
1 complication	1.09(1.05-1.13) Z=4.82, p<.001	1.10(1.06-1.14) Z=5.12, p<.001
2 pregnancy complications	1.21(1.15-1.27) Z=7.65, p<.001	1.20(1.15-1.26) Z=7.63, p<.001
3 pregnancy complications	1.22(1.14-1.31) Z=5.37, p<.001	1.20 (1.12-1.29) Z=5.16, p<.001
4+ pregnancy complications	1.39(1.25-1.54) Z=6.13, p<.001	1.34 (1.21-1.48) Z=5.64, p<.001
Sex		.84 (.81-.87) Z=-11.15, p<.001
Low Social Risk		1.05(1.01-1.10) Z=2.39, p=.02
Moderate Social Risk		1.15 (1.09-1.20) Z=5.86, p<.001
High Social Risk		1.29 (1.22-1.36) Z=9.15, p<.001
Number of people smoking in pregnancy in household		1.12 (1.08-1.16) 1.23 (1.16-1.31) 1.36 (1.20-1.55)

Aim 2: whether cumulative pregnancy complications were associated with *clinically significant* mental health scores

- Generalised linear mixed models (GLMMs) with a random effect of participant ID.
- Binomial distribution with its default link function.
- Predicted probabilities calculated for being in clinical range for different “types”

