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Chapter 2. Childhood socioeconomic status and depressive symptom trajectories in the transition to adulthood in the United States and Canada

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Abstract

Purpose: This study examined whether young people in the United States (USA) and Canada exhibit similar depressive symptom trajectories in the transition to adulthood and compared the effect of childhood socioeconomic status (SES) on trajectory membership.

Methods: The American National Longitudinal Survey of Youth 79 Child/Young Adult (n=6315) and the Canadian National Longitudinal Survey of Children and Youth (n=3666) were used. Depressive symptoms were measured using five items from the Centre for Epidemiological Studies on Depression scale. Latent trajectories of depressive symptoms from ages 16-25 were identified using growth mixture models. The effect of childhood family income, parental education, and parental unemployment on trajectory membership was estimated using multivariable Poisson regression models with robust variances.

Results: Four similar trajectories were identified in the two countries: (1) low-stable, (2) mid-peak, (3) increasing, and (4) decreasing. Relatively more Americans were in the low-stable trajectory group than Canadians (77.6% vs. 64.9%), and fewer in the decreasing group (7.1% vs. 19.1%). In the USA, childhood family income in the bottom two quartiles was related to higher rates of increasing trajectory membership compared with income in the top quartile (IRR: 1.59-1.79, $p<0.05$), but not in Canada. In the USA, parental education at a high-school level was associated with higher rates of decreasing trajectory membership compared with higher education (IRR=1.45, CI: 1.10-1.91, $p=0.01$) but not in Canada.

Conclusions: Depressive symptoms may take a similar course in the transition to adulthood within these two countries. Country-differences may modify the degree to which childhood SES determines trajectory membership

2.1. Introduction

Depression during the transition to adulthood is a serious public health concern.[13 98] In 40% of cases of major depressive disorder the first episode occurs by the age of 20.[99] Depression during this transition presents risks for later social problems including school dropout and joblessness.[100] Prevention is essential for both individual future health and wellbeing, and for its economic and societal benefits.[101]

The resources and opportunities associated with childhood socioeconomic status (SES) are important entry points for public policy, given the ample evidence that low childhood SES increases the risk of depression over the life course.[102] Low childhood SES increases the risk of chronic exposure to adverse experiences which may elevate stress reactivity and impair neurobiological systems that increase vulnerability to future stressors.[103 104] Further, low childhood SES shapes the social and health trajectories playing out in the transition to adulthood.[105] Young people with few family resources may become marginalized as they navigate the school-to-work transition and financial independence. How young people react to economic difficulty, however, depends on the available institutional resources and cultural values.[105] The institutional environment, broadly defined by the design and implementation of welfare state policies, can mitigate the effect of low childhood SES by providing material resources and improving the psychosocial context for low-SES families.[64 105-107]

While the United States (USA) and Canada, both liberal market welfare states, share similar institutional environments,[64 108] key differences suggest that the American institutional environment may be less effective at mitigating the effects of low childhood SES. For example, school quality and funding is more unequal in the USA,[79 80] and monetary transfers to families less generous and less universal compared to Canada.[79 109] Young people from low-SES

families in the USA may be expected to have a higher risk of depression in the transition to adulthood than their counterparts in Canada.

Whether young people in the USA and Canada exhibit similar longitudinal patterns or trajectories of depressive symptoms in the transition to adulthood is unclear, as is the influence of childhood-SES. Examining dynamic trajectories of depressive symptoms for prevention purposes, rather than single instances of disorder is important as both subclinical psychiatric symptoms and clinical levels of disorder before the age of 18 equally predict poor outcomes in psychiatric morbidity and health service use in adulthood.[110] Findings on differences between depressive symptom trajectories are also consistent with developmental theories on the joint influence of individual and environmental factors on the course of psychopathology from childhood to adolescence.[111] Put simply, particular combinations of personal and environmental characteristics may result in differently shaped trajectories.

