Mental Health and Pregnancy under COVID-19

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Introduction to Topic and Motivation

- Interested in mental health and other factors impacting pregnant women during COVID-19 pandemic
- Data has significant health implications and relevant as we emerge from pandemic
- Looks specifically at impact of COVID-19 on mental health and factors affecting
- Able to investigate potential long-term effects on children born during the pandemic, which may lead to other health factors
- Goal is to hopefully understand the correlation of mental health on mothers and the development of infant babies

Introduce Data

- Data collected from Canada (2020-2021)
- Utilized Research Electronic Data Capture (REDCap), promoted through Facebook and Instagram
- Respondents (aged 17 to 35 years) followed-up multiple times during their pregnancy until one year post-birth
- Observations focused on the mothers' mental health and the babies' birth information such as weight, height, date of birth, and gestational age
- Mental health information was collected through Edinburgh Postnatal Depression Scale and PROMIS anxiety scale (survey system)

Raw Pregnancy Dataset

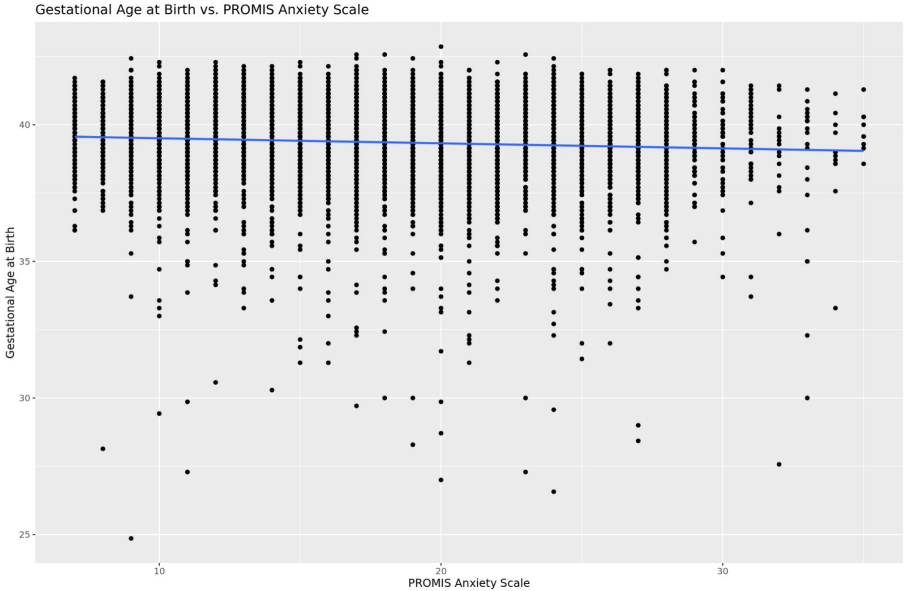
A view of the first 50 observations in the dataset captured through REDCap

