Growing Up in New Zealand

Now We Are Twelve

Life in early adolescence

Supplementary material for Structural disadvantage and rangatahi Māori mental wellbeing

Authors: Sarah-Jane Paine, Denise Neumann, Esther Yao.

Growing Up in New Zealand

University of Auckland Waipapa Taumata Rau New Zealand

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1. Summary

This technical document describes the supplementary information for the Structural disadvantage and rangatahi Māori mental wellbeing report, written for the 12-year data collection wave (DCW) reporting in 2023.

2. Structural disadvantage at 12 years of age

Figure S 1 and S 2 as well as Table S 1 provide descriptive information for the indicators of structural disadvantage for the rangatahi Māori cohort at 12-years. In summary, 28.6% of 12-year old rangatahi Māori were living in the most socioeconomically-deprived neighbourhoods (i.e. NZ Deprivation Index 2018 deciles 9 and 10, Figure 4) and 15% were living in material or severe material hardship (i.e. Dep-17 score of 6 or higher, Figure 5). Less than half of the rangatahi Māori cohort were living in the same home at the 8-year and 12-year DCWs, with 14.4% reporting that they had moved 3 or more times since they were 8-years old.

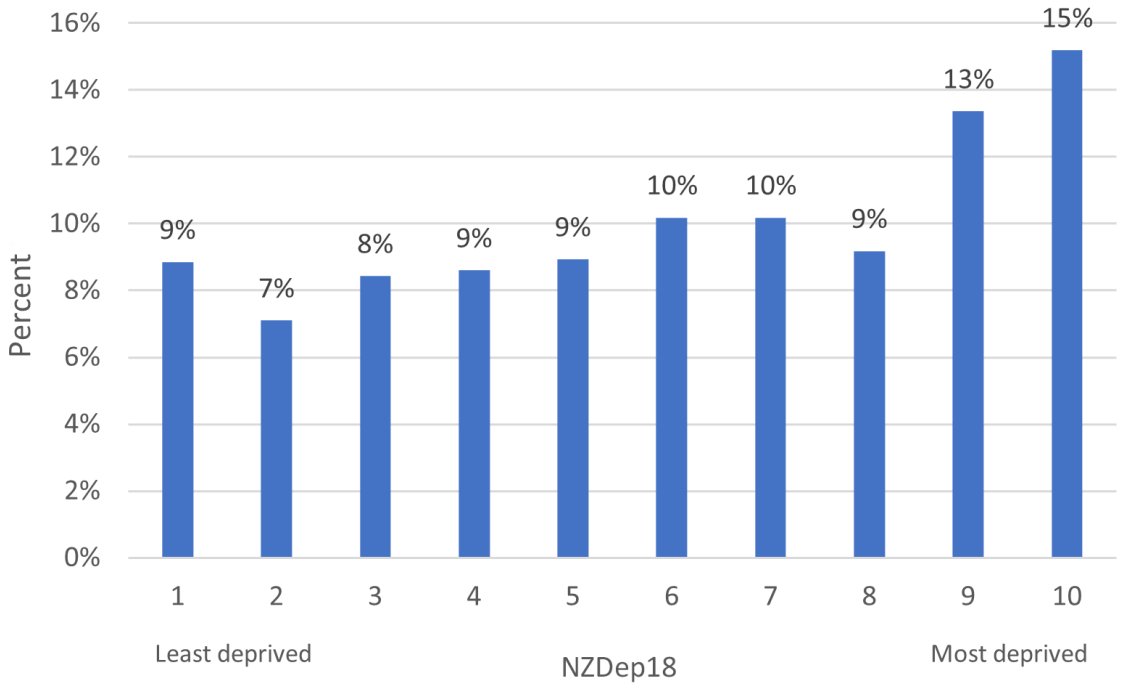

Figure S 1 Distribution of area-level socioeconomic deprivation for rangatahi Māori at 12-years of age (NZ Deprivation Index 2018 deciles).