Research suggests that between 5-15% of people display persistent depressive symptoms across adolescence and young adulthood, while others show changes over time.[45 59] It is unclear how the number and shape of depressive symptom trajectories compares across countries due to differences in the underlying populations (e.g., age groups) and measures (e.g., Centre for Epidemiological Studies of Depression scale vs. Youth Self Report). Additionally, few studies examine whether and how differences in social, educational, and economic policies modify the influence of childhood SES on when and how depressive symptoms develop in the transition to adulthood.[107] Only one study has examined the effect of macro-social determinants on mental health inequalities in adolescents.[107] This study, which compared psychological complaints for 11, 13, and 15 year-olds across 27 European countries, found that greater social protections, particularly with regards to family benefits, were linked to better overall mental health among young people.[112]

Given existing evidence on depressive symptom trajectories,[45 59] between three and seven trajectory groups are expected in both the USA and Canada. Further, given country-level differences in their institutional arrangements and population health, a stronger association is expected between low-childhood SES and depressive symptoms in the USA than in Canada. This study aims to:

(1) Examine whether young people in the USA and Canada exhibit comparable depressive symptom trajectories in the transition to adulthood; and,

(2) Compare the association between childhood SES and depressive symptom trajectory membership across these two countries.

2.2. Methods

2.2.1. Data sources and study sample

This study used (1) the National Longitudinal Survey of Youth 1979 Children/Young Adult (NLSY79 Children/YA; 1986-2014, n=11,530) in the USA, and (2) Cycles 4-8 of the longitudinal cohort of the National Longitudinal Survey of Children and Youth in Canada (NLSCY; 2002-2009, n=16,125). These longitudinal surveys collect information biennially from national samples of children. The target population for the NLSY79 Children/YA was American children of the NLSY79 females, enrolled from 1986 onwards. These data were then linked to information on the children's mothers from the main NLSY79 survey. The target population for the longitudinal cohort of the NLSCY was non-institutionalized children between the ages 0-11 in 1994 from Canada's 10 provinces. The sample included individuals that had at least 3 time-points of data on their depressive symptoms between the ages 16 and 25 (USA: n=6,135; Canada: n=3,666). Young people entered the cohort at age 16-17, which was from 1994-2006 in the American cohort and 2000-2003 in the Canadian cohort (Cycles 4 and 5).

2.2.2. *Measures*

2.2.2.1. *Depressive symptoms*

Depressive symptoms were measured using a sum score (range 0-15) of five items from the Centre for Epidemiological Studies on Depression scale (CES-D) that appeared in both data sources: (1) I did not feel like eating; my appetite was poor; (2) I had trouble keeping my mind on what I was doing; (3) I felt depressed; (4) I felt that everything I did was an effort; (5) My sleep was restless.[88 89] Respondents rated the frequency of their symptoms with higher scores indicating greater risk of depression. Confirmatory factor analyses for the five items in this study supported a single-factor model at each age in both cohorts (Confirmatory Factor Index: 0.942-0.998, Tucker Lewis Index: 0.884-0.997, Root Mean Square Error of Approximation: 0.011-0.075).[113] The internal reliability (Cronbach's alpha) ranged from 0.55-0.60, which is an acceptable range given the number of items.[114]

2.2.2.2. *Childhood socioeconomic status*

Three aspects of childhood SES were measured at the ages 10-11: relative family income, parental education, and parental unemployment. *Relative family income* was measured according to the income quartile of the family relative to the national sample. *Parental education* was measured using the highest parental educational achievement, grouped into three categories: (1) less than high school, (2) high school diploma, and (3) beyond high school. *Parental unemployment* was measured as a binary variable indicating whether the child's parent(s) did or did not work at all over 12-months.

2.2.2.3. *Covariates*

Individual and structural characteristics related to both childhood SES and depressive symptoms were assessed: gender, race, mother's immigration history, single-parent household, mother's age, region of residence, and urbanicity. contains details about variable derivation.

2.2.3. Analyses

First, the comparability of the sample characteristics of the American and Canadian cohorts were assessed. Depressive symptom trajectories between the ages 16-25 in the American and Canadian cohorts were then identified using growth mixture modeling (GMM), a method that examines the presence of multiple heterogeneous trajectories of change rather than an overall mean trajectory.[95] See Appendix B for details. Briefly, missing data was handled using full information maximum likelihood with robust errors.[95] Decisions about the number of classes to model were based on *a priori* expectations, model parsimony, overall model fit calculated using the Bayesian information criterion (BIC), group size of at least 5%, and average posterior probabilities (the probability of belonging in each class).[95] Young people were then categorized into the trajectory group where they had the highest probability of membership, based on their posterior probabilities. Due to administrative limitations, data from the two cohorts were not merged to statistically compare cross-national differences. Instead, each cohort was analyzed separately and results were compared via inspection.