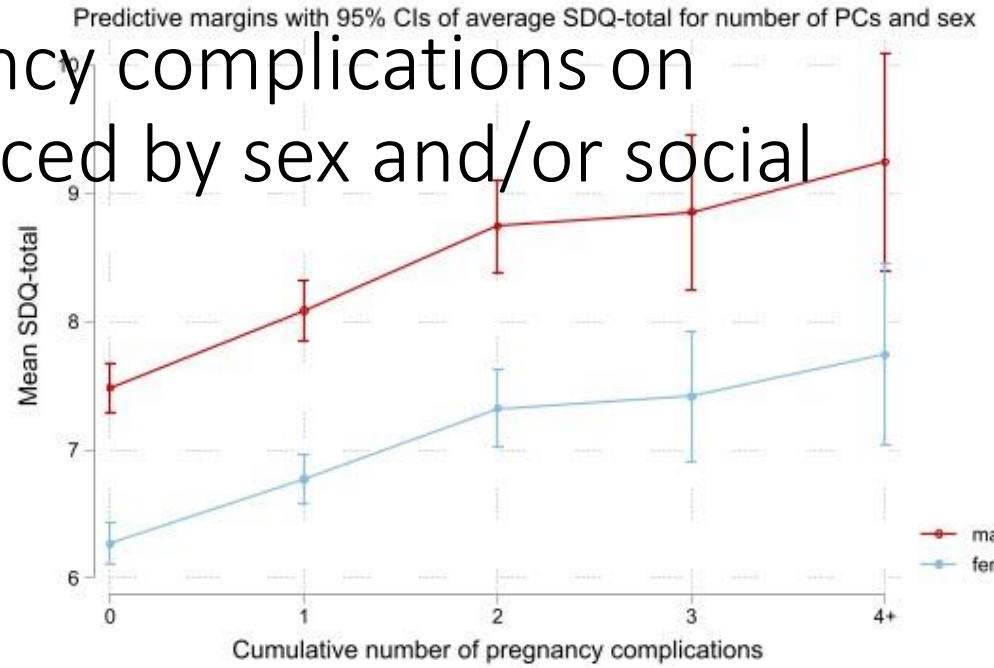


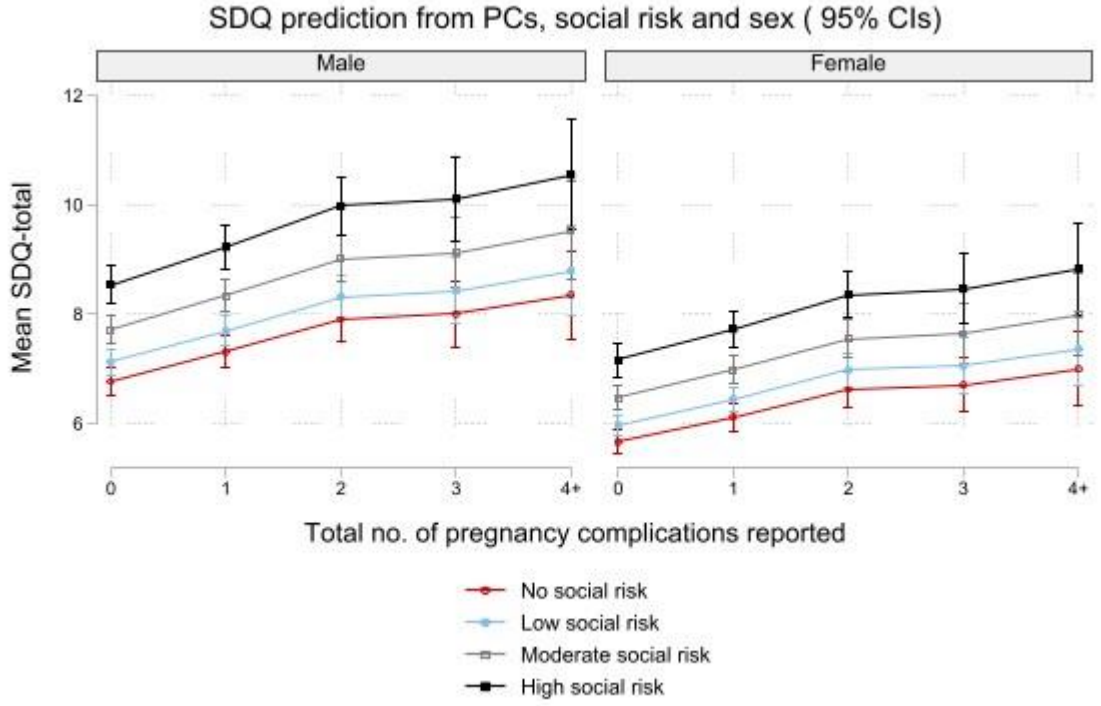
	Unadjusted Model (fixed PCs+ random effect)	Fully Adjusted Model
N=	8483	8483
1 complication	1.88 (1.37-2.59) Z=3.88, p=<.001	1.88 (1.37-2.59) Z=3.90, p<.001
2 Pregnancy complications	2.35 (1.56-3.54) Z=4.08, p<.001	2.31 (1.53-3.50) Z=3.96, p<.001
3 Pregnancy complications	2.03 (1.01-4.05) Z=2.00, p=.05	1.77 (.89-3.52) Z=1.62, p=.11
4+ Pregnancy complications	8.50 (4.01-18.03) Z=5.58, p<.001	6.88 (3.29-14.40) Z=5.12, p=<.001
Sex (female)		.43 (.32-.57) Z=-5.86, p=<.001
Low Social Risk		1.56 (1.00-2.43) Z=1.95, p=.05
Moderate social Risk		2.84 (1.81-4.46) Z=4.55, p=<.001
High Social Risk		6.83 (4.16-11.22) Z=7.58, p=<.001
Number of people smoking in pregnancy in household		1.49 (1.24-1.78) Z=4.25, p=<.001



Aim 3: whether the effect of pregnancy complications on childhood mental health was influenced by sex and/or social risk