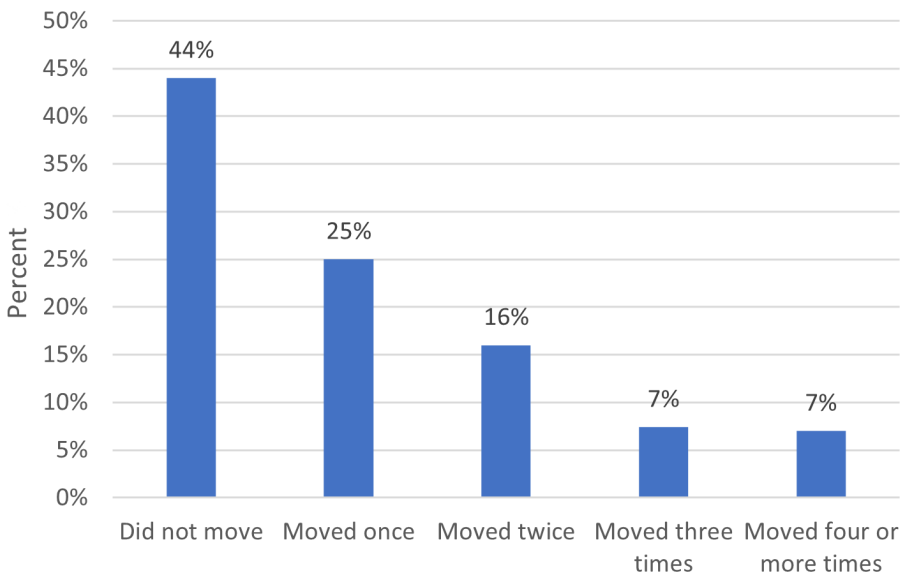

Figure S 2 Number of residential moves since 8-year DCW or the rangatahi Māori cohort

Table S 1 Material hardship (Dep-17 Index) for rangatahi Māori at 12-years of age.

No/little Material Hardship (Scores 0–5)		Material Hardship (Scores 6–8)		Severe Material Hardship (Scores 9+)	
n	%	*n*	%	*n*	%
881	85%	93	9%	61	6%

3. Longitudinal analysis of structural disadvantage and the association with rangatahi Māori mental wellbeing at 12 years

3.1. Latent Class Analysis (LCA)

As a first step, we conducted Latent Class Analysis (LCA) to identify how different factors of structural disadvantage cluster together at each time point for rangatahi Māori (from antenatal through to 12 years of age). LCA is a statistical method that supports the identification of subgroups or 'clusters' based on similarities in participants' responses to a set of variables. For our analysis, we used a set of structural disadvantage variables that we had longitudinal data for: neighbourhood deprivation, material hardship, maternal employment status and residential mobility. Note material hardship and residential mobility information was not available at the antenatal time point, so we used the variable of home ownership for this time point instead. LCA was conducted six times, for each of the six DCWs from pregnancy through to early adolescence: antenatal, 9-months, 2-years, 4.5-years,

8-years and 12-years. We determined the optimal number of clusters of structural disadvantage for each DCW based on statistical model fit indices and theoretical considerations.

For example, at the 9-month DCW, two clusters appeared to be the best solution based on statistical indices and theoretical reasoning. Figure S 3 illustrates the 2-cluster solution at 9-months and the distribution of the four indicators of structural disadvantage within these two clusters. The text on the right-hand side of the figure provides a brief explanation of the clusters. Text in red highlights factors indicating relative high structural disadvantage, and text in green highlights factors indicating relative low structural disadvantage.