Chi-square tests were used to examine the relationship between childhood SES and trajectory membership in the depressive symptom trajectories in Canada and the USA. Multivariable Poisson regressions were then used to estimate the association between childhood SES and depressive symptom trajectory group membership, while accounting for all other covariates.[115] Incident rate ratios (IRR) were reported with their 95% confidence intervals (CI) and exact p-values. Rates of partial non-response were 19.8% in the USA and 9.5% in Canada. Non-response was related to male gender and lower parental educational achievement in the USA, and to parental unemployment in Canada. Missing values on the covariates were imputed for the American cohort using multiple imputation by chained equations.[116] 30 imputations were performed on four covariates – relative family income (19.5% missing), parental

unemployment (3.8% missing), single parent status (3.6% missing), and rural residence (0.6% missing) – using binary and ordered logistic regression models to impute categorical variables and linear regression for continuous variables. Imputation models were based on all analytic variables of interest, and additionally included data on each imputed variable from survey years 1986 to 2014. Given that family income data had already been imputed in the Canadian dataset, and that non-response was lower than in the American dataset, multiple imputation was not deemed necessary.

All analyses used sampling weights to account for survey design. GMM was performed in Mplus version 7 and regression analyses in Stata versions 12 (USA) and 13 (Canada). Study procedures were approved by the UBC Behavioural Research Ethics Board (H18-0049).

2.3. Results

2.3.1. Sample characteristics

The two cohorts differed in their baseline characteristics (Table 2.1). The American cohort had a lower median childhood relative income and lower parental education than the Canadian cohort. The American cohort also had fewer migrant mothers, more single parents, and more rural residents.

Table 2.1 Characteristics of the American and Canadian cohorts

	USA (n=6135)		**Canada (n=3666)**	
Variable	**%**	**n**	**%**	**n**
Relative family income (median percentile)	58.2	4944	62.9	3598
Parental educational achievement (%)		6135		3665
Less than high school	8.3		5.0	
High school graduation	41.3		8.9	
Beyond high school	50.4		86.1	
Parental unemployment (%)		5899		3553
No	76.8		79.2	
Yes	23.2		20.8	
Gender (%)		6135		3666
Male	51.7		48.8	
Female	48.3		51.2	
Mother born in the USA or Canada (%)		6135		3466
No	4.3		15.0	
Yes	95.7		85.0	
Single parent status. (%)		5916		3666
No	74.5		85.6	
Yes	25.5		14.4	
Rural residence (%)		6101		3666
No	76.7		84.0	
Yes	23.3		16.0	
Mother's age (median)	36	6135	38	3577

2.3.2. Depressive symptom trajectories in the USA and Canada

In both cohorts, a four-class model with random intercepts was found to be best fitting and most parsimonious (Table 2.2).

Table 2.2 Results from Growth Mixture Modeling Information Criteria

Classes	AIC	BIC	BIC (sample size adjusted)	Entropy
USA				
1	123027.4	123161.9	123098.3	NA
2	106878.6	107006.3	106945.9	0.58
3	106296.9	106458.2	106382.0	0.70
4	105936.5	106131.4	106039.3	0.70
5*	105828.2	106056.7	105948.7	0.73
Canada				
1	63766.4	63884.3	63824.0	NA
2	63075.7	63193.7	63133.3	0.47
3	62670.2	62812.9	62739.9	0.64
4	62402.0	62569.6	62483.8	0.64
5*	62298.2	62490.6	62392.1	0.65

Note: *Deemed to be less parsimonious because the model included a group with fewer than 5% of the sample. The fit of models of between six and eight classes were also tested but fit statistics were not reported because all resulted in computation issues, included small group sizes, or were less parsimonious.

Four qualitatively similar trajectories were identified in each cohort (Figure 2.1): (1) a low-stable depressive symptom trajectory characterized by low symptom frequency throughout; (2) a mid-peak symptom trajectory characterized by a peak between the ages 19 and 21; (3) an increasing symptom trajectory; and (4) decreasing symptom trajectory (details in Appendix B).

The distribution of the trajectories differed across cohorts, with 77.6% of Americans and 64.9% of Canadians classified into the low-stable trajectory. Compared with 7.9% of Americans, 19.1% of Canadians were classified into the decreasing trajectory. Finally, 9.3% and 5.5% of Americans were classified into the increasing and mid-peak trajectory groups, compared with 9.3% and 6.7% of Canadians, respectively.