OSF_ID	Maternal_Age	Household_Income	Maternal_Education	Edinburgh_Postnatal_Depression_Scale	PROMIS_Anxiety	Gestational_Age_At_Birth	Delivery_Date(converted to month and year)	Birth_Length	Birth_Weight	Delivery_Mode	NICU_Stay	Language	Threaten_Life	Threaten_Baby_Danger	Threaten_Baby_Harm
1	38.3	$200,000.00	Masters degree	9	13	39.71	Dec2020	49.2	3431	Vaginally	No	English	2	3	27
2	34.6	$200,000.00	Undergraduate degree	4	17							English	2	33	92
3	34.3	$100,000 -$124,999	Undergraduate degree									French			
4	28.8	$100,000 -$124,999	Masters degree	9	20	38.57	Dec2020	41	2534	Vaginally	No	French	53	67	54
5	36.5	$40,000-$69,999	Undergraduate degree	14	20	39.86	Oct2020	53.34	3714	Caesarean-section (c-section)	No	English	23	32	71
6	38.3	$150,000 - $174,999	Undergraduate degree	3	8	38.57	Jun2020					English	29	36	33
7	34.5	$200,000.00	High school diploma	8	15							English	24	30	32
8						38	May2021	50.17	2892	Caesarean-section (c-section)	Yes	English			
9	33.1	$100,000 -$124,999	College/trade school	1	7	40.86	Nov2020	55.88	4480	Vaginally	No	English	27	76	72
10	25.8	$70,000-$99,999	College/trade school									English	50	88	84
11	28.6	$70,000-$99,999	Less than high school diploma	20	28							French	0	50	98
12	29.5		Undergraduate degree			38.71	Sep2021	54.61	3913	Caesarean-section (c-section)	No	English			
13	29.7	$125,000- $149,999	Undergraduate degree									French			
14	29.2	$70,000-$99,999	Masters degree	14	17	41	Oct2020	47	3084	Vaginally	No	French	68	69	81
15	31.8	$200,000.00	Doctoral Degree	3	14	30.29	Mar2021	32	1050	Caesarean-section (c-section)	Yes	French	30	30	50
16	30.1	$150,000 - $174,999	College/trade school	14	17	39.43	Jun2021	47.63	3289	Vaginally	No	English	79	76	97
17	31	$100,000 -$124,999	College/trade school	16	26							French	73	74	97
18	27.1	$200,000.00	Undergraduate degree	0	8	40.43	Jun2021	48	2694	Vaginally	No	English	50	76	64
19	34.6	$175,000- $199,999	High school diploma	8	24	39.71	Jan2021	53.34	4678	Caesarean-section (c-section)	Yes	English	23	67	70
20	33	$150,000 - $174,999	Masters degree	18	31	41.14	Apr2021	53.34	3289	Vaginally	No	English	85	100	100
21	30.7	$70,000-$99,999	Undergraduate degree	16	29	35.71	Jun2020	49.53	2694	Vaginally	Yes	English	34	50	83
22	34.3	$40,000-$69,999	Undergraduate degree			37.86	Jun2021	46.99	2694	Vaginally	No	English			
23	32.5	$70,000-$99,999	College/trade school	9	22	39.14	Oct2020					English	43	31	29
24	26.6	$200,000.00	Undergraduate degree	15	28							English	85	85	99
25	28	$100,000 -$124,999	Undergraduate degree	6								English	43	60	68
26	33.6	$125,000- $149,999	Undergraduate degree	1	7							English	9	10	15
27	33.1	$100,000 -$124,999	Undergraduate degree									English			
28	28	$20,000- $39,999	Masters degree	10	18	40.57	Jun2020	50.8	3799	Vaginally	No	English	21	68	73
29	25.4	$40,000-$69,999	High school diploma									French	25	50	50
30	33.8	$200,000.00	Undergraduate degree	6	13	40.86	Aug2020	52	3410	Vaginally	No	English	27	26	50
31	38	$200,000.00	College/trade school	9	17	38.86	Aug2020	48.26	2863	Vaginally	No	English	22	22	30
32	35.2	$125,000- $149,999	Undergraduate degree	9	16	38.29	Aug2020	53.34	3062	Vaginally	No	English	54	63	67
33	21.8	Less than $20, 000	Less than high school diploma	11	22	41.14	Aug2021	49.5	3200	Vaginally	No	French	0	0	0
34	20.2	Less than $20, 000	College/trade school	27	33							French	74	92	95
35	38	$70,000-$99,999	Undergraduate degree	10	20	40.14	Aug2020	53.34	3289	Vaginally	No	English	16	15	31
36	25	$20,000- $39,999	Undergraduate degree	18	27	40.14	Jun2020	49	3431	Vaginally	No	English	29	28	25
37	21.8	$40,000-$69,999	High school diploma	12	26							English	50	92	91
38	31.7	$125,000- $149,999	Undergraduate degree	8	21	39	Dec2020	54.61	3771	Caesarean-section (c-section)	No	English	30	70	75
39	27.8	$70,000-$99,999	Undergraduate degree									English	58	58	15
40	28.5	$40,000-$69,999	Masters degree	8	16							English	75	76	53
41	35.3	$175,000- $199,999	Undergraduate degree	7	24	40.57	Apr2021	38.1	3034	Vaginally	No	English	36	60	100
42	24.7	$70,000-$99,999	College/trade school	19	29							English	94	95	92
43	29.8	$40,000-$69,999	College/trade school	17	25	38.43	Jul2021	49	2892	Vaginally	No	French	50	69	98
44	26.4	$100,000 -$124,999	High school diploma	15	26							English	49	47	50
45	31.8	$150,000 - $174,999	College/trade school	5	17	39.14	Jun2020		3827	Vaginally	No	English	56	62	92