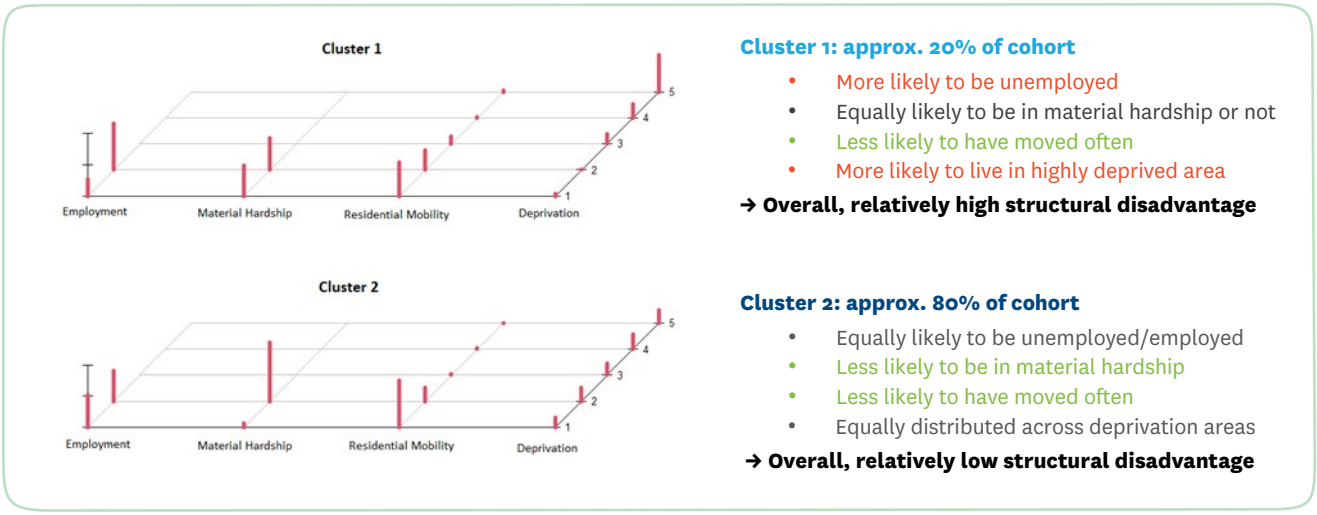

Figure S 3 Results of latent class analysis with 2-cluster solution at the 9-month DCW.

Note - Within each cluster, the frequency distribution is shown for (left to right): Employment (1 = yes, 2 = no); Material hardship (1 = yes, 2 = no); Residential mobility (Number of moves 0, 1, 2, 3, 4 or more); Deprivation (Quintiles 1, 2, 3, 4, 5). The text on the right provides a brief explanation of the clusters: Red highlights factors indicating relatively high structural disadvantage, and green highlights factors indicating relatively low structural disadvantage.

We underwent the same process for each of the six time points. Two clusters of structural disadvantage also appeared to be the optimal solution for the other time points based on statistical model fit and theoretical considerations (e.g., increasing the number of clusters to three or more did not add meaningful differentiation between clusters). Hence, we decided to use the 2-cluster solution for each DCW. For each DCW, we labelled the two clusters:

- ***Relatively low structural disadvantage***
- ***Relatively high structural disadvantage***

The labels acknowledge that the structural disadvantage identified is relative to other rangatahi Māori in the *Growing Up in New Zealand* cohort, and not to non-Māori in the cohort or the wider population in Aotearoa New Zealand. The labels also reflect the diversity in the characteristics of

structural disadvantage in the two clusters across DCWs. For example, at most time points, relatively high structural disadvantage is characterised by a higher likelihood of being unemployed and living in a highly deprived area. However, at some time points, the relatively high structural disadvantage cluster is also characterised by high residential mobility.

3.2. Social Sequence Analysis (SSA)

As a next step, we conducted Social Sequence Analysis (SSA) to identify longitudinal patterns of structural disadvantage for rangatahi Māori from prebirth to 12 years of age. SSA is a statistical approach that identifies trajectories or sequences of experiences over time. In our case, we used SSA to identify longitudinal trajectories of the two clusters of structural disadvantage that were identified at each of the six DCWs via LCA earlier (***Relatively low structural disadvantage*** and ***Relatively high structural disadvantage***). Cluster analysis was then used to group similar trajectories together.