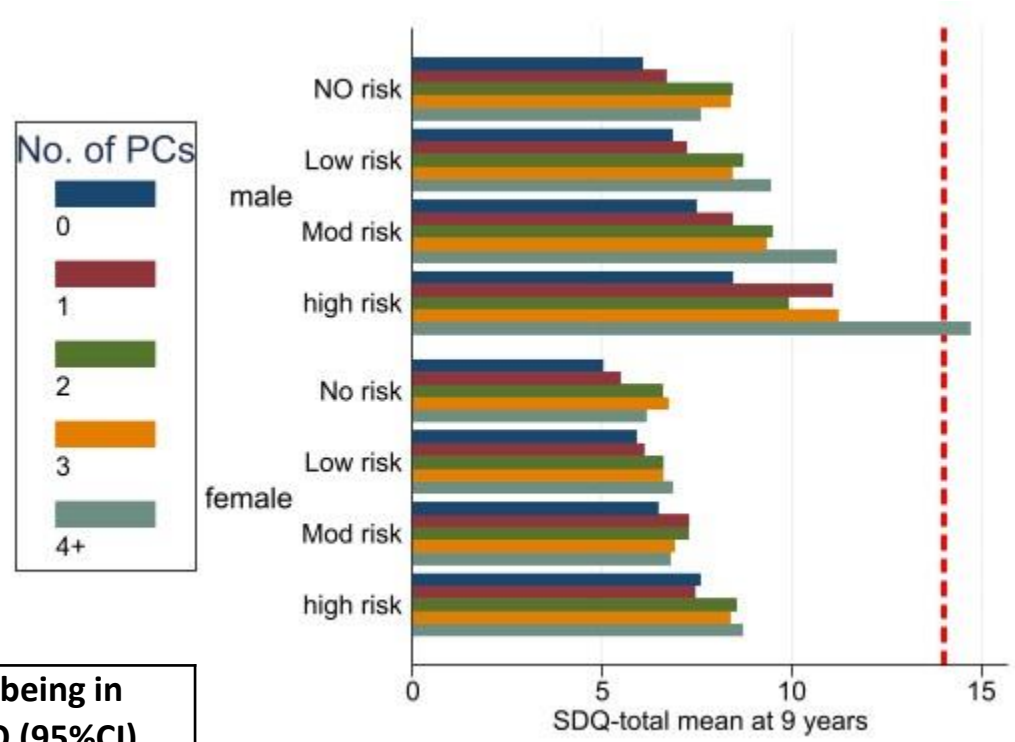
	Effect estimates and 95% CI's after adjustment		
Total no.of PCs	Total (n=8483)	Male (n=4277)	Female (n=4206)
None	REFERENCE		
1	1.89(1.37-2.59)	2.65(1.72-4.10)	1.18(.74-1.89)
2	2.31(1.53-3.50)	3.23(1.83-5.69)	1.50(.82-2.75)
3	1.77(.89-3.52)	2.27(.90-5.69)	1.25(.44-3.58)
4+	6.88(3.29-14.40)	10.73(3.73-30.86)	4.23(1.51-11.83)





Number needed to SCREEN

Using total complications of none ‘v’ any with clinical SDQ-total @ 9-years – we would need to screen 17 males to find 1 male with clinical level of problems but 100 females to find 1.



	Sex	Pregnancy complications	Social Risk	Predicted probability of being in the clinical range on SDQ (95%CI)
1	Males	4+	High	22.6% (15.4-29.7%)
2	Females	4+	High	15.6% (10.0-21.2%)
3	Males	0	Low	3.7% (2.9-4.5%)
4	Females	0	Low	2.1% (1.6-2.6%)
5	Males	0	High	9.0% (7.1-10.9%)
6	Females	0	High	5.5% (4.2-6.9%)
7	Males	1	Low	5.5% (4.4-6.7%)
8	Females	1	Low	3.2% (2.5-4.0%)

Note: “ideal types are particularly illustrative for interpretation when independent variables are substantially correlated” (Long & Freese, 2014).