Do pregnant individuals with higher anxiety and depression levels (measured in the PROMIS and Edinburgh scale) tend to have a shorter gestational age at birth? To what extent are these factors correlated with the gestational age at birth?

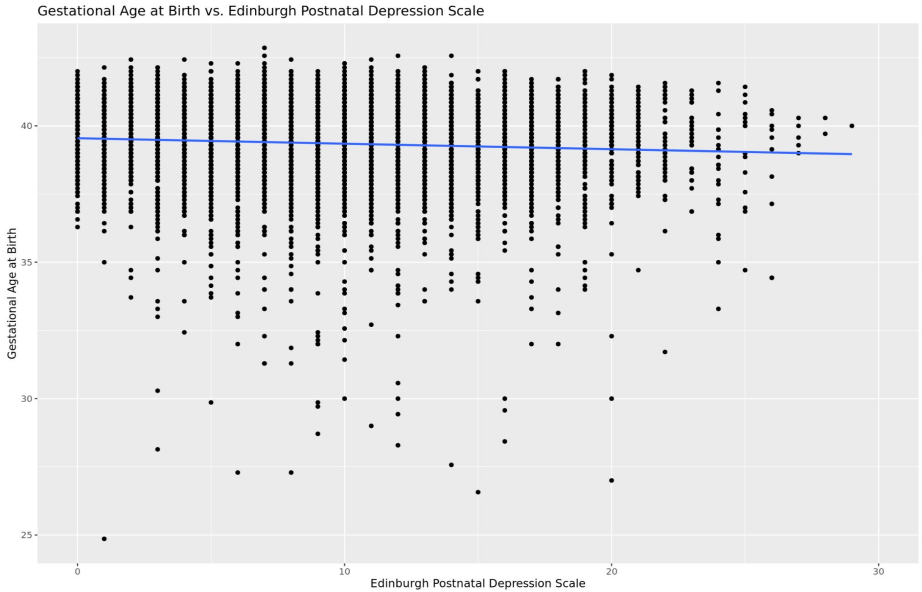
Analysis

Relationship of the Offsprings' Gestational Age and Anxiety (measured through the Promis Anxiety Scale)



R-Squared Value: 0.004481741

Relationship of the Offsprings' Gestational Age and Depression (measured through the Edinburgh Postnatal Depression Scale)



R-Squared Value: 0.00475772

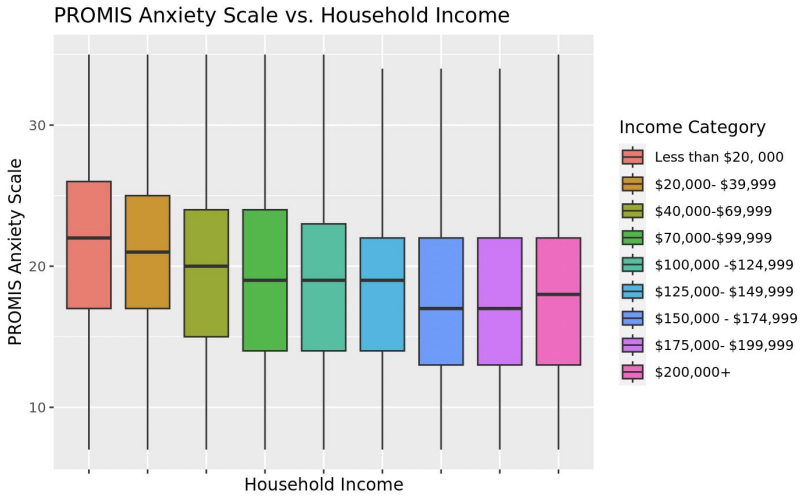
Note: These models have a near 0 p-value, which shows evidence of a relationship between the variables. The low r-squared values signifies that the model should not be used to predict values.