Based on statistical assessment and theoretical considerations, we identified three distinct clusters of longitudinal trajectories for relative structural disadvantage (see the main document for a detailed description of these trajectories):

- Trajectory group 1 – **persistent relatively high disadvantage** (21% of rangatahi Māori cohort)
- Trajectory group 2 – **intermittent relatively high disadvantage** (35% of rangatahi Māori cohort)
- Trajectory group 3 – **persistent relatively low disadvantage** (44% of rangatahi Māori cohort)

3.3. Multivariable Linear Regression Analysis

Multivariable linear regression analysis was used as a next step to determine the degree to which structural disadvantage trajectories (as identified via SSA earlier) are associated with mental health and wellbeing for rangatahi Māori at 12 years of age, and if cultural connectedness can buffer against the negative impacts of structural disadvantage on mental health. Specifically, we conducted five analogous models for each mental health outcome (Depression symptoms, Anxiety symptoms and Quality of life) using a step-by-step approach:

1. Model 1: The unadjusted model, modeling the association between trajectories of structural disadvantage and mental health outcomes at 12 years
2. Model 2: Model 1 + adjustment for maternal age, maternal educational qualifications and rangatahi gender identity
3. Model 3: Model 2 + additional adjustment for rangatahi Māori experience of racial discrimination

4. Model 4: Model 3 + additional adjustment for cultural connectedness
5. Model 5: Model 4 + addition of the interaction effect between cultural connectedness and trajectories of structural disadvantage on mental health outcomes

Table S 2-4 present the results of the five regression models for each of the three mental health and wellbeing outcomes. The statistical parameters of the regression models include:

- Estimate (Beta): Represents the strength and direction of the relationship between variables. Estimate of 0.5 means a predicted increase of 0.5 units in the outcome variable for each unit increase in the predictor variable.
- Standard Error: Is a measure of the variability around the estimated value, indicating how reliable or precise the estimate is. The smaller the standard error, the more precise and reliable the estimate is.
- p-value: Is a measure of statistical significance, indicating the likelihood of observing the estimated relationship by chance alone. Generally, a p-value less than 0.05 suggests a significant relationship between the outcome and explanatory variable.

3.4. Estimation of predicted values for depression symptoms based on different scenarios

To understand what the findings of the regression analysis might mean for rangatahi Māori depression symptoms, we used the final model for depression symptoms (see Model 5 in Table S 2) and created two scenarios. The following parameters were used in each scenario to estimate the predicted score of depression symptoms.

Scenario 1: We considered this a "worst case" scenario

- Persistent relatively high structural disadvantage
- Experience of racial discrimination
- Low cultural connectedness (MEIM score of 1 standard deviation [or more] below the mean MEIM score)

Scenario 2: We considered this a "best case" scenario

- Persistent relatively low structural disadvantage
- No experience of racial discrimination
- High cultural connectedness (MEIM score of 1 standard deviation [or more] above the mean MEIM score)

Note that for both scenarios, the parameters for the covariates in the model were kept constant as:

- Gender identity at 12-years: Cisgender girls
- Maternal educational qualifications at antenatal wave: Secondary school qualification or higher
- Maternal age at antenatal wave: 25-34 years

Table S 2 Multivariable linear regression models for Depression symptoms.

	Model 1			Model 2			Model 3			Model 4			Model 5		
	Estimate (beta)	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**
Intercept	8.71	0.22	<.001	7.46	0.62	<.001	7.04	0.61	<.001	9.16	0.95	<.001	8.48	1.25	<.001
Rangatahi Gender at 12-years															
Cisgender boy				Ref			Ref			Ref			Ref		
Cisgender girl				1.20	0.32	<.001	1.27	0.32	<.001	1.33	0.31	<.001	1.33	0.31	<.001
Trans-Non-binary/Unsure				3.73	0.39	<.001	3.65	0.39	<.001	3.63	0.38	<.001	3.61	0.38	<.001
Maternal educational qualifications at the antenatal wave															
Less than secondary school qualification				Ref			Ref			Ref			Ref		
Secondary school qualification or higher				-0.33	0.48	0.49	-0.10	0.48	0.84	-0.08	0.48	0.86	-0.09	0.48	0.85
Maternal age at the antenatal wave															
≤ 24 years				Ref			Ref			Ref			Ref		
25-34 years				0.73	0.36	0.04	0.69	0.36	0.05	0.68	0.35	0.05	0.69	0.35	0.05
≥ 35 years				0.42	0.45	0.35	0.39	0.44	0.38	0.36	0.44	0.42	0.40	0.44	0.37
Structural disadvantage trajectory															
Persistent low structural disadvantage	Ref			Ref			Ref			Ref			Ref		
Intermittent high structural disadvantage	0.17	0.33	0.622	0.002	0.33	0.99	-0.11	0.33	0.74	-0.04	0.33	0.91	2.35	1.70	0.17
Persistent high structural disadvantage	0.76	0.39	0.055	0.71	0.43	0.10	0.68	0.42	0.11	0.69	0.42	0.10	-0.40	2.07	0.85