Implications

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Growing Up in Ireland

- The majority of women (78.6%) experienced none or only one pregnancy complication. However, 21.4% of women experienced 2 or more PCs, and their children had **double to six fold** increased odds of experiencing clinically significant levels of mental health symptoms in middle childhood compared to children whose mothers experienced no complications
- We cannot infer a causal relationship underlying the association between PCs and child mental health however cumulative PCs could be considered as a possible **prognostic** factor for child mental health. Our findings highlight the potential of the cumulative number of PCs experienced to be used to screen/identify children at-risk of poorer mental health outcomes who may benefit from early intervention.
- Although we know there is a relationship between **social-risk** and outcomes such as cognition in high-risk groups e.g. preterm birth (Beauregard et al., 2017), our findings highlight a relationship between social-risk and *mental health* outcomes at population-level, that is, for *all* children.
- **Economically**, the costs of intervening for children at-risk preventatively has been shown to be lower and require less intense treatment that the cost of providing interventions targeting children who already present in the clinical range (Campbell….& Pan, 2014). Screening for PCs and SR at baby developmental appointments may help identify vulnerable babies during a unique window of opportunity for early interventions promoting both maternal and child well-being ***prior*** to mental health difficulties being evident.
- It is important to note that although there was increased risk among children exposed to PCs, the majority of children (ranging from 80-95%) of mothers with PCs did not have mental health problems. Further research into determinants of such resilience might be important for designing interventions for children at-risk. Additionally, future research should consider cumulative exposures in pregnancy across **biopsychosocial** domains not just biological, psychological or social exposures independently.

GOAL B

Optimum physical and mental health

OBJECTIVE 6

Babies, young children and their parents enjoy positive mental health

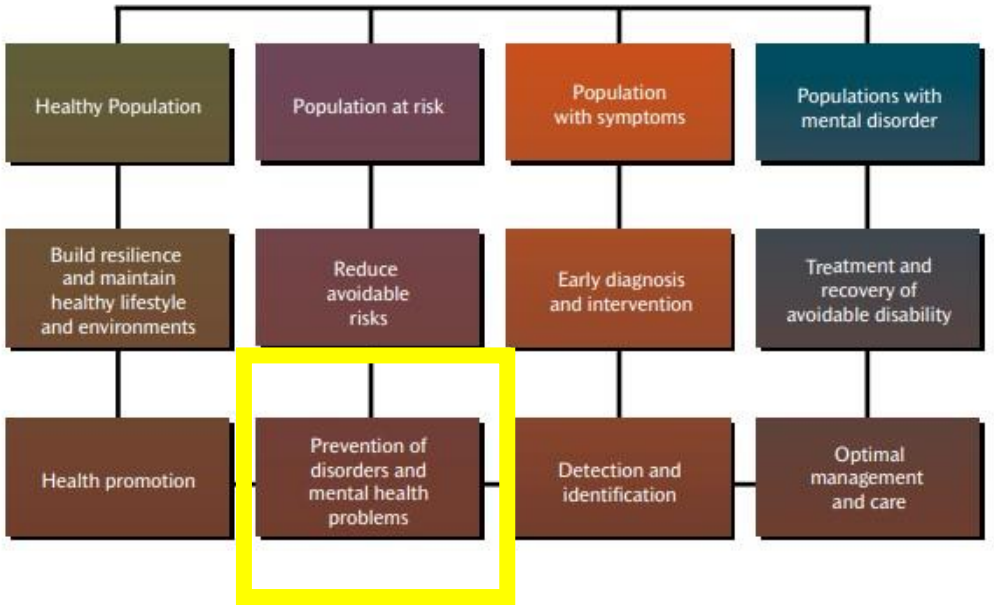
First 5

Strategic Action	Action	Lead and Partner(s)	Key Output by 2021
6.1 **Improve the early identification of mental health problems among babies, young children and families.**	B.6.1.1. Provide information and guidance on promoting and supporting positive mental health among pregnant women, babies, young children and families and carry out a public information campaign to raise awareness of the importance of promoting social-emotional development, positive mental health and reducing the impact of early childhood trauma in babies and young children.	Lead: HSE Partner: DoH	Infant mental health promoted and supported through better information sources. See also actions B.6.1.6 and B.6.2.6.
	B.6.1.2. Enhance efforts to promote positive mental health among pregnant women, babies, young children and their families in all resources and service contacts by extending the Making Every Contact Count: A Health Behaviour Change Framework and Implementation Plan for Health Professionals in the Irish Health Service to include mental health.	Lead: HSE	Scoping document to outline the expansion of Making Every Contact Count (MECC) to include the promotion of mental health and wellbeing as part of the revised implementation plan for the programme from 2021.

The National Healthy Childhood Programme

Figure 5.1 Opportunities for mental health promotion: A population perspective

Adapted from Building capacity to promote mental health of Australians.[66]



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