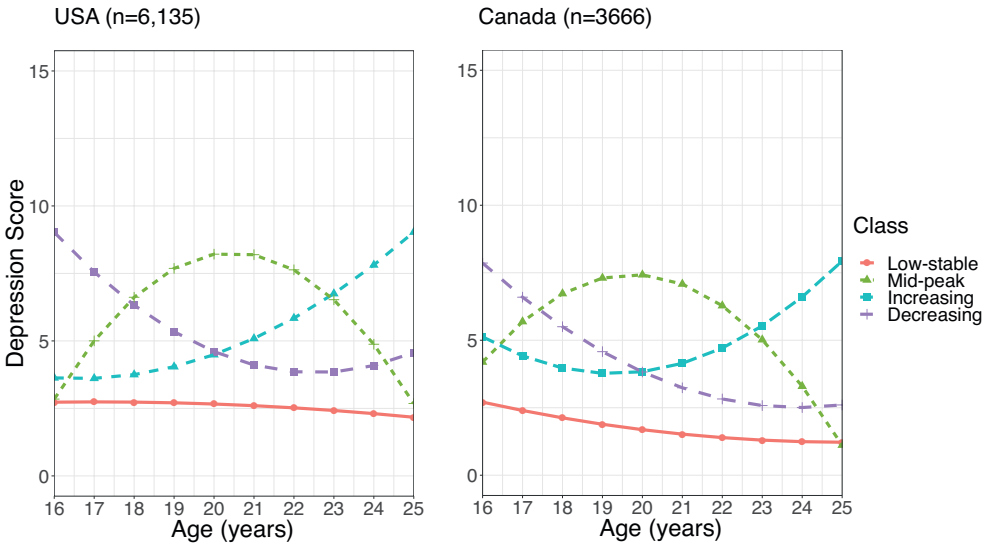

Figure 2.1 Four estimated trajectories of depressive symptomatology in the United States (left) and Canada (right). CES-D, Center for Epidemiologic Studies Depression Scale

2.3.3. The association between childhood SES and depressive symptom trajectory membership

In both the American and Canadian cohorts, the increasing trajectory group had a lower average childhood family income compared to the low-stable group (Table 2.3). In the USA but not in Canada, both the decreasing and mid-peak groups had a lower average childhood family income than the low-stable group. In the USA but not in Canada, trajectory groups also differed by parental education and parental unemployment.

Table 2.3 Group differences between depressive symptom trajectory groups in the USA and Canada

Variable	USA Low-stable	Increasing	Decreasing	Mid-peak	n	*p*	Canada Low-stable	Increasing	Decreasing	Mid-peak	n	*p*
Percent	77.6	9.3	7.9	5.2	6135		64.9	9.3	19.1	6.7	3666	
Relative family income[1] (median percentile)	60.9	45.8	48.2	53.8	4944	***	65.9	57.9	62.8	62.9	3598	*
Parental educational achievement (%)					6135	***					3665	
Less than high school	7.3	12.3	11.8	9.9			4.9	8.7	3.1	6.5		
High school graduation	39.3	50.2	49.7	43.5			9.4	7.9	8.4	7.9		
More than high school	53.4	37.5	38.5	46.6			85.7	84.2	88.4	83.4		
Parental unemployment (%)					5899	*					3553	
No	78.1	71.0	71.2	76.4			78.8	72.5	83.4	81.3		
Yes	21.9	29.0	28.8	23.6			21.2	27.5	16.6	18.7		
Gender (%)					6135	***					3666	***
Male	53.8	48.6	38.1	46.0			54.40	41.7	38.7	33.3		
Female	46.2	51.4	61.9	54.0			45.60	58.3	61.3	66.7		
Mother born in the US or Canada (%)					6135						3466	
No	4.5	3.2	5.2	2.6			14.7	13.6	14.8	20.5		
Yes	95.5	96.8	94.8	97.4			85.3	86.4	85.2	79.5		
Single parent status. (%)					5916	***					3666	
No	76.3	70.4	67.7	66.4			87.0	84.4	84.4	77.4		
Yes	23.7	29.6	32.3	33.6			13.0	15.6	15.6	22.6		
Rural residence (%)					6101						3666	
No	76.6	76.7	77.3	76.9			82.9	87.8	85.6	84.0		
Yes	23.4	23.3	22.7	23.0			17.1	12.2	14.4	16.0		
Mother's age (median)	35	33	34	35	6135	***	38	38	38	36	3577	*