Experience of racial discrimination at 12-years									
No experience of racism	Ref			Ref			Ref		
Experience of racism	3.08	0.49	<.001	3.20	0.49	<.001	3.19	0.49	<.001
Cultural connectedness									
MEIM sum score				-0.05	0.02	0.004	-0.04	0.03	0.18
Interaction terms									
MEIM score*Persistent low structural disadvantage							Ref		
MEIM score*Intermittent high structural disadvantage							-0.06	0.04	0.16
MEIM score*Persistent high structural disadvantage							0.03	0.05	0.59

Note: MEIM=Multigroup Ethnic Identity Measure. Model 1 is the unadjusted model, Model 2 adjusts for maternal age (ref=20-24yrs), maternal educational qualifications (ref=no secondary school qualifications), and rangatahi gender identity (ref=cisgender boy). Model 3 additionally adjusts for rangatahi Māori experience of racial discrimination (ref=No racial discrimination). Model 4 additionally adjusts for cultural connectedness (sum score). Model 5 adds the interaction effect between cultural connectedness and the trajectories of structural disadvantage on mental health.

Table S 3 Multivariable linear regression models for Anxiety symptoms.

	Model 1			Model 2			Model 3			Model 4			Model 5		
	Estimate (beta)	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**
Intercept	45.86	0.46	<.001	41.73	1.28	<.001	40.99	1.28	<.001	41.13	2.00	<.001	38.86	2.62	<.001
Rangatahi Gender at 12-years															
Cisgender boy				Ref			Ref			Ref			Ref		
Cisgender girl				2.80	0.67	<.001	2.91	0.66	<.001	2.91	0.66	<.001	2.90	0.66	<.001
Trans-Non-binary/Unsure				7.61	0.82	<.001	7.46	0.81	<.001	7.45	0.81	<.001	7.42	0.81	<.001
Maternal educational qualifications at the antenatal wave															
Less than secondary school qualification				Ref			Ref			Ref			Ref		
Secondary school qualification or higher				0.67	1.01	0.50	1.08	1.00	0.28	1.09	1.00	0.28	1.06	1.00	0.29
Maternal age at the antenatal wave															
≤ 24 years				Ref			Ref			Ref			Ref		
25-34 years				1.79	0.75	0.02	1.71	0.74	0.02	1.71	0.75	0.02	1.72	0.75	0.02
≥ 35 years				0.77	0.94	0.41	0.72	0.93	0.44	0.72	0.93	0.44	0.81	0.93	0.39
Structural disadvantage trajectory															
Persistent low structural disadvantage	Ref			Ref			Ref			Ref			Ref		
Intermittent high structural disadvantage	0.04	0.69	0.96	-0.16	0.69	0.82	-0.35	0.69	0.61	-0.35	0.69	0.62	6.57	3.58	0.07
Persistent high structural disadvantage	-0.62	0.82	0.45	-0.35	0.89	0.69	-0.41	0.88	0.64	-0.41	0.88	0.64	-1.76	4.35	0.69

