

Enduring Value of the All Our Families Cohort Study

ACHRI Retreat, December 15, 2022



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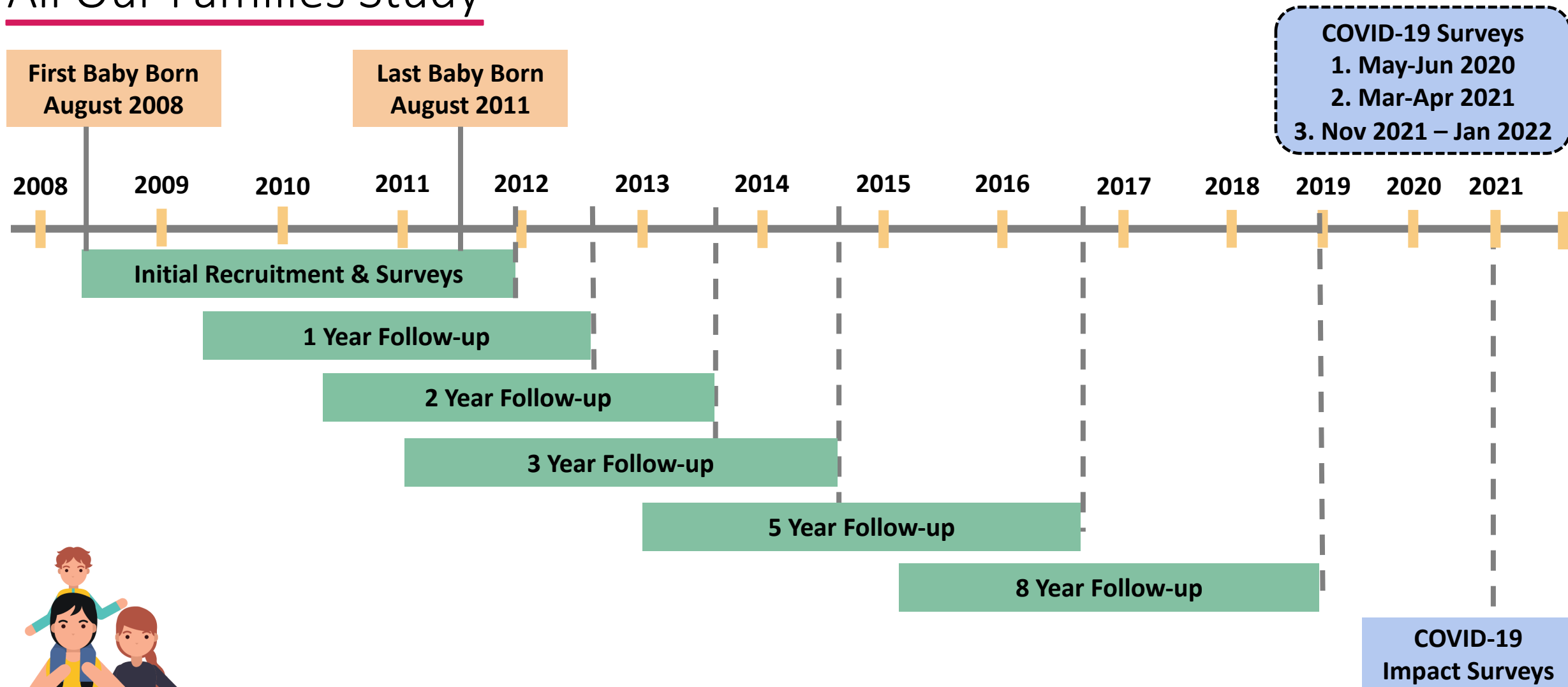