[1] 2018 equivalized income using the 2018 American and Canadian consumer price indices and reported in USD and CAD, respectively (gross family income in the US, and net household income in Canada); *p<0.01, **p<0.001, ***p<0.0001 based on chi-square tests of differences in proportion

In the USA, childhood family income in the lowest and the second quartiles were associated with 1.82 (95%CI: 1.23-2.68) and 1.59 times (95%CI: 1.11-2.27) higher rates of increasing trajectory membership compared with the top income quartile (Table 2.4). Childhood family income in the lowest quartile also showed a trend towards higher rates of membership in the decreasing (IRR=1.51, 95%CI: 0.99-2.33) and mid-peak trajectories in the USA (IRR=1.66, 95%CI: 1.00-2.77). In Canada, the lowest income quartile was associated with higher rates of membership in the increasing (IRR=1.51, 95%CI: 0.88-2.60) and mid-peak trajectories (IRR=1.57, 95%CI: 0.87-2.83), but the 95% CIs included the null.

In the USA but not in Canada, having a parent with only high school-graduation was associated with 1.42 times (95%CI: 1.08-1.87) higher rates of decreasing trajectory membership compared with having a parent with more than high-school education.

Finally, the associations with family unemployment differed between the US and Canada. While 95% CIs were inclusive of the null, estimates in both countries suggested a trend whereby parental unemployment was associated with higher rates of increasing trajectory membership (USA: IRR=1.18, 95%CI: 0.92-1.52; Canada: IRR=1.39, 95%CI: 0.92-2.12). Parental unemployment in the USA also showed a trend towards higher rates of membership in the decreasing trajectory (IRR=1.22, 95%CI: 0.94-1.59), while in Canada it was associated with lower rates of membership in the decreasing trajectory relative to the low-stable trajectory (IRR=0.76, 95%CI: 0.59-0.98).

Table 2.4 Results of the multivariable Poisson regressions with robust variances on the US sample using the low-stable trajectory as the reference group

	US (n=6135)												**Canada (n=3320)**											
	Increasing				**Decreasing**				**Mid-peak**				**Increasing**				**Decreasing**				**Mid-peak**			
	IRR	**LCI**	**UCI**	***p***	**IRR**	**LCI**	**UCI**	***p***	**IRR**	**LCI**	**UCI**	***p***	**IRR**	**LCI**	**UCI**	***p***	**IRR**	**LCI**	**UCI**	***p***	**IRR**	**LCI**	**UCI**	***p***
Relative family income																								
In bottom income quartile	1.82	1.23	2.68	0.00	1.51	0.98	2.33	0.06	1.66	1.00	2.77	0.13	1.51	0.88	2.60	0.14	1.18	0.84	1.67	0.34	1.57	0.87	2.83	0.13
In 25-50%ile	1.59	1.11	2.27	0.01	1.19	0.82	1.73	0.35	1.41	0.88	2.25	0.99	1.31	0.81	2.11	0.26	1.16	0.88	1.53	0.30	1.00	0.58	1.70	0.99
In 50-75%ile	1.06	0.76	1.50	0.72	0.91	0.64	1.31	0.63	1.27	0.83	1.93	0.68	1.13	0.71	1.81	0.61	0.96	0.73	1.26	0.76	0.89	0.51	1.57	0.68
In top 25%ile (ref)	1.00				1.00				1.00				1.00				1.00				1.00			
Parental education																								
Less than high school	1.31	0.90	1.91	0.16	1.36	0.91	2.02	0.14	1.09	0.64	1.85	0.75	1.03	0.47	2.24	0.94	0.74	0.50	1.09	0.13	0.47	0.21	1.04	0.06
High school graduation	1.21	0.93	1.58	0.15	1.42	1.08	1.87	0.01	0.99	0.71	1.39	0.96	0.88	0.55	1.43	0.61	0.87	0.65	1.17	0.34	0.66	0.35	1.24	0.19
More than high school (ref)	1.00				1.00				1.00				1.00				1.00				1.00			
Parental unemployment																								
No (ref)	1.00				1.00				1.00				1.00				1.00				1.00			
Yes	1.18	0.92	1.52	0.19	1.22	0.94	1.59	0.13	0.97	0.68	1.39	0.89	1.39	0.92	2.12	0.12	0.76	0.59	0.98	0.03	0.82	0.55	1.22	0.33
Gender																								
Male (ref)	1.00				1.00				1.00				1.00				1.00				1.00			
Female	1.22	0.99	1.52	0.06	1.78	1.41	2.25	0.00	2.00	1.36	2.97	0.00	1.65	1.17	2.32	0.00	1.68	1.36	2.07	0.00	2.00	1.36	2.97	0.00
Mother born in US																								
No	1.42	0.81	2.49	0.23	0.79	0.46	1.34	0.37	1.46	0.60	3.54	0.40	0.97	0.51	1.86	0.93	0.98	0.68	1.12	0.92	1.48	0.78	2.85	0.23
Yes (ref)	1.00				1.00				1.00				1.00				1.00				1.00			
Single parent status																								
No (ref)	1.00				1.00				1.00				1.00				1.00				1.00			
Yes	0.80	0.61	1.05	0.11	1.15	0.86	1.54	0.36	1.42	0.85	2.40	0.18	0.96	0.64	1.45	0.84	1.14	0.84	1.54	0.39	1.42	0.85	2.40	0.18
Mother's age	0.95	0.93	0.97	0.00	0.98	0.95	1.01	0.14	1.01	0.97	1.04	0.71	0.99	0.96	1.02	0.54	0.98	0.96	1.00	0.11	0.96	0.92	1.01	0.10
Rural residence																								
Urban (ref)	1.00				1.00				1.00				1.00				1.00				1.00			
Rural	0.95	0.72	1.25	0.71	0.92	0.69	1.22	0.56	0.96	0.66	1.40	0.85	0.70	0.50	0.99	0.04	0.88	0.71	1.10	0.27	1.06	0.73	1.55	0.74