Experience of racial discrimination at 12-years									
No experience of racism	Ref			Ref			Ref		
Experience of racism	5.40	1.03	<.001	5.41	1.03	<.001	5.39	1.03	<.001
Cultural connectedness									
MEIM sum score				-0.003	0.04	0.93	0.05	0.06	0.36
Interaction terms									
MEIM score*Persistent low structural disadvantage							Ref		
MEIM score*Intermittent high structural disadvantage							-0.16	0.08	0.05
MEIM score*Persistent high structural disadvantage							0.03	0.10	0.75

Note: MEIM=Multigroup Ethnic Identity Measure. Model 1 is the unadjusted model, Model 2 adjusts for maternal age (ref=20-24yrs), maternal educational qualifications (ref=no secondary school qualifications), and rangatahi gender identity (ref=cisgender boy). Model 3 additionally adjusts for rangatahi Māori experience of racial discrimination (ref=No racial discrimination). Model 4 additionally adjusts for cultural connectedness (sum score). Model 5 adds the interaction effect between cultural connectedness and the trajectories of structural disadvantage on mental health.

Table S 4 Multivariable linear regression models for Quality of life.

	Model 1			Model 2			Model 3			Model 4			Model 5		
	Estimate (beta)	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**	**Estimate (beta)**	**Std. Error**	**p-value**
Intercept	39.34	0.22	<.001	39.68	0.63	<.001	39.95	0.62	<.001	34.06	0.95	<.001	34.07	1.25	<.001
Rangatahi Gender at 12-years															
Cisgender boy				Ref			Ref			Ref			Ref		
Cisgender girl				-0.51	0.33	0.12	-0.53	0.32	0.10	-0.71	0.32	0.02	-0.71	0.32	0.03
Trans-Non-binary/Unsure				-2.65	0.40	<.001	-2.44	0.40	<.001	-2.40	0.39	<.001	-2.39	0.39	<.001
Maternal educational qualifications at the antenatal wave															
Less than secondary school qualification				Ref			Ref			Ref			Ref		
Secondary school qualification or higher				0.75	0.49	0.13	0.60	0.49	0.22	0.55	0.48	0.25	0.55	0.48	0.25
Maternal age at the antenatal wave															
≤ 24 years				Ref			Ref			Ref			Ref		
25-34 years				-0.54	0.37	0.14	-0.50	0.37	0.17	-0.50	0.36	0.16	-0.50	0.36	0.16
≥ 35 years				-0.40	0.46	0.38	-0.35	0.46	0.44	-0.24	0.44	0.59	-0.25	0.45	0.57
Structural disadvantage trajectory															
Persistent low structural disadvantage	Ref			Ref			Ref			Ref			Ref		
Intermittent high structural disadvantage	-0.09	0.34	0.79	-0.001	0.34	1.00	0.08	0.34	0.81	-0.11	0.33	0.74	-0.36	1.71	0.83
Persistent high structural disadvantage	-1.74	0.40	<.001	-1.64	0.44	<.001	-1.57	0.43	<.001	-1.60	0.42	<.001	-1.18	2.09	0.57

Experience of racial discrimination at 12-years									
No experience of racism	Ref			Ref			Ref		
Experience of racism	-2.76	0.51	<.001	-3.08	0.49	<.001	-3.08	0.49	<.001
Cultural connectedness									
MEIM sum score				0.14	0.02	<.001	0.14	0.03	<.001
Interaction terms									
MEIM score*Persistent low structural disadvantage							Ref		
MEIM score*Intermittent high structural disadvantage							0.01	0.04	0.88
MEIM score*Persistent high structural disadvantage							-0.01	0.05	0.84

Note: MEIM=Multigroup Ethnic Identity Measure. Model 1 is the unadjusted model, Model 2 adjusts for maternal age (ref=20-24yrs), maternal educational qualifications (ref=no secondary school qualifications), and rangatahi gender identity (ref=cisgender boy). Model 3 additionally adjusts for rangatahi Māori experience of racial discrimination (ref=No racial discrimination). Model 4 additionally adjusts for cultural connectedness (sum score). Model 5 adds the interaction effect between cultural connectedness and the trajectories of structural disadvantage on mental health.

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For further information, please contact researchgrowingup@auckland.ac.nz