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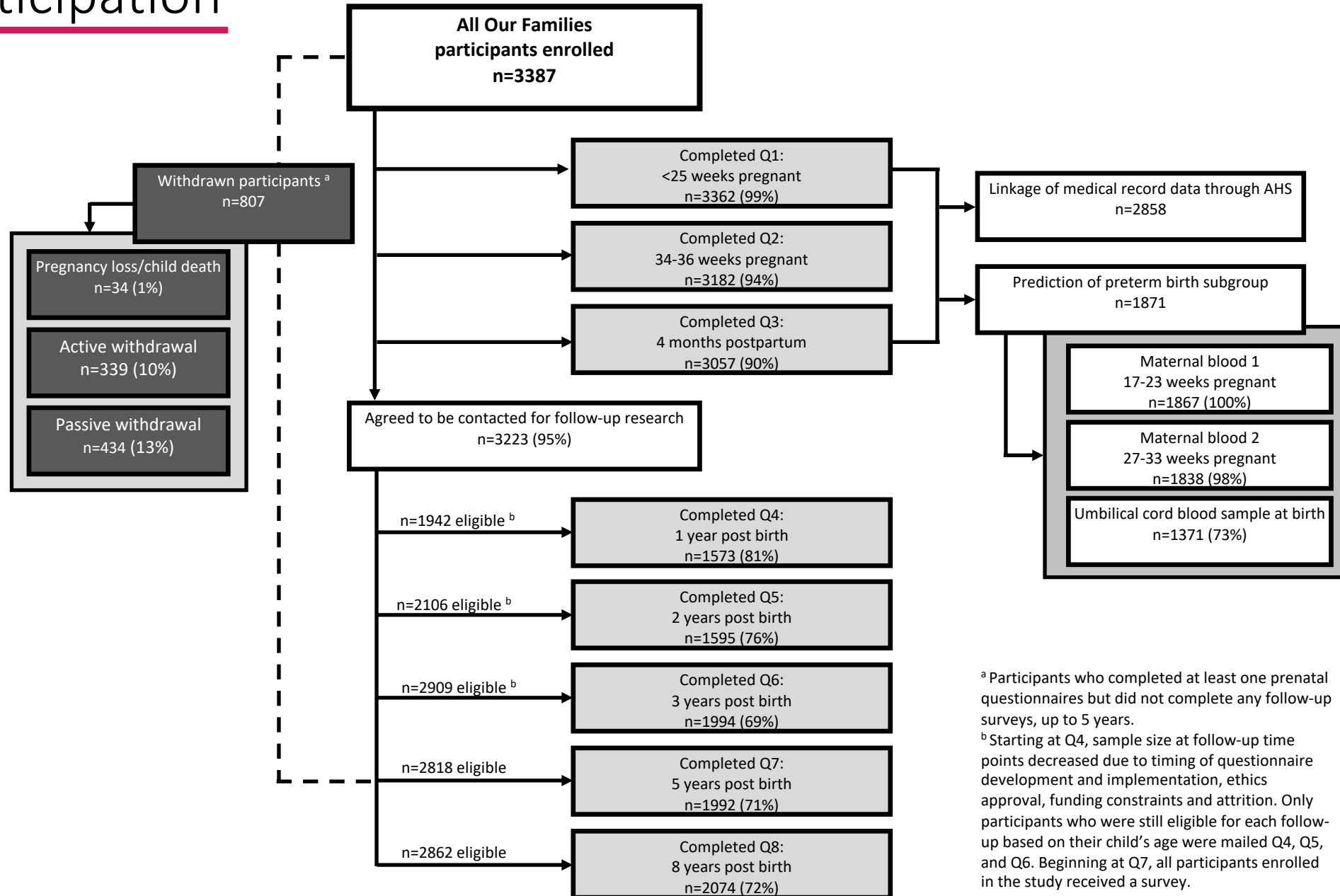
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All Our Families Study



- AOF families are typically educated, married and employed
- AOF median family income was comparable to Calgary median family income (~100K), yet higher than Canada as a whole

Participation



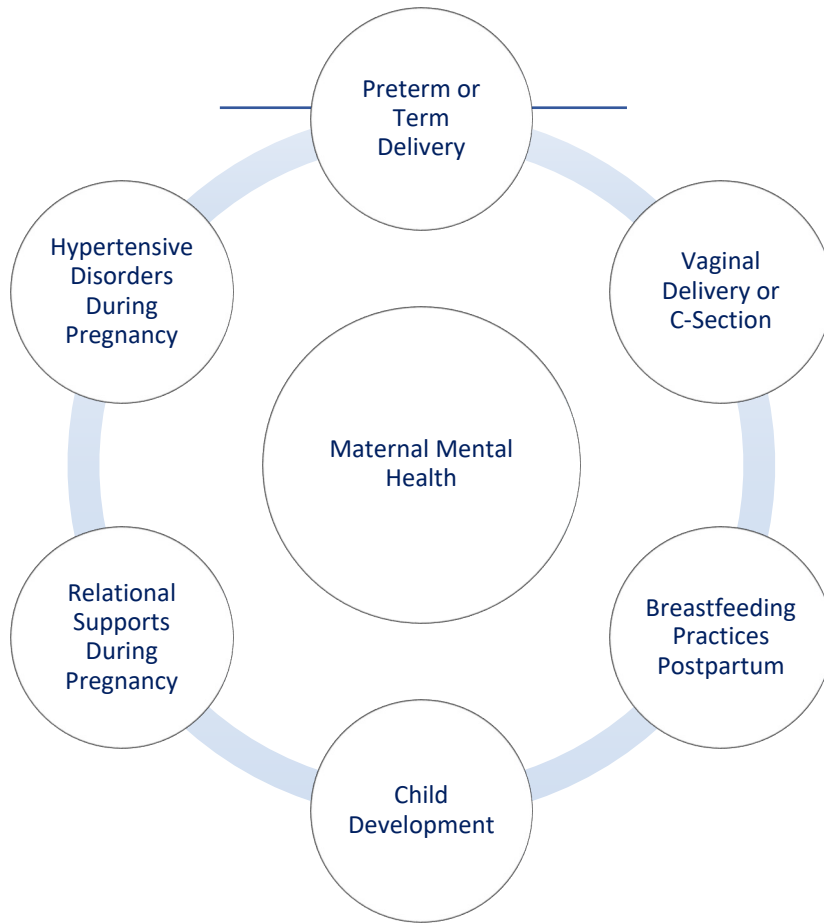
^a Participants who completed at least one prenatal questionnaire but did not complete any follow-up surveys, up to 5 years.

^b Starting at Q4, sample size at follow-up time points decreased due to timing of questionnaire development and implementation, ethics approval, funding constraints and attrition. Only participants who were still eligible for each follow-up based on their child's age were mailed Q4, Q5, and Q6. Beginning at Q7, all participants enrolled in the study received a survey.

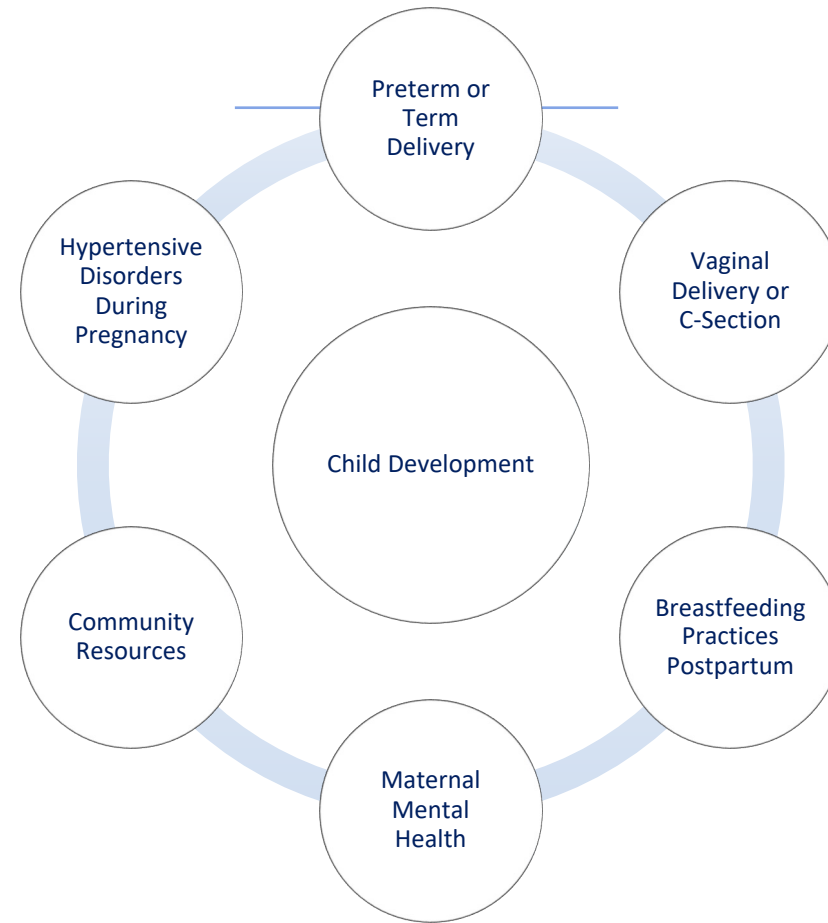
Benefits of the AOF Study Cohort

- Ability to understand complex relationships between the prenatal period and human development, accounting for the influence of genes, lifestyle, social and physical environments on long term health.
 - **The Life Course Perspective.**
- Alberta data comparison to other pregnancy cohorts including the CHILD cohort study in Ontario and the Quebec Pregnancy Cohort.
 - International collaborations including Centering Pregnancy in the USA, LifeCycle and EUCAN projects in Europe.
- Comparison data to understand the effects of unexpected environmental exposures, such as the Calgary Flood (2013) and COVID-19 pandemic (2020-2022) → AOF data from before, during, and after such exposures.

Benefits of Pregnancy Longitudinal Cohorts



Examples of exposures that can impact maternal mental health.



Examples of exposures that can impact child development.



What Have We Studied?

- Gene expressions associated with preterm birth. (Heng et al., 2016)
- Second trimester cytokine profiles associated with gestational diabetes and hypertensive disorders of pregnancy. (Hart et al., Accepted)
- Child development at ages 1, 2, 5, 8 and (soon) 13 years!
- Maternal mental health and...
 - Maternal metabolites during pregnancy (Laketic K, et al., In submission)
 - Obstetric outcomes (Bayrampour et al., 2015)
 - Social support during pregnancy (Hetherington et al., 2018)
 - Maternal adverse childhood experiences (Racine et al., 2018)
 - Preterm birth (McDonald et al., 2014; Doktorchik et al., 2018; Adhikari et al., 2020)
 - Breastfeeding practices and child weight at 24 months (Shay et al., 2020)
 - Child development at age 5 (Hentges et al., 2020)

What Have We Studied?

- Methods...
 - Comparing anxiety scales (Adhikari et al., 2020)
 - Psychometric properties of 3 mental health scales (Benediktsson et al., 2016)
 - Spielberger State Anxiety Scale, Perceived Stress Index, and Life Optimism Test
 - Development of prenatal psychosocial screening tool for postpartum depression and anxiety (McDonald et al., 2012)
 - Postpartum depression screening effectiveness (Premji et al., 2019)
 - Community vs. population recruitment (Leung et al., 2013)
 - Mother's recall vs. electronic health records (Bat-Erdene et al., 2013)
 - Quality assessment of RNA in long-term storage (Stephenson et al., 2020)
 - Disaster response resilience prediction with cortisol validation (Kingston et al., 2019)

And many more!

Over 200 peer reviewed manuscripts published to date.



Genetics and Preterm Birth

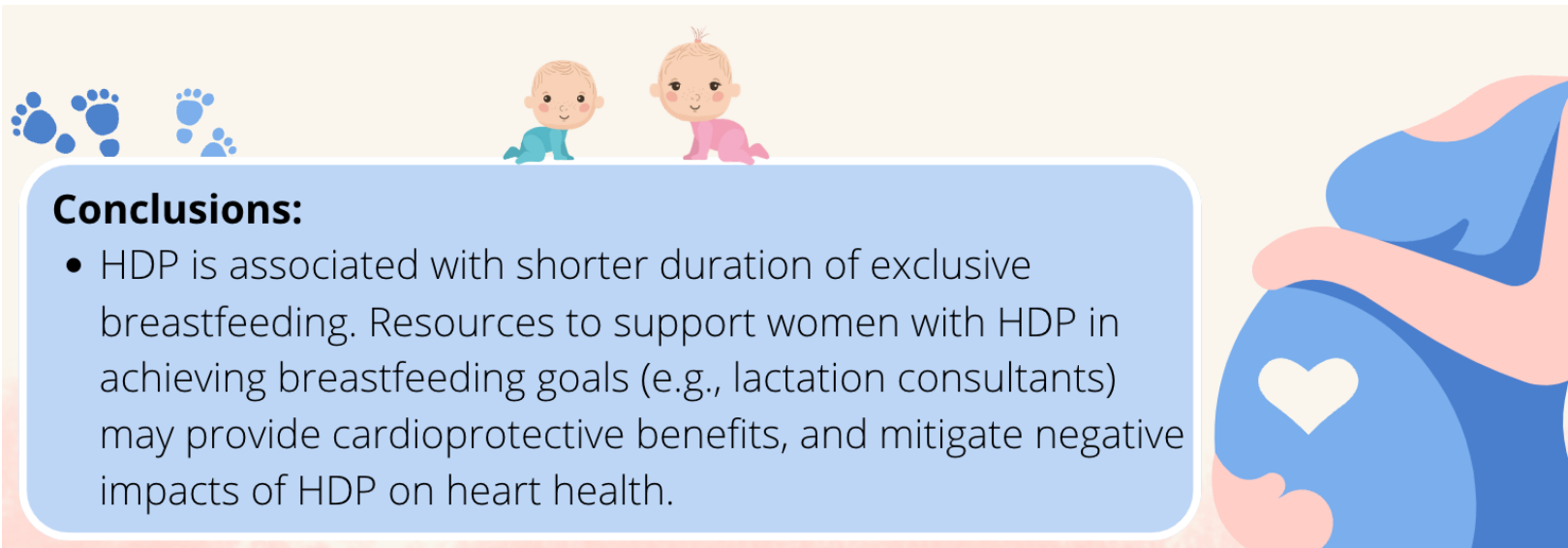
Model		AUC ROC	Sensitivity	Specificity
A: Time 1	<i>Clinical Model, ATAD3A, VNN1, ABT1, GRWD1 and PCDHGA12</i>	0.945	70.6%	88.6%
B: Time 2	<i>Clinical Model, NEAT1, MIR601, RPH3A, CST13P, LOC284561, LOC101060029, EEF1D, CD63 and EBAG9</i>	0.984	78.7%	92.1%
C: Δ (T2 – T1)	<i>Clinical Model, FPR3, MIR3612, UPF2, SNORD91A and LOC100506882</i>	0.960	76.6%	91.2%
Clinical baseline model	Hx abortion, Hx PTB, Anaemia, Bleeding, UTI	0.793	41.2%	91.2%
A: Time 1	<i>ATAD3A, VNN1, ABT1, GRWD1 and PCDHGA12</i>	0.858	56.9%	90.4%
B: Time 2	<i>NEAT1, MIR601, RPH3A, CST13P, LOC284561, LOC101060029, EEF1D, CD63 and EBAG9</i>	0.858	51.1%	86.8%
C: Δ (T2 – T1)	<i>FPR3, MIR3612, UPF2, SNORD91A and LOC100506882</i>	0.862	61.7%	87.7%

Biological Data

- T1 Plasma and T2 Serum samples
 - To date used for cytokine / metabolomic / metallomic profiling
 - Second trimester cytokine profiles associated with gestational diabetes and hypertensive disorder of pregnancy.
 - Hart P, Stephenson N, Scime N, Tough SC, Slater DM, Chaput KH. PloS One (Accepted)
 - Serum metallomic signatures associated with pregnancy smoking exposure.
 - Laketic K, et al., (In submission)
 - Maternal metabolites indicative of mental health status during pregnancy: a preliminary investigation.
 - Laketic K, et al., (In submission)
 - Mid-pregnancy maternal inflammatory cytokines and gene expression profiling during pregnancy: Implications for preterm birth and mechanisms of labour.
 - Hornaday K, et al (in preparation)
- DNA isolated and available to address research questions
 - To date research questions
 - Relationship between psychosocial distress in pregnancy and two genes associate with human social interaction: a pilot study. Dewell S et al., 2018
 - Role of oxytocin receptor variants in stress and preterm birth (ongoing)
 - Role of prostaglandin pathway variants and spontaneous preterm birth (ongoing)

Hypertensive Disorders of Pregnancy (Horsely et al., 2022)

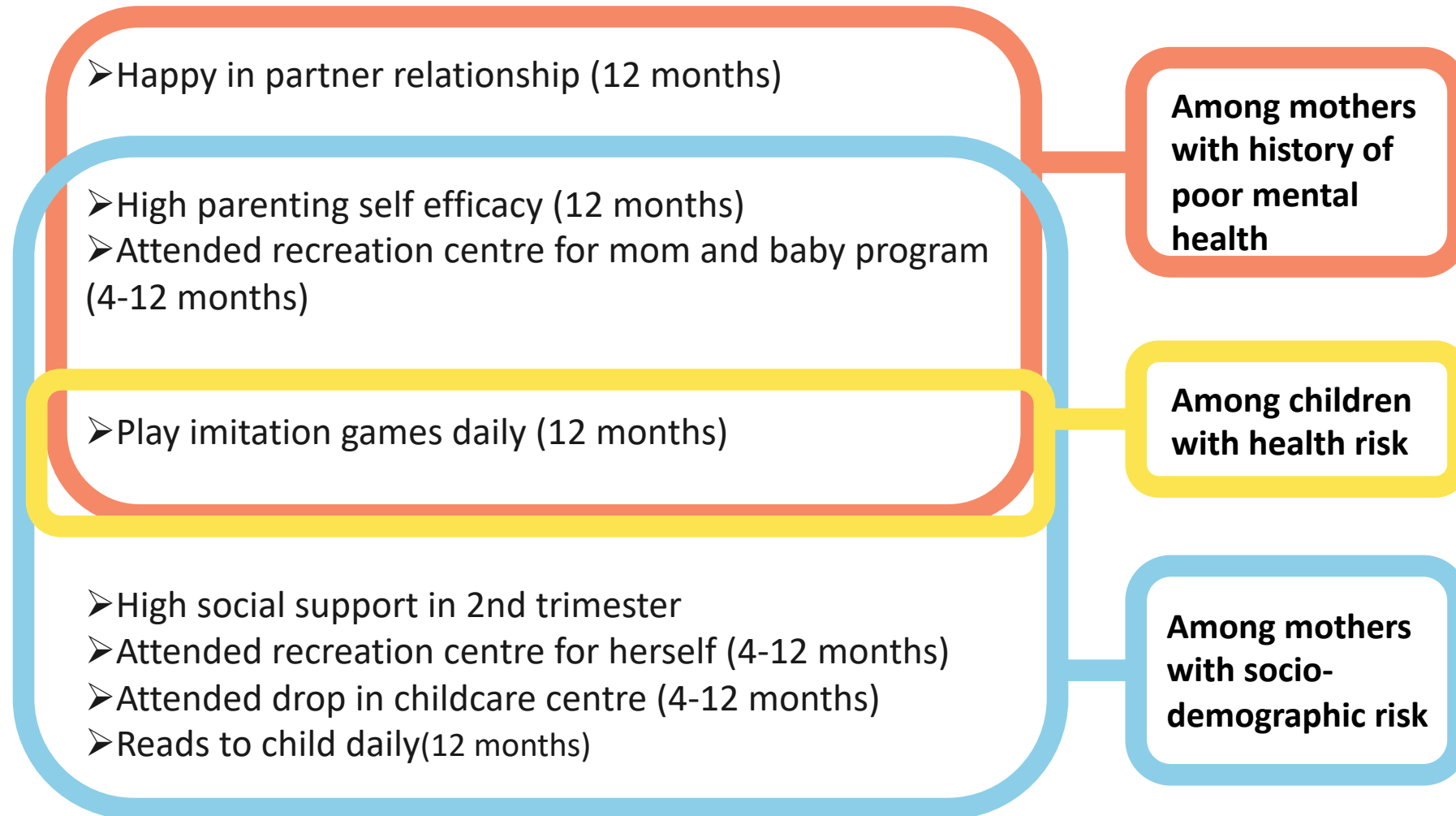
- Compared to women without HDP, women with HDP reported:
 - Higher rates of overweight/obesity.
 - Higher rates of planned or emergency cesarean delivery.
 - Gave birth ~1 week earlier.
 - Shorter intended breastfeeding duration (by ~10 weeks), and shorter total breastfeeding duration (by ~6 weeks).
 - Lower rate of exclusive breastfeeding practice (36% vs 60%), and higher rates of formula only feeding (28% vs 15%).



Conclusions:

- HDP is associated with shorter duration of exclusive breastfeeding. Resources to support women with HDP in achieving breastfeeding goals (e.g., lactation consultants) may provide cardioprotective benefits, and mitigate negative impacts of HDP on heart health.

Preventing Delays



Child Development



- **Greater screen use** at 24 months was associated with **lower reading** at 36 months, which in turn was associated with **greater screen use** at 60 months. (McArthur et al., 2020)
- **Maternal mental health risks impact child development at age 2** (e.g., behavioural problems, delayed social-emotional competencies) but factors such as social support during pregnancy and high relationship happiness can protect against child development problems. (McDonald et al., 2016)
- Poor maternal mental health and high levels of maternal neuroticism were associated with **increased risk of externalizing problems** at age 3. (Hetherington et al., 2019)
 - Boys whose mothers did not participate in community activities were **4 times more likely** to have externalizing problems.
- **Poor self-regulation** at age 5 was associated with **excess screen time** (>1 hour/ day), lower family income, maternal mental health difficulties, and male sex. (Hetherington et al., 2020)

Maternal Mental Health (Adhikari et al., 2022)

- The adjusted odds ratio for a woman having **anxiety and/or depression** was **3.5** for women juggling family responsibilities, and **2.4** for women with stressful partner relationships.
- **Increased mental health difficulties** were associated with financial crunch and poor partner relationships.



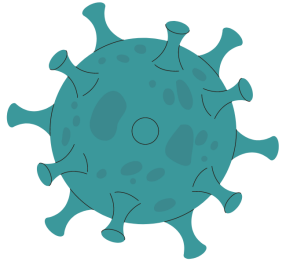
Women **without challenges** in roles or relationships had **23% lower predicted probability** of anxiety and/or depression.

Upcoming Projects

- From languishing to flourishing.
- Prenatal cannabis exposure and child neurodevelopmental outcomes.
- Oxytocin receptor variants: possible genetic link to spontaneous preterm birth.
- Parent-youth mental health before and after the pandemic.
- Will the kids be alright?

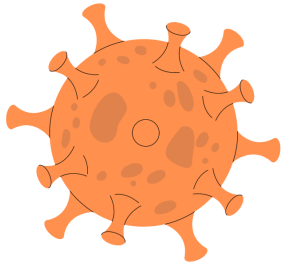


COVID-19 Surveys



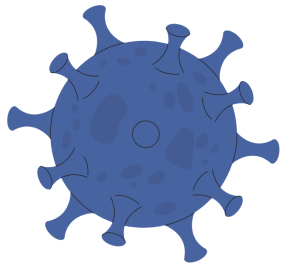
Survey 1: May – June 2020

- Mothers (N=1815, 55%)
- Youth (N=893, 69%)



Survey 2: March – April 2021

- Mothers (N=1361, 56%)
- Youth (N=1045, 43%)



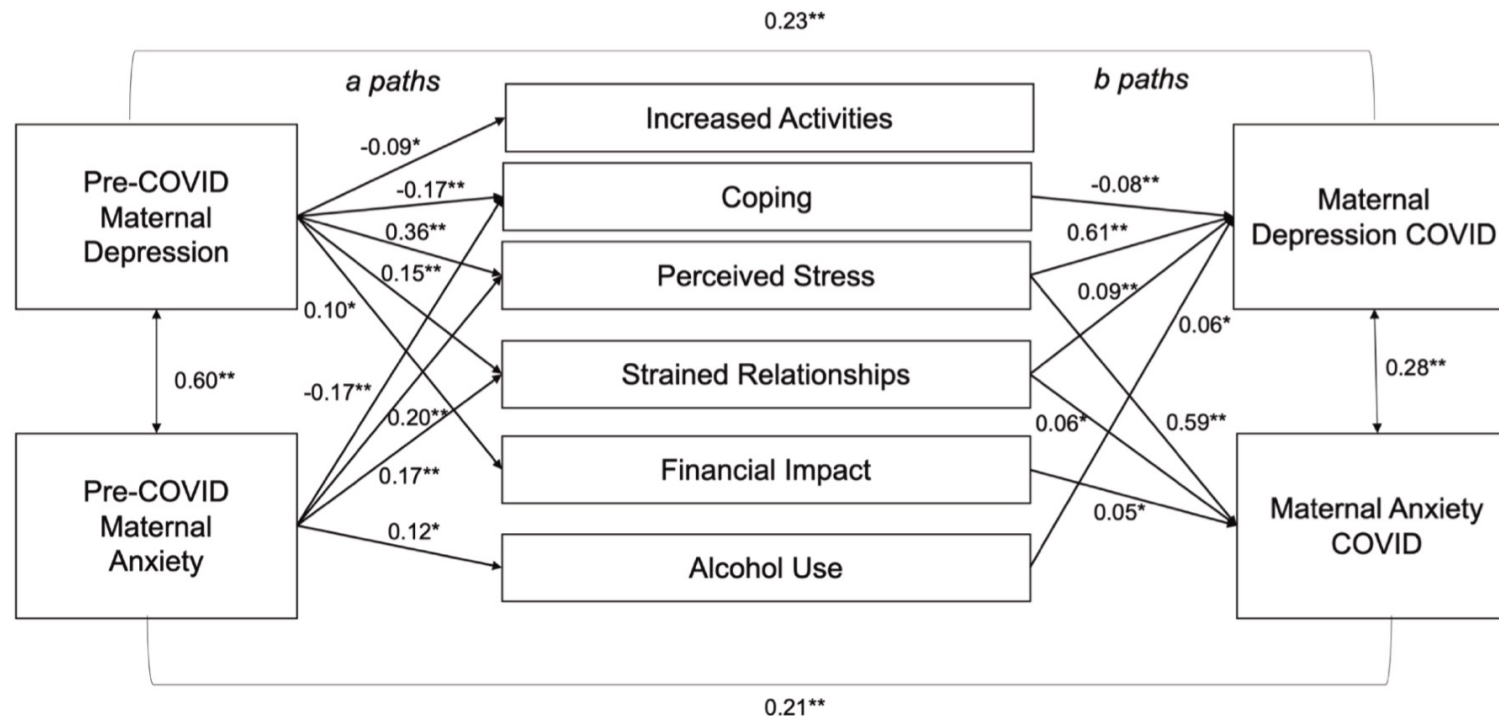
Survey 3: Nov 2021 – Jan 2022

- Mothers (N=1280, 54%)
- Youth (N=1034, 43%)



COVID-19 Family Impacts

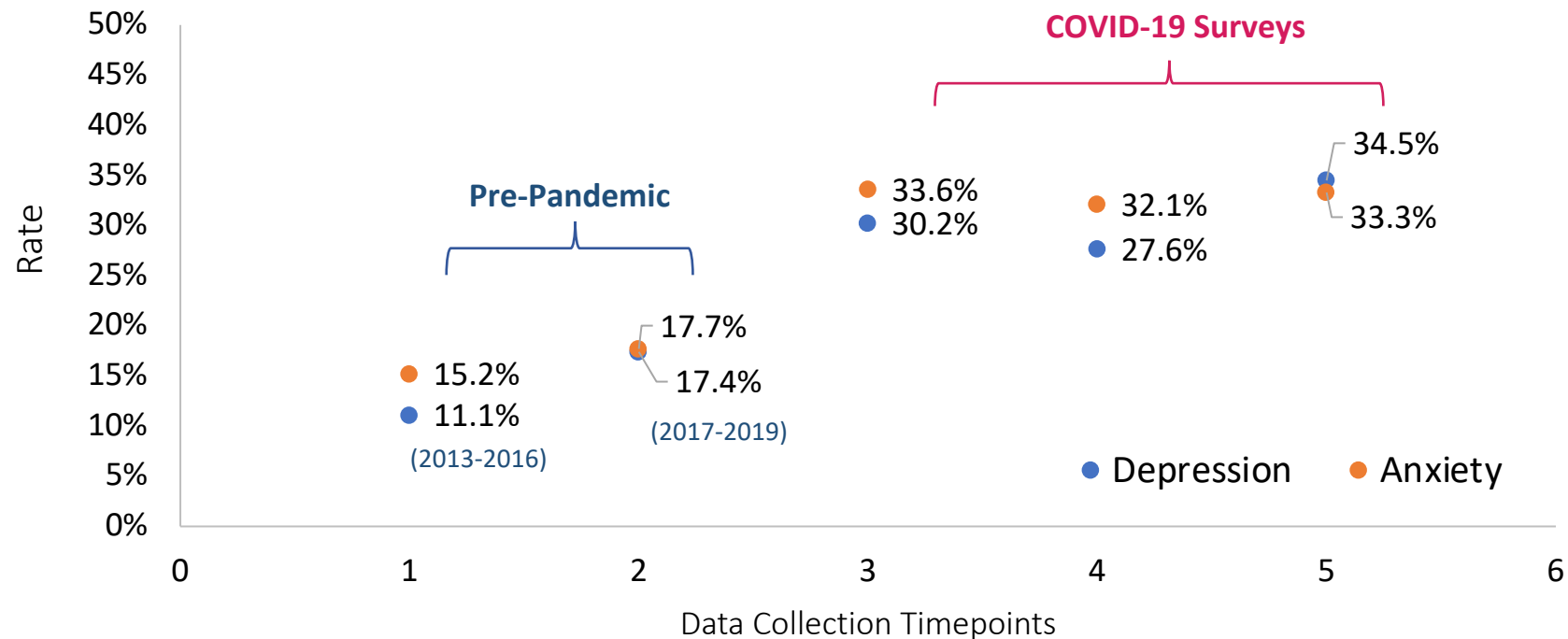
- 23% of families experienced moderate to major difficulty meeting financial obligations and essential needs during the first year of the pandemic
 - 58% of families had some form of financial impact (e.g., job loss, reduced hours), affecting families across the socioeconomic spectrum



Perceived stress, coping attitudes, and interpersonal relationships are 3 potential intervention targets to mitigate mental health symptoms (Racine et al. 2021)