Note: IRR = incidence rate ratio, LCI/UCI: lower and upper bounds of 95% confidence interval, *p* = p-value for z-test; all analyses have also been adjusted for the age at which individuals enter into the cohort, race, and region of residence

2.4. Discussion

This study compares the association between depressive symptom trajectories in the transition to adulthood in the USA and Canada and childhood SES. Findings show that there are similarities between the two countries in the number and shape of trajectories between ages 16-25, but differences in the relative share of trajectories. Lower childhood family income in the USA is related to higher rates of membership in the increasing depressive symptom trajectory. Lower parental education in the USA is related to higher rates of decreasing trajectory membership. In contrast, there was no association observed between childhood family income or parental education and depressive symptom trajectory membership in Canada. There was some evidence that parental unemployment during childhood was associated with a lower likelihood of being in the decreasing trajectory membership in Canada but not in the USA.

The similarities observed between the depressive symptom trajectories in the USA and Canada suggest that depressive symptoms may follow consistent patterns in the transition to adulthood. As in other studies, this study found that a low-stable trajectory with few to no symptoms was most common in both countries.[45 59] It also showed that both increasing and decreasing symptom trajectory groups exist in the USA and Canada; but the proportion of young people within trajectories groups varies. Of note, the entropy for the latent trajectory solutions was lower in Canada i.e., differential misclassification needs to be considered when comparing across countries. As this study only included five depressive symptoms items, scores may not have had as much variability as the scales used in other studies that additionally identified a high-persistent trajectory.[45] An expanded set of items may be necessary to establish a core set of depressive symptom trajectories amongst young Americans and Canadians.

The finding that there was an association between low family income and young people's depressive symptom trajectories in the USA, with less support for the same association in Canada, is consistent with cross-national research documenting the relationship between greater income inequality in the USA and correspondingly worse child and adolescent outcomes.[79 117 118] This study found a particularly strong association between low childhood family income and the increasing trajectory in the USA. These results suggest that in the USA, the relative income level of the family in childhood may be important for determining symptoms later in the transition to adulthood.

Findings also show that low parental educational achievement predicted depressive symptom trajectory membership in the USA but not in Canada. These findings are consistent with evidence showing that comparatively weaker protections for lower-educated families in the USA are associated with worse child and adult well-being compared with other similar countries.[79 119]

Finally, parental unemployment in childhood was associated with lower membership rates in the decreasing trajectory than the low-stable symptom trajectory in Canada. This finding contrasts with evidence from Canada that parental unemployment predicts worse depressive symptom trajectories.[120] Others have shown, however, that the effect of parental unemployment on child mental health depends on which parent was unemployed, whether joblessness was voluntary, and on the age of the child when their parents experienced unemployment.[121] A study of British children between the ages 11-15 found that parental unemployment had a positive influence on children's happiness if it occurred when children were young but had either a negative or non-significant effect if unemployment occurred later in a child's life.[121] Unemployed parents have also been shown to spend more time on parenting and childcare,[122] which may translate to benefits for child mental health. Taken together, findings suggests that after accounting for family income and parental education, parental

unemployment in childhood may protect young Canadians from having higher depressive symptom levels at the start of the transition to adulthood.

Childhood parental unemployment was not associated with a lower likelihood of membership in the decreasing trajectory relative to the low-stable trajectory in the USA, which may reflect the greater generosity of unemployment insurance systems and other forms of social benefits available to families in Canada compared to the USA. The loss of employment, after accounting for the influence of family income and parental education, may come with comparatively fewer stressors in Canada than in the USA.

This study has a number of strengths. It used the largest available national cohorts of young people in the USA and Canada. Using equivalent measures and the same modelling technique across cohorts, this study was able to compare the longitudinal patterns in depressive symptoms in the transition to adulthood in both countries and their relationship to childhood SES.

This study also has numerous limitations. First, it used self-reported data which may have biases including recall bias and under-reporting. Second, while a number of covariates were included in the model to control for potential confounding, residual confounding may be present as some measures were poorly defined (e.g., race, and family educational attainment). Third, the American and Canadian cohorts were more socioeconomically advantaged compared to their respective populations.[123] [124] Findings may thus underestimate the association between childhood SES and depressive symptom trajectories. Fourth, there are some limitations associated with GMM. GMM may be vulnerable to errors in the specification of the underlying latent structure (i.e. the number of classes and growth factors) which may result in over-extraction of trajectory groups.[125] Parameter estimates may also be biased and standard errors underestimated due to the categorization of individuals into their most probable trajectory groups.[126] Study findings should therefore be replicated with alternative parametric

approaches,[127] and classification uncertainties should be accounted for. Finally, the Canadian cohort had a smaller sample size than the American cohort, suggesting that the Canadian analyses may be relatively underpowered.

Limitations notwithstanding, the findings have implications for policy and research. Results imply that depressive symptoms may follow consistent patterns in the transition to adulthood but that country-level differences in the institutional and policy landscape may affect how they are distributed within a population. Future research may replicate this study by examining whether similar trajectories exist in countries with similar economic and educational institutions, but differences in the relative progressiveness of their taxation and transfer systems and in the provision of social benefits. Replication of the study findings using representative samples, harmonized data, and/or matching techniques are also warranted. The findings further suggest that country-level differences modify the effect of childhood SES, and that effects differ by trajectory type. Policy makers should attend to institutional barriers to addressing social inequalities across childhood and young adulthood. Child benefit programs, for example, are an important aspect of the social safety net for disadvantaged children and families that may be leveraged for prevention. Canadian benefits are mostly universal, whereas in the USA, child benefits have work requirements and are not universal, limiting the support available for low-SES families.[109] Compared with Canada, there is also greater inequality in the American school system, with funding for schools being more localized, leading to greater variability in school-level resources at the neighbourhood or city-level.[79 80] Future research may examine whether improving taxes and transfers, school quality, and resource allocation helps to mitigate mental health problems associated with low childhood SES, and at what point in the transition to adulthood they are most effective. Study findings also have implications for the design of targeted depression prevention programs. Targeted prevention programs have been shown to be more effective than universal programs.[128] The findings show that such strategies are

particularly important in the USA, where low childhood SES is a greater risk for depressive symptoms in the transition to adulthood. The findings also indicate that such programs attend to the relationship between childhood SES and the timing and course of depressive symptoms during this period.

In conclusion, this study showed that while depressive symptom trajectories during the transition to adulthood follow consistent patterns in the USA and Canada, institutional differences may matter for their population distribution. In Canada, a country with stronger social protections for families and less unequal education compared with the USA, the risk of depressive symptom trajectories marked by increasing and decreasing symptoms depend less on childhood family income and parental education, respectively. The effects of parental unemployment in childhood on depressive symptoms may also differ between the two countries. This study finds evidence to support the idea that even in countries with similar institutions, country level differences (e.g., in the taxation and transfer system and education systems) may have profound implications for how childhood SES influences the risk of depressive symptoms in the transition to adulthood.