A Deeper Analysis on the Factors Leading to Poor Mental Health of Mothers During the Pandemic

The pregnancy dataset includes the mothers' income bracket, age, education, and a subjective measure on how threatened they are with their offsprings' health.

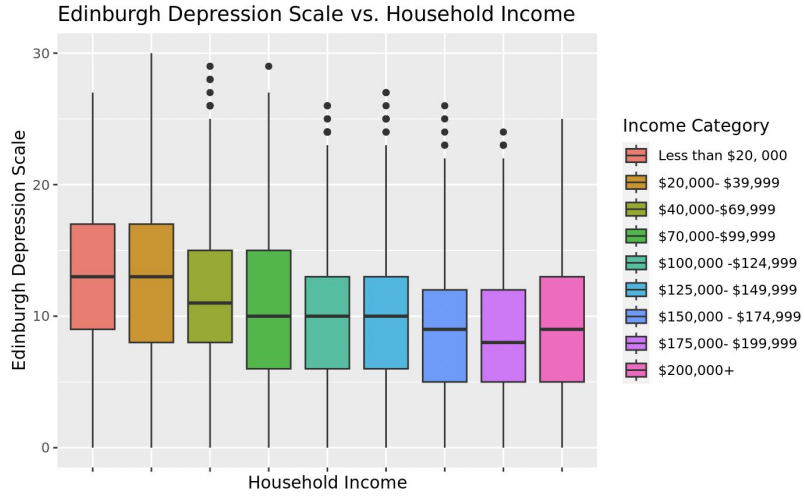
We decided to explore the income bracket...

Relationship of Anxiety (measured through the Promis Anxiety Scale) and Income Bracket



reordered_income <fctr>	medanxiety <dbl>
Less than $20, 000	22
$20,000– $39,999	21
$40,000–$69,999	20
$70,000–$99,999	19
$100,000 –$124,999	19
$125,000– $149,999	19
$150,000 – $174,999	17
$175,000– $199,999	17
$200,000+	18

Relationship of Depression (measured through the Edinburgh Postnatal Depression Scale) and Income Bracket



reordered_income <fctr>	meddep <dbl>
Less than $20, 000	13
$20,000- $39,999	13
$40,000-$69,999	11
$70,000-$99,999	10
$100,000 -$124,999	10
$125,000- $149,999	10
$150,000 - $174,999	9
$175,000- $199,999	8
$200,000+	9

Kruskal-Wallis Statistical Test

Testing if the medians of all these groups are the same

Anxiety
Null Hypothesis: The median anxiety level of each income category is the same.

Alternative Hypothesis: The median anxiety level of the income categories is not the same across each category (At least one group's median may be different).