Maternal Impacts

- Maternal **depression** rates increased (15% → 33%)
- Maternal **anxiety** rates increased (11% → 34%)
- Women with **income disruptions, difficulty balancing work and home schooling, & difficulty obtaining childcare** were most affected. (Racine et al., 2021)

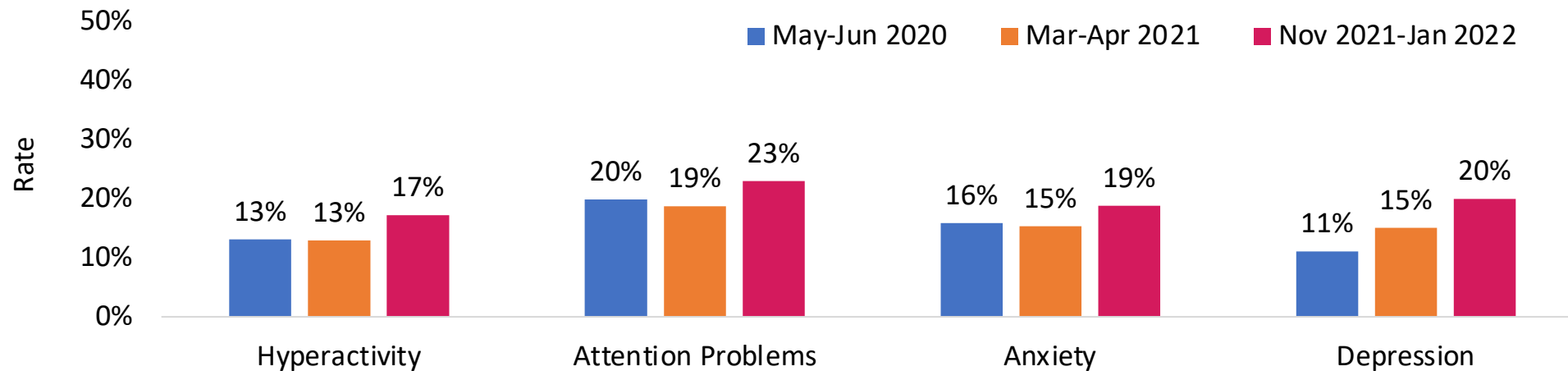




Youth Impacts: Behaviour and Mental Health

From early to late pandemic:

- Youth **depression** rates increased 11% → 20%
- Youth **anxiety** rates increased 16% → 19%
- Depression and anxiety were **higher** among those with **less connectedness to caregivers, less sleep, & more screen time.**



Family Screen Time

- Using screens to **engage with others or connect with family** can be beneficial.
- **Setting limits** reduces overall screen use.
- **Physical activity and recreation** decrease overall screen use.



What Families Can Do



The 3 R's of Support:

Resources – financial and structural (e.g., childcare)

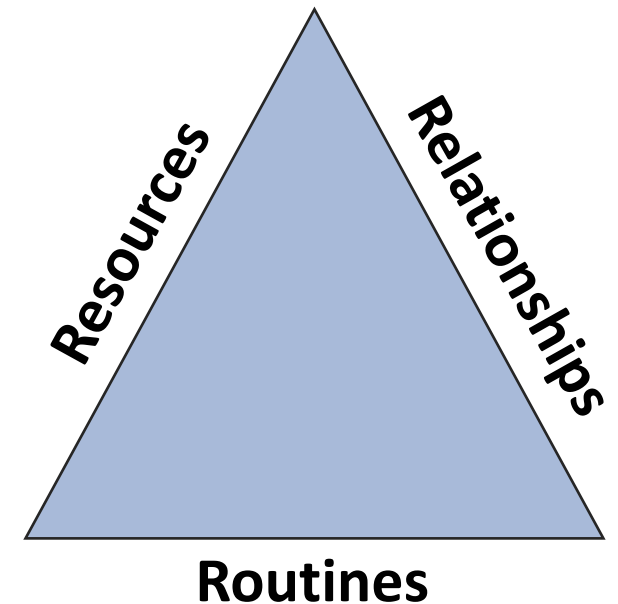
- > *Reduces physiologic stress, enables job stability, facilitates skill development*

Relationships – commit to social connections

- > *Increases oxytocin, normalizes experiences, increases belonging, improves mood*

Routines – sleep, meals, recreation, school, screens

- > *Reduces decision making fatigue which frees resources for complex decisions, helps children thrive*



What Communities Can Do

Have a Social Snack!

HOW TO BUILD NATURALLY SUPPORTIVE COMMUNITIES WITH SOCIAL SNACKING



- Challenge yourself to three social snacks a day
- Post snacking ideas on neighbourhood websites
- Post stories of a social snack that made a difference in your day



Brief, informal (and safe) positive interactions that contribute to happiness, sense of belonging and identity



<https://www.connectionsfirst.ca/>

What Decision Makers Can Do



Invest in Mental Health Services and Supports

- Access to psychological services, including telehealth.
- Prioritize mechanisms for children and youth to stay engaged
- Resources and supports to address family time-crunch
 - Workplace protection
 - Childcare



Acknowledgements



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Questions?



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