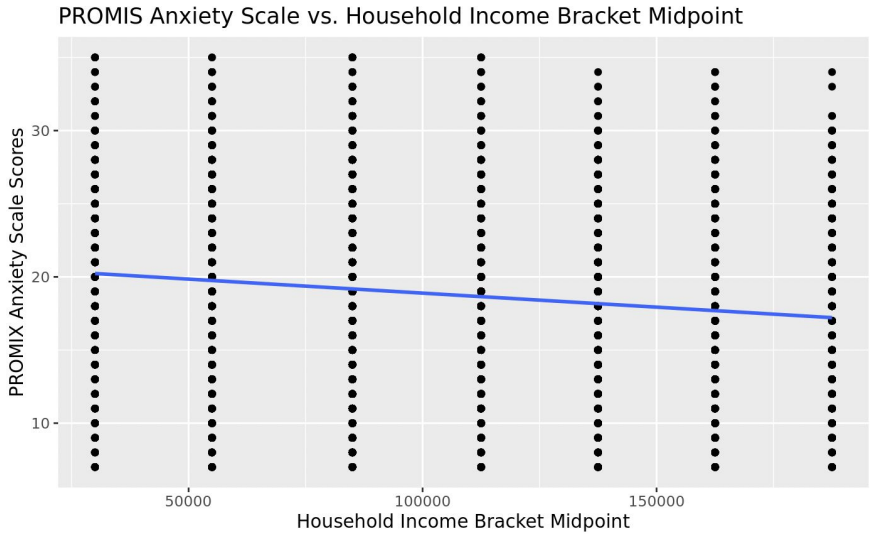
Results: p-value of nearly 0 (2.2e^-16) = reject the null hypothesis

Depression
Null Hypothesis: The median depression level of each income category is the same.

Alternative Hypothesis: The median depression level of the income categories is not the same across each category (At least one group's median may be different).

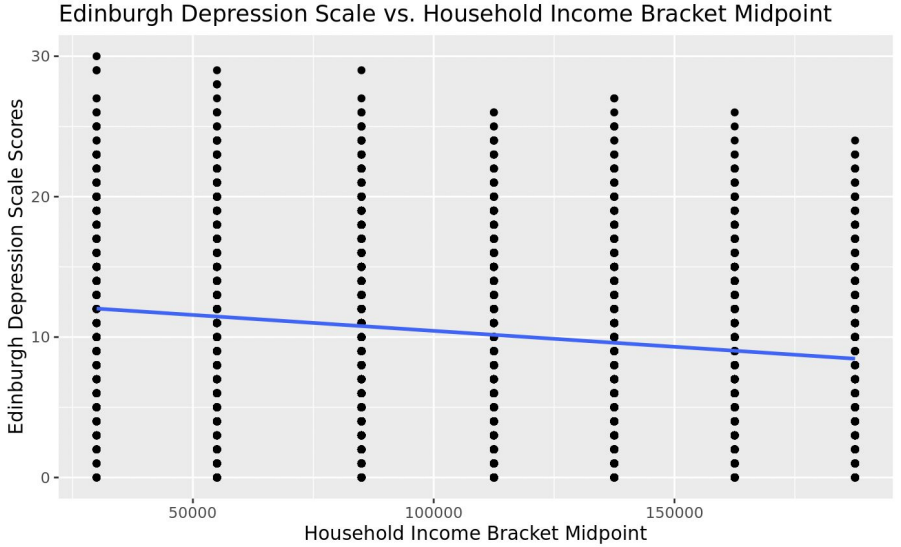
Results: p-value of nearly 0 (2.2e^-16) = reject the null hypothesis

Relationship of Anxiety (measured through the Promis Anxiety Scale) and Income Bracket Midpoint



R-Squared Value : 0.01895088

Relationship of Depression (measured through the Edinburgh Postnatal Depression Scale) and Income Bracket Midpoint



R-Squared Value: 0.0322626

Note: These models have a near 0 p-value, which shows evidence of a relationship between the variables. The low r-squared values signifies that the model should not be used to predict values.

Conclusions + Future Work

- Weak negative relationship between gestational age vs mental health
  - Low R^2 values indicate mental health measures cannot be reliable for predicting gestational age
- Negative relationship between mental health vs income
  - Kruskal-Wallis Test – difference in medians across income groups
  - Linear regression models showed evidence of negative relationship
  - Low R^2
- Findings limited by non-random non-generalizable nature of the sample
- Take these findings further: look at the long term effects of COVID-19 on other developmental factors of infants (i.e. cognitive development, emotional well-being, and overall health)
  - Compare w/ gestational age